Technical and Bibliographic Notes / Notes techniques et bibliographiques

The Institute has attempted to obtain the best original copy available for filming. Features of this copy which may be bibliographically unique, which may alter any of the images in the reproduction, or which may significantly change the usual method of filming, are checked below.

L'Institut a microfilmé le meilleur exemplaire qu'il lui a été possible de se procurer. Les détails de cet exemplaire qui sont peut-être uniques du point de vue bibliographique, qui peuvent modifier une image reproduite, ou qui peuvent exiger une modification dans la méthode normale de filmage sont indiqués ci-dessous.

- [x] Coloured covers/ Couverture de couleur
- [ ] Covers damaged/ Couverture endommagée
- [ ] Covers restored and/or laminated/ Couverture restaurée et/ou pellicuiée
- [ ] Cover title missing/ Le titre de couverture manque
- [ ] Coloured maps/ Cartes géographiques en couleur
- [ ] Coloured ink (i.e. other than blue or black)/ Encre de couleur (i.e. autre que bleue ou noire)
- [ ] Coloured plates and/or illustrations/ Planches et/ou illustrations en couleur
- [x] Bound with other material/ Relié avec d'autres documents
- [x] Tight binding may cause shadows or distortion along interior margin/ La reliure serrée peut causer de l'ombre ou de la distorsion le long de la marge intérieure
- [ ] Blank leaves added during restoration may appear within the text. Whenever possible, these have been omitted from filming/ Il se peut que certaines pages blanches ajoutées lors d'une restauration apparaissent dans le texte, mais, lorsque cela était possible, ces pages n'ont pas été filmées.

- [ ] Coloured pages/ Pages de couleur
- [ ] Pages damaged/ Pages endommagées
- [ ] Pages restored and/or laminated/ Pages restaurées et/ou pelliculées
- [x] Pages discoloured, stained or foxed/ Pages décolorées, tachetées ou piquées
- [ ] Pages detached/ Pages détachées
- [x] Showthrough/ Transparence
- [x] Quality of print varies/ Qualité inégale de l'impression
- [ ] Continuous pagination/ Pagination continue
- [x] Includes index(es)/ Comprend un (des) index

Title on header taken from:/ Le titre de l'en-tête provient:

- [ ] Title page of issue/ Page de titre de la livraison
- [ ] Caption of issue/ Titre de départ de la livraison
- [ ] Masthead/ Générique (périodiques) de la livraison

- [x] Additional comments:/ Commentaires supplémentaires: Various pagings.

This item is filmed at the reduction ratio checked below/
Ce document est filmé au taux de réduction indiqué ci-dessous.

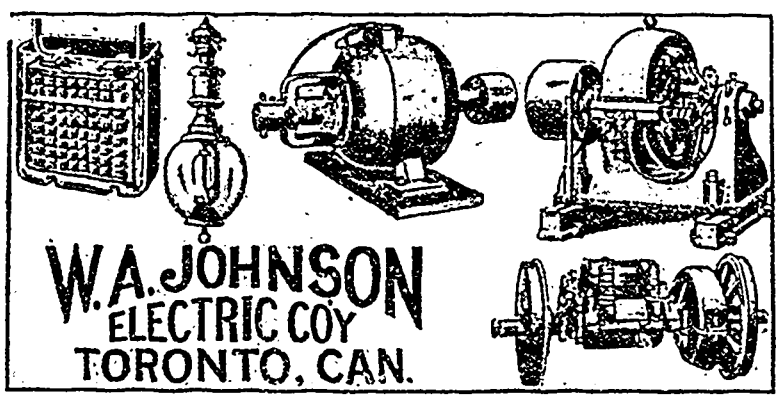
10X	12X	14X	16X	18X	20X	22X	24X	26X	28X	30X	32X
									✓		

CANADIAN
ELECTRICAL NEWS
AND ENGINEERING JOURNAL

OLD SERIES, VOL. XV.—No. 6.
NEW SERIES, VOL. IX.—No. 1.

JANUARY, 1899

PRICE 10 CENTS
$1.00 PER YEAR.



ALTERNATING GENERATORS
Induction and Revolving Field Types.
DIRECT CURRENT GENERATORS
For Power, Railways, Lighting.
WAGNER TRANSFORMERS
For any Pressure up to 40,000 Volts.
ARC DYNAMOS AND ENCLOSED ARC LAMPS
W. A. JOHNSON ELECTRIC CO'Y. 134 KING ST. W., TORONTO

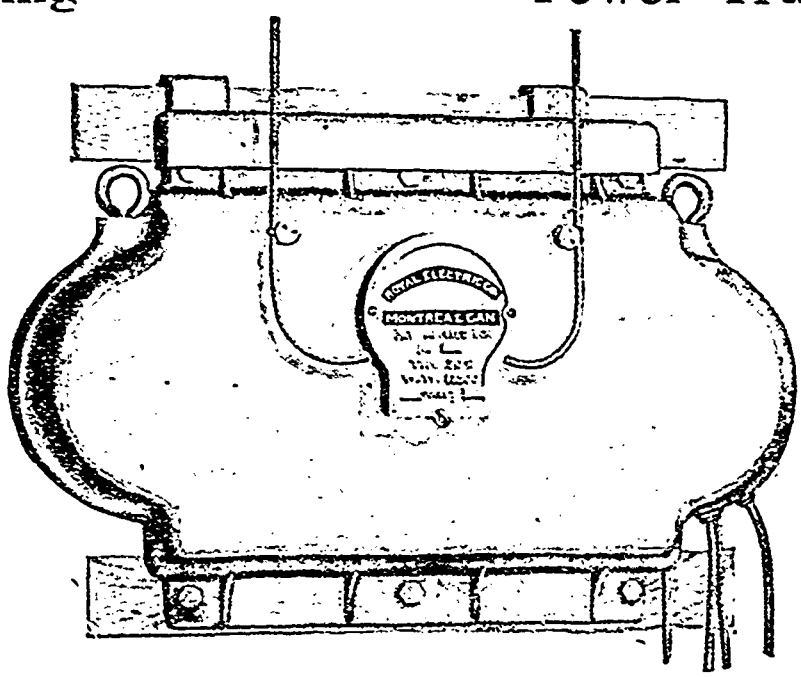
STANLEY TRANSFORMERS

The Standard of the World for

Incandescent Lighting
Arc Lighting

Operating Motors
Power Transmission

INCREASE
STATION
CAPACITY



DIMINISH
OPERATING
EXPENSES

We furnish a Guarantee of the EFFICIENCY and REGULATION of each Transformer and will Insure them for one per cent. per annum.

THE ROYAL ELECTRIC CO.

MONTREAL, QUE. Western Office— TORONTO, ONT.

ROBERT A. ROSS, E. E.
Member Canadian Society C.E.
Member American Institute E.E.
Formerly Electrical Engineer of Royal Electric Co. and Canadian General Electric Co.

CONSULTING ENGINEER

Specifications, Plans, Advice upon Steam and Electric Plants, Power Transmission and Distribution, Special machines designed.

17 ST. JOHN STREET - MONTREAL

J. ALEX. GULVERWELL
ELECTRICAL and MECHANICAL... FINANCIAL BROKER
Special Agent Royal Victoria Life.
Late Local Manager Toronto and Central Ontario for Royal Victoria Life.
Formerly with Edison General Electric Co., Canadian District.
5 King Street West - TORONTO

EDWARD SLADE
Electrical Contractor
and Engineer.....
137 St. John Street, QUEBEC

GEORGE WHITE-FRASER
CONSULTING ELECTRICAL ENGINEER
Mem. Am. Inst. Elec. Eng. Mem Can. Soc. C.E.

Advice in Management of Central Stations; Alterations, Extensions, Tests—Steam or Water Plans, Estimates, Specifications Construction, Power and Electric Plants.

18 Imperial Loan Building,
32 Adelaide St. E. - TORONTO

FIRSTBROOK BROS.
King St. East, - TORONTO.
MANUFACTURERS OF
TOPPINS,
SIDE-BLOCKS
AND CROSS-ARMS.
WRITE FOR PARTICULARS.

C. E. SHEDRICK
Manufacturer of SHERBROOKE, QUE.

High Grade Electrical Measuring Instruments and X-Ray Outfits.

Licensee of the Whitney Electrical Instrument Company's Patents in Canada.

Patronize Home Industries.
All I ask is a trial

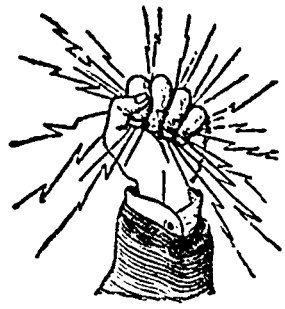
Advertising Rates for this journal can be had on application to the publishers.

CHARLES F. CLARK, President. JARED CHITTENDEN, Treasurer.
ESTABLISHED 1849.
THE BRADSTREET
MERCANTILE AGENCY
THE BRADSTREET COMPANY, Proprietors
346 & 348 Broadway, NEW YORK.
Offices in the principal cities of the United States, Canada, the European Continent, Australia, and in London, England.

The Bradstreet Company is the oldest, and, financially, the strongest organization of its kind—working in one interest and under one management—with wider ramifications, with more capital invested in the business, and it expends more money every year for the collection and dissemination of information than any similar institution in the world.

TORONTO OFFICES:
McKinnon Bldg., Cor. Jordan & Melinda Sts.
THOS. C. IRVING, Superintendent.

EUGENE F. PHILLIPS, President. JOHN CARROLL, Sec. and Treas.
EUGENE F. PHILLIPS ELECTRICAL WORKS
(LIMITED)
MONTREAL, CANADA



BARE AND INSULATED ELECTRIC WIRE
Electric Light Line Wire
Incandescent and Flexible Cords
RAILWAY FEEDER AND TROLLEY WIRE
Americanite, Magnet, Office and Annunciator Wires
Cables for Aerial and Underground Use.

U. S. Factory: AMERICAN ELECTRICAL WORKS, Providence, R. I.
New York Store: P. C. ACKERMAN, Agent, 10 Cortland Street.
Chicago Store: F. E. DONOHOE, Agent, 241 Madison Street.

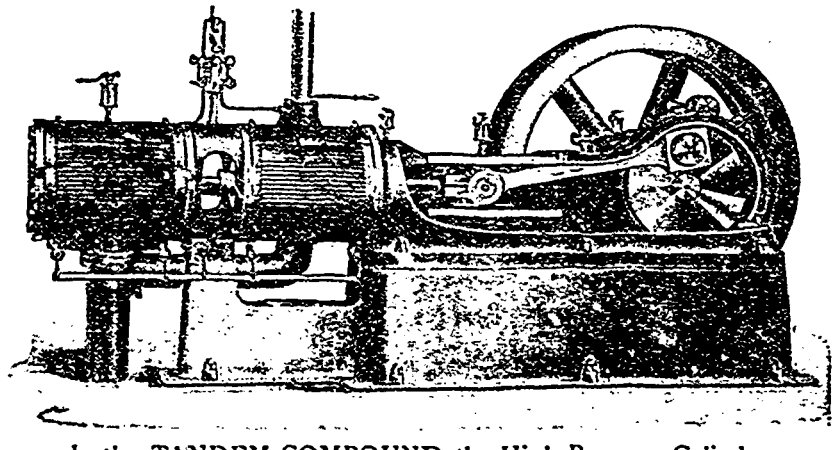
The Jenckes Machine Co.
during the past summer and fall have supplied the following concerns with
CROCKER PATENT TURBINE
Water Power Plants for Electrical Purposes:

The Shipton Electric Light and Power Co.,	Danville, Que.	1-35 in.,	Horizontal Setting.
Electric Reduction Co.,	Buckingham, Que.	2-45 in.,	" "
Stanstead Electric Light Co.,	Stanstead, Que.	2-15 in.,	" "
Montmagny Electric Light Co.,	Montmagny, Que.	1-35 in.,	" "
Sherbrooke Gas & Water Co.,	Sherbrooke, Que.	2-40 in.,	" "
Lake Weedon Electric Light Co.,	Lake Weedon, Que.	1-15 in.,	" "
Stanbridge, East, Que.,	Stanbridge, Que.,	1-25 in.,	Vertical Setting.
Town of Granby, Que.		2-30 in.,	Horizontal Setting.
Mattawa Electric Light Co.,	Mattawa, Ont.	2-35 in.,	" "

Detailed descriptions of these plants and any other information of interest to prospective users cheerfully furnished on application.

32 Lansdowne St. - Sherbrooke, Que.

Robb-Armstrong Automatic Engines
Centre or Side Crank



In the TANDEM COMPOUND the High Pressure Cylinder is placed next the frame, and both Pistons and Cylinder Heads may be withdrawn through the Low Pressure Cylinder without disturbing it. Both Valves are controlled by the Governor, so arranged that an equal amount of work is done in each Cylinder.

ROBB ENGINEERING CO., Limited, Amherst, N.S.

CANADIAN

ELECTRICAL NEWS

—AND—

Steam Engineering Journal

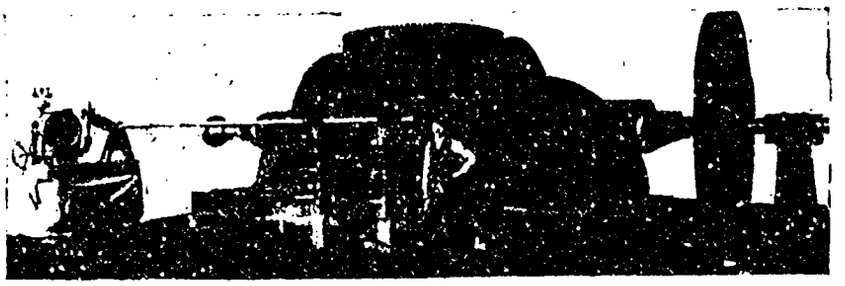
VOL. IX

1899:
THE C. H. MORTIMER PUBLISHING COMPANY OF TORONTO, LIMITED,
TORONTO, CANADA.

INDEX

McCORMICK TURBINES

State your Requirements and send for Catalogue



Estimates Furnished for Complete Power Plants, and Results Guaranteed

Represents a pair of 30-inch McCormick Turbines, with Governor and Fly-Wheel for regulating speed. The Turbine Shaft is direct-connected to a 750 k.w Generator.

Four Outfits like this, developing 5,000 h.p., and one pair of 51 inch of 1,350 h.p., furnished the Sacramento Electric, Gas & Railway Co., Folsom, Cal. Power is transmitted 23 miles.

S. MORGAN SMITH CO. - YORK, PA., U.S.A.

What Every Electrical Engineer Appreciates

In an Engine is A Sensitive Governor

With a Quick and Certain Action, Producing Fine Regulation.

This can be found in the

"IDEAL" HIGH SPEED ENGINE

BUILT BY

The Goldie & McCulloch Co'y

(LIMITED)

GALT - ONTARIO

Note.—The IDEAL will not spray or throw oil on your floors, or saturate your dynamos.

WRITE FOR CATALOGUE

If you wish to do business in the Electrical Field, THE ELECTRICAL NEWS is the best medium through which to reach probable customers.

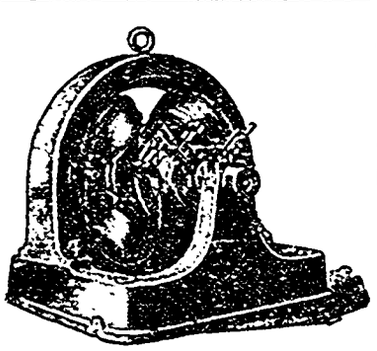
Can I Become an Electrical Engineer?

For our free book entitled "Can I Become An Electrical Engineer?" address

The Electrical Engineer Institute of Correspondence Instruction

(Conducted under the auspices of "THE ELECTRICAL ENGINEER.")

HERMAN A. STRAUSS, E. E., General Manager. 120 LIBERTY STREET, NEW YORK, U.S.A.



Write Us For Prices

....ON....

SWITCHES, DYNAMOS AND MOTORS, AUTOMATIC MOTOR STARTERS

and all Electrical Devices and Repairs

T. & H. ELECTRIC CO.

255-7 James St. North, HAMILTON 58 Adelaide St. West, TORONTO

JUBILEE SHAKING GRATES

The Most DURABLE, EFFICIENT and ECONOMICAL Bar in the World.

More Heat from Soft Coal, Slack or Screenings than from the Best Select Lump or Steam Coal burned on Stationary Bars. 10 to 25% Saving in Fuel Bills easily effected by using cheaper fuel on JUBILEE BARS.

Manufactured by.....

[COPY.]

THE JUBILEE GRATE BAR CO., Toronto. TORONTO, Jan'y 8th, 1898.

DEAR SIRS,—Answering your enquiry as to our opinion of the Jubilee Grates, would say that we have had them in use for over a month, and have found them very satisfactory. We are saving over $2.00 in our coal bill per day for 10 hours' work. With the old grates we could not get steam without using Screened Lump Soft Coal; now we use Soft Coal Screenings, and we are developing about 24 h.p. more than we could with the old grates. You have already taken a memorandum of the tests that were made of the old and the new grates; we have checked over the figures to-day and find them quite correct.

Yours truly,

(Sgd.) THE TORONTO RADIATOR MFG. CO., Limited.
Jno. M. Taylor, Sec'y-Mgr.

THE JUBILEE GRATE BAR CO. of Toronto, Limited,
Office and Factory: Esplanade, Foot of West Market St., TORONTO, ONTARIO
and THE GOLDIE & McCULLOCH CO., Limited, Galt, Ontario

A PROSPEROUS NEW YEAR

We wish all the members of the Electrical Fraternity a Happy and Prosperous Year. We take this opportunity of extending you our thanks for your liberal patronage in the past; our business doubled itself last year, and we hope to double it this year with **Imperial Incandescent Lamps, Upton Arcs, Imperial Rubber-Covered Wires, Bryant Supplies, Anchor Switches, Hartford Switches and Flexible Conduit.**

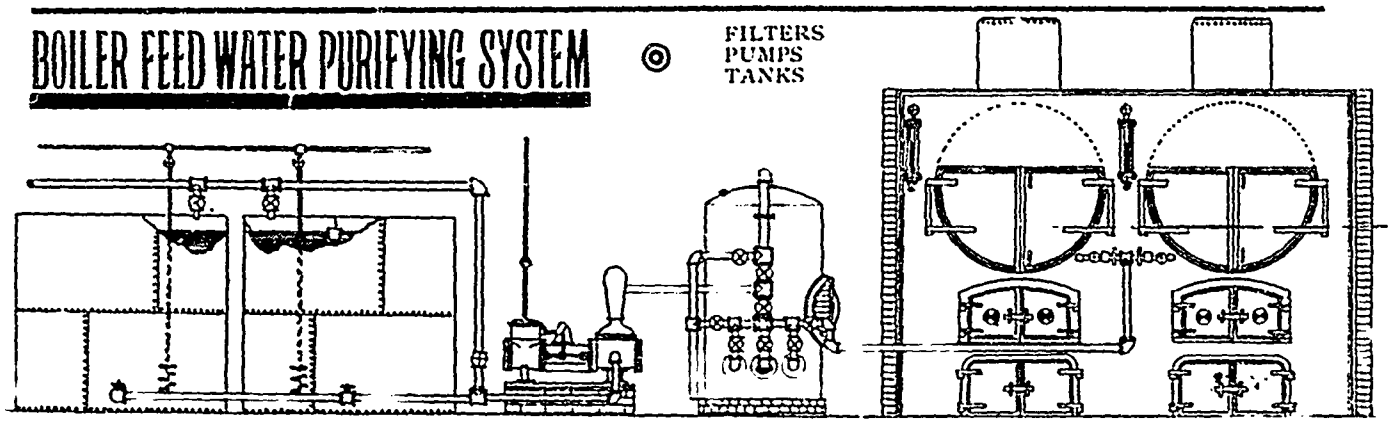
We can meet your wants for '99.
We keep everything Electrical.

JOHN FORMAM

644 Craig Street - MONTREAL, QUE.

BOILER FEED WATER PURIFYING SYSTEM

FILTERS
PUMPS
TANKS



JOHN McDOUGALL - Caledonian Iron Works, MONTREAL, QUE.

There is Nothing Too Good for your Boiler

IT IS THE HEART OF YOUR FACTORY

CLEAN BOILERS Save Repair Bills and Shut-Downs. **SAVE FUEL**

Our **ZINKOLENE** and Special Compounds are
MONEY-MAKERS for You.

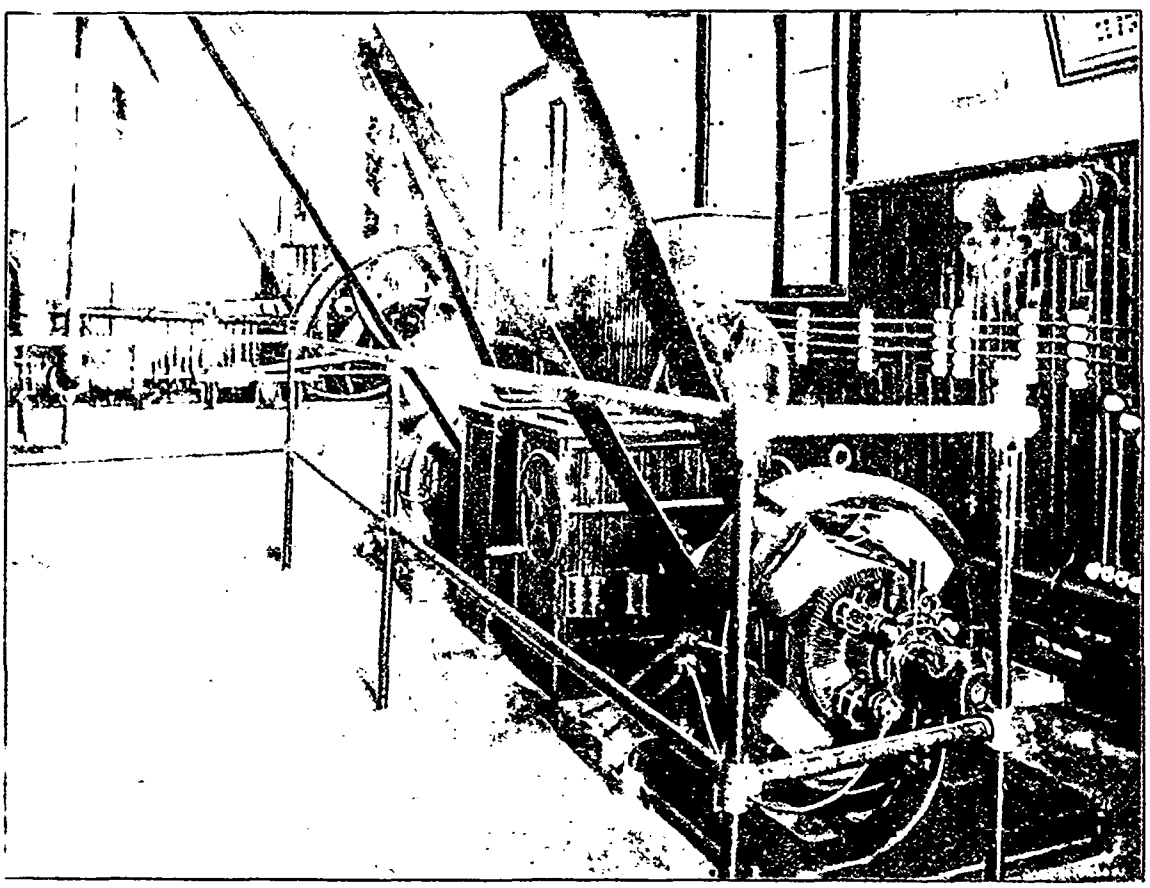
THE CHEMICAL COMPOUND CO. - ROOM 311 TEMPLE BUILDING, TORONTO

CANADIAN
ELECTRICAL NEWS
AND
STEAM ENGINEERING JOURNAL.

VOL. IX. JANUARY, 1899 No. 1.

ELECTRICAL PLANT AT THE BEAUPORT INSANE ASYLUM.

JUST outside the city of Quebec, at the Beauport Insane Asylum (L'Asile d'alienes de Beauport) an unusually complete electrical plant of small size has recently been installed, a description of which may interest some of our readers. The Beauport Asylum grounds cover an area of about 140 acres, upon which there are fourteen different buildings, eleven of these being supplied with electric light. The boiler house, a part of which forms the dynamo room, is in the centre of the buildings, the most advantageous position.



ELECTRICAL PLANT AT THE BEAUPORT INSANE ASYLUM—DYNAMO ROOM.

A noteworthy feature of the installation is the extreme flexibility of the generating plant, which renders the lighting system practically infallible, a point which has very great significance in an institution where lunatics have to be dealt with.

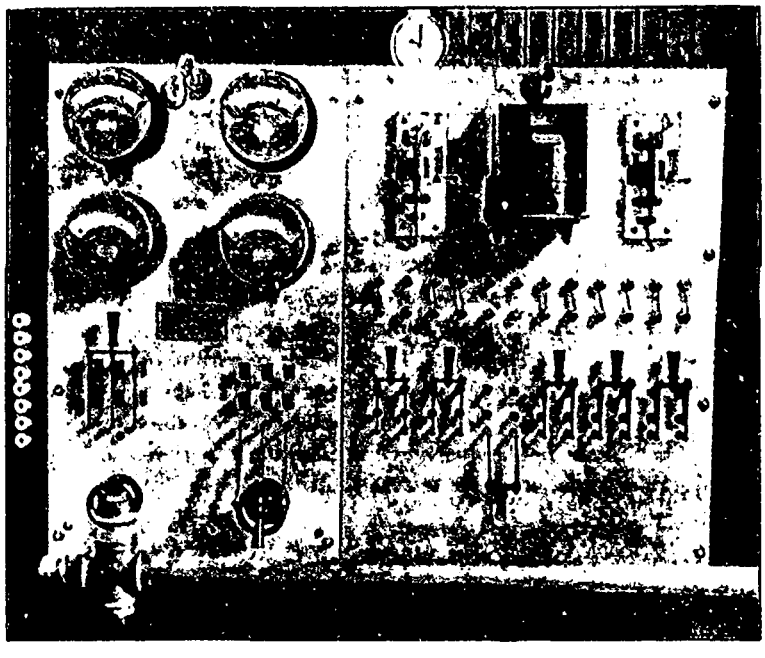
The generating plant is operated by water power, and is in duplicate throughout, with the exception of the steam engine, which is held in reserve as an auxiliary and at the same time is used as a "booster" during the heavy load, the water supply being limited and inadequate for driving the machines under full load. This water power is brought through an underground iron pipe for a distance of four miles, from a large lake which is at an altitude of 300 feet above the grounds upon which the buildings of the institution are located. This pipe is eight inches in diameter for the first two miles and six inches for the remaining distance, and was never intended for any other purpose than an ordinary household water supply, the question of power other than for fire purposes never having been taken into consideration. But upon the advent of the present engineer, he, having had considerable experience in hydraulic work, at once realized the power in store, and in a short time had all the steam power used in the machine shops, laundries, etc., replaced by water power.

The water wheels are of the Pelton type, designed and built on the premises to suit the local conditions. On account of the success attained with these wheels, the management of the institution was led to ask for an engineer's report on the practicability of utilizing this power to light the various buildings on the grounds with electric light. The coal gas system in use was in need of costly repairs, and was also accompanied by a considerable amount of danger in an institution of this sort.

The illustration on this page is a view of the dynamo room, showing the arrangement of the dynamos, waterwheels and the engine. The dynamos are of the slow-

speed Johnson type. The belts going from the pulleys on each machine and the steam engine are connected to the line shaft on the ceiling. As will be seen, the dynamos are directly connected to the shafts of the water-wheels by means of flexible couplers.

Under ordinary conditions it is necessary to run only one machine, but very often it happens that both of them are required. For this purpose, the machines were arranged with equalizer connections brought back onto the middle poles of three-pole main switches, which may be seen on the machine panel of the switchboard, just above the rheostat wheels. The second illustration is of the marble switchboard.



ELECTRIC PLANT AT BEAUPORT INSANE ASYLUM.—SWITCHBOARD.

At all times when the two dynamos are running together, they are belted to the line shaft, which serves as a very simple and reliable regulator as regards the equalizing effect between the two machines. This is the case whether one machine is being run by water and the other by steam, or whether both are being run by water. In the latter case, of course, the engine belt is free. The engine is always ready to run, summer and winter, as the boilers are used to generate the steam for cooking, heating and laundry work.

One water-wheel is provided with a governor, which was also designed and built by the engineer; but this governor is used only during the day when the water pressure is unsteady, on account of the varying loads on other wheels on the premises. At night, when other wheels are not in use, the water pressure is absolutely constant, and once the gate is adjusted for the normal load, it is very little trouble for the attendant to keep the voltage steady. As the load is very near a constant one, the amount of regulation necessary is practically nil. Great pains were taken to make as nearly perfect an installation as was possible, and only the best of apparatus was used throughout, including Weston instruments and T. H. watt-meter.

The circuits are so arranged that should a main fuse blow on any one of them, the fuse terminals may be bridged immediately till the fuse is replaced, unless it is that the mains themselves become short-circuited, which event is highly improbable on account of the substantial character of the outside construction.

The wiring throughout all the buildings is cleat and knob work, with the exception of the main portion of the women's building, which is done in moulding. The whole wiring system is most elaborately laid out as regards the distribution of switches. Each ward is so arranged that one or more lights may be turned on from either end. The completeness of this switch system may be imagined when it is stated that the total number is equal to one switch to every two lamps installed. Leaving out the workshops, stables and laundries, the proportion of switches is equal to every one and one-one-third lamps.

The arrangement of the electric irons in the ironing room of the laundry is shown in the third illustration. In the laundry department there is an equipment of sixteen eight-pound domestic irons of the American Heating Corporation's make, and it is claimed that about twice as much work is accomplished daily since the adoption of this system.

ELECTRIC PLANT AT BEAUPORT INSANE ASYLUM —IRONING ROOM IN LAUNDRY.

The chapel after illumination is an exceedingly pretty and artistic feature of this installation. For this purpose 13 volt miniature series lamps are used in many colors, and the rich effect they give when lighted is one not easily forgotten.

In the spring this plant is to be made even more com-

plete by the addition of quite a large storage battery to carry the night load and to take the place of the second machine and engine during the heavy load.

The entire plant as above described was contracted for and installed by Mr. Edward Slade, of Quebec, upon whom it reflects much credit. It is one of the most interesting small installations yet carried out.

QUESTIONS AND ANSWERS.

"SUBSCRIBER" writes. "I am in charge of an alternator stamped by its makers 40 amperes, 1,040 volts. As I understand it, one ampere on primaries gives 20 amperes on secondaries, if so, 20 × 40 = 800 amperes, total secondary capacity. Now, some electricians calculate on 104 volts, ½ ampere per lamp, others 6 amperes to 10 lamps. The one would give 1,600 lamps, the other 1,440 lamps capacity. This must be wrong, for the manufacturers only claim 800 16 c.p. lamps as the total capacity of the machine. Will you kindly give me the proper system of figuring out a machine's capacity, also what size of wire should be used for primaries, it being 1,500 feet from machine to centre of distribution? Our transformers are banked in pairs, operating on a three-wire secondary system. What size of wire should be used to give the highest efficiency?"

ANSWER. You are making a serious error in your method of calculating the machine capacity. If you desire 20 amperes on the secondary for each ampere on the primary, you must have a "transforming ratio" of 20 to 1. This will give you 52 volts secondary pressure. If, on the other hand, you desire 104 volts secondary pressure, your transforming ratio must be 10 to 1, in which case you will have only 400 amperes on the secondaries, not 800; so that you will see that in your calculation you are multiplying a 20 to 1 ratio amperage by a 10 to 1 ratio voltage, thus getting, of course, a very wrong result. Whether you get 20 secondary amperes to every primary single ampere or not is a matter that depends on your transformers. It is not usual to-day to use 52-volt lamps; therefore, assuming you use 104-volt lamps, and have therefore 104-volt secondaries, with a transforming ratio of 10 to 1, the method of calculating your machine capacity is as follows: The primary capacity is, of course, 40 × 1,040 = 41,600 watts. The secondary capacity, as you probably know, is the same number of watts, but with different volts and amperes. Using 104 volt secondaries, divide 41,600 by 104, and the quotient 400 is the total secondary amperage (because 104 × 400 = 41,600 watts). How many lamps this 400 amperes will allow depends on the kind of lamp. You are aware that you can purchase in the market lamps requiring 3, 3½ or 4 watts per candle power, or per 16 c.p. lamp requiring 48, 56, or 64 watts. Probably the 3½ 56-watt lamp is what you use. This lamp takes 56 ÷ 104 amperes, or .538 amperes. The total number of lamps that the machine will supply can therefore be calculated by dividing 400 by .538, with the result 743 lamps. A 4 64-watt lamp would similarly require 64 ÷ 104 = .615 ampere, giving 400 ÷ .615 = 652 lamps. And again, similarly, a 3 48-watt lamp would require 48 ÷ 104 = .461 ampere, giving a total capacity of 400 ÷ .461 = 867 lamps. The foregoing gives the method of calculation in unnecessary detail, for the sake of explanation. The shortest method is: A machine with the primary voltage and amperage 1,040 and 40, has a capacity of 41,600 watts. The capacity of this in 56-watt lamps is evidently 41,600 ÷ 56 = 741 lamps. The size of primary wire to use is found by the formula,

$$\frac{21 \times 1{,}500 \times 40}{\text{volts in "drop"}}$$

Allowing 5% drop, or 52 volts, the wire is calculated at 24,231 c. m. = No. 6 B. & S. The proper size of wire for secondaries depends on the distance apart of transformers, but probably three No. 6 secondaries would be the best.

"J M.," Toronto, writes "I have read with interest your article in the November issue on the transmission to Arthur, Ont. As I, in common with a great many others of your readers, am interested in prospective transmissions, I would take it as a great favor if you would publish a full description of the plant; give length of line, size of wire, number of wires, voltage of transmission; state whether it is single or two phase, number of lights supplied, and the formulae by which the 6% loss was obtained."

ANSWER. The Grand Valley-Arthur transmission plant, referred to by our correspondent, has been in operation for some time. The plant is located at Grand Valley, and consists of a 75 h.p. high speed engine, manufactured by the Goldie-McCulloch Co., of Galt, and an 85 h.p. boiler. Fuel used is mill refuse and slabs. The electrical equipment was furnished throughout by the Royal Electric Co., and consists of a type R "S.K.C." two phase generator, with the the usual station instruments, mounted on a marble switchboard. One phase of the generator supplies incandescent street and house lights for the village of Grand Valley, to the number of about 350, and is distributed in the ordinary way, the primary voltage being 2,080 volts and the secondary 104 volts. The second phase of the machine is carried to the switchboard in the usual way. After passing through the switchboard, it enters a booster transformer, which has a range of 300 volts. This is sufficient to overcome the ohmic loss in the transmission of 9 amperes at 2,400 volts a distance of 13 miles, where it reaches the village of Arthur, and is there distributed in the usual way, 2,080 volts primary and 104 volts secondary. There are also operated at Arthur from this circuit three alternating current arc lamps of a nominal 2,000 candle power, and 15 32 c.p. street lamps, the balance being used up in store and house lighting. The regulation of the lights at Arthur is accomplished from Grand Valley by a regulator head set in the booster transformer, where the primary voltage can be regulated at 20 volts per step, or one volt in the secondary. There is also a telephone line erected on the transmission line, and if the light varies or the voltage raises or drops, the man in charge at Arthur immediately notifies the engineer at Grand Valley. Thus the pressure is kept practically constant. The heart of the entire system is, of course, the transmission line. Special care was taken in the construction of this line. The poles vary from 30 to 35 feet in length, with not smaller than 7 inch tops, set 5 feet in the ground, thoroughly tamped and properly guyed. Running through an open country as this line does, it is subject to severe lightning storms. It was, therefore, very essential that lightning should be guarded against. In constructing the line there was put underneath every fifth pole an iron plate one foot square, No. 16 Birmingham gauge. To this was attached a galvanized iron wire run to the top of the pole and there attached to a barbed wire, which is strung along the entire line on top of the poles, and which is also grounded at each end of the line. This protection has proven sufficient, as it passed through two very severe lightning storms late last fall without any damage. The cross-arms are made of seasoned pine fastened to the pole with two 7 inch lag screws. The pins are of the best white oak, and the insulators triple-petticoat glass. The transmission line consists of two No. 4 bare copper wires, which are fastened to the insulators in the usual way, with a side tie. Beneath this cross-arm is affixed a second one, which carries the telephone wires. The telephone line is constructed in the ordinary way, with the exception that it is transposed every fifth pole, or every 500 feet, to overcome the induction due to alternating current. This it does entirely, as the telephones are in use daily, and conversation can be carried on in an ordinary tone when the transmission line is carrying its full complement of current. That the above is a successful venture is evidenced by the fact that the proprietor of the plant is negotiating for a machine of a larger size, or one having a capacity of 1,000 lights.

The Leamington Electric Light Company, of Leamington, Ont., will increase its capital stock from $3,000 to $30,000.

The Board of Trade of Parry Sound, Ont., has recommended the construction of an electric railway to connect Parry Sound and Depot Harbor. The cost of the road is estimated at $25,000.

The Gurney Tilden Co., of Hamilton, are now operating their entire works by electric power. They have installed two 20-h.p. and one 30-h.p. S.K.C. two-phase motors, and get their current from the Cataract Power Co.

The gas and electric light works at St. Hyacinthe, Que., were badly damaged by fire on the 5th inst. The buildings, including engines and dynamos, were almost completely destroyed. The loss is estimated at $10,000, which is believed to be fully covered by insurance. The works are owned by Mr. Louis Brousseau.

The Hamilton Electric Light and Power Co. are installing in their lighting station two 240 k.w. S.K.C. synchronous motors. These are to drive the shafting from which is operated the arc machines and the motor power service. The current for these motors is to be supplied by the Cataract Power Co. It is expected that the steam plant will be entirely shut down by the first of February. The incandescent light has been furnished from the Cataract Power Co's current for the past three months, and has been very satisfactory.

EFFECTS OF THE RECENT STORM AT HAMILTON.

After the experience through which they have recently passed, the citizens of Hamilton should be able to appreciate, at something like their true value, the advantages conferred by the modern street railway, electric light, telegraph and telephone systems. The unusually destructive snow and sleet storm which passed over that city in December completely demoralized for a time all these electrical agencies. The accompanying illustration will show even better than a lengthy description the chaotic condition which the electrical companies were called upon to face in Hamilton and throughout the western peninsula. The transmission lines between Hamilton and Niagara and west to Sarnia and Windsor were badly crippled. One

ELECTRIC LIGHT AND POWER INSTALLATION.

What is doubtless one of the most complete and conveniently arranged electric plants operated by water power has recently been put in operation at Sherbrooke, Que., by the Sherbrooke Gas & Water Company. The new plant was designed to largely augment their facilities for supplying electric light and power, there being an increasing business in sight, one contract, for example, being the electrical driving of the machinery in the new shops of the Quebec Central Railway in Newington. During last fall their water power was re-developed, the two Leffel vertical wheels being replaced by two 40-inch horizontally set Crocker turbines, and their lighting machines by two 300 k.w. S.K.C. Royal Electric generators, these being belted direct to the

View on Hughson Street, Hamilton, Showing Effect of the Recent Sleet Storm.

of the telegraph officials applied a rule to a No. 8 fallen wire at Burlington and found the diameter, inclusive of the coating of ice, to be 4½ inches, and the weight about 8 lbs. to the foot. It was impossible that even the best constructed lines could withstand such a burden, so that in the sections where the storm raged most severly there was a total collapse. Mr. A. B. Smith, superintendent of construction, and Mr. C. P. Dwight, of the G. N. W. Telegraph Co., Mr. L. B. McFarlane, superintendent of the Bell Telephone Co., and Mr. Homer Pringle, division superintendent of the C.P.R. Telegraph Co., were early on the scene with a large corps of linemen summoned from various directions. As soon as possible temporary lines of communication were strung, to serve until a permanent restoration of the lines could be effected. This will involve much time and an expenditure running high up into the thousands.

water wheel shaft, and the consequent loss by gearing and jack shaft transmission obviated. The company's station, so prettily situated on the rocky little island, has been enlarged and improved. The imposing marble switchboard, the large and nicely finished generators on the main floor, with elbow opening off containing the wheel case and pulleys, within the light and roomy station building, give evidence of the company's determination to be in the front rank in these days of improvement, and reflect great credit on Mr. Sangster, their able and efficient superintendent.

The construction and installation of the water power machinery as a whole was placed in the hands of the Jenckes Machine Co., of Sherebrooke, and the finished work reveals an excellent example of progressive ideas and good workmanship. Two 40-inch Crocker turbines in horizontal setting are contained in one steel case, 10 feet in diameter and over 20 feet in length, and are

supplied with water under 31 feet head from the dam some 70 feet away, by two feeder pipes, 80 inches in diameter. Each wheel will develop 518 horse power. The whole wheel case and shafting is supported by steel girders and solid masonry. All bearings are of the self-oiling ring type, and the gate mechanism is operated from a suitable point in the dynamo room overhead. The main driving pulleys located at each end of the wheel case are 108 in. diameter and 36 in. face. The weight of the entire plant is about 125,000 lbs.

Taken altogether, the starting up of this plant marks an important point in Sherbrooke's industrial history, and emphasizes the ability and energy of those concerned

ELECTRICAL STAGE APPLIANCES.

THE proposed application of electrical power for mounting plays at Drury Lane, on the lines advocated by Mr. Edwin O. Sachs, has now taken a tangible form in the completion of the first section of the stage installation in time for the impending pantomime.

Mr. Sachs' present work refers principally to the stage floor and its movability in sections above and below the footlights. The total area now already movable by mechanical power exceeds 1200 square feet.

The electrical appliances just completed take the form of so-called 'bridges,' each working independently. Each individual section measures 40 feet by 7 feet, and weighs about 6 tons, of which about 4 tons are counterbalanced. They can travel about 20 feet vertically.

The motive power is from the ordinary electric supply mains over a four-pole motor, developing 7½ h.p. at 520 revolutions per minute. The 'bridges' are suspended from cables, and these, working over the motor, allow the former to be raised with the necessary live load at rates varying from 6 feet to 20 feet per minute.

Mr. Sachs has arranged for every possible safeguard against accident, the 'bridges' themselves being so constructed that in the event of derangement of current the appliances can be worked by hand gear. Automatic switches are provided so as not to be entirely dependent on the attendants, and automatic catches will work in case of rope-breaking. Special locking gear has been installed to hold the bridges stationary at certain points, such as stage level, and a very large factor of safety has been allowed in apportioning the strengths and weights in the various parts of the mechanism, having special regard to the ever-increasing scenic requirement under Mr. Arthur Collins' able management.

As regards the economic aspect of the electrical installation, the initial outlay on Mr. Sachs' system is about half that of Continental hydraulic work, and this is allowing for English contractors as against foreigners. The maintenance is minimal, whilst the actual working only costs a few pence per performance. The saving in manual labor on the tage is very considerable, whilst the hygiene of the theatre is materially raised by the absence of woodwork.

The Dominion Bridge Company, Montreal, have just completed the installation of an arc lighting system in their large works at Lachine. The dynamo and arc lamps were manufactured by the W. A. Johnson Electric Company, of Toronto.

It is learned that the new electric railway in Kingston, Jamaica, which is being built by Montreal capitalists, is nearing completion. A fortnight ago a trial trip was made, under the direction of Mr. Henry Holgate, superintendent for the West India Electric Co. The speed of the car was about nine miles per hour.

GOOD ADVICE TO BOILER ATTENDANTS.

THE Manchester, Eng., Steam Users' Association has issued the following hints to boiler attendants:

WATER LEVEL.—Before lighting fires see that there is sufficient water in the boiler. Test the water gauges frequently and keep the water level steady.

BLOW-OFF COCKS.—Before lighting fires be sure that the blow-off cocks are closed and not leaking. Occasionally feel if the blow-off waste pipes are hot. Blow off from bottom before starting the engine. Sediment has then settled in the elbow pipe. Blow off the scum before stopping the engines, but only when the water level is at the correct height. At such times most of the scum has collected in the troughs.

LIGHTING FIRES. Sudden changes of temperature may produce fractures or start leakages. Therefore never raise steam hurriedly. The top and bottom of a boiler should grow warm together. If convenient, fill the boiler with warm water through the economizer. If the boiler water is cold, allow fully six hours for raising steam. If pressed for time, fill the boiler to the top of the water gauge, fire slowly, and keep the safety valve open until steam blows off freely. After closing the safety valve, blow out the bottom cold water till the working level is reached. The pressure may now be raised more quickly.

SMOKE PREVENTION.—*Smoke and imperfect combustion* are caused by an insufficient air supply or by premature cooling of the flames. Therefore after coaling, when the fires are black, admit air either at the door or through the split bridge. It is less wasteful to admit too much air than too little. With smoky boilers or when hard pressed, keep the fires thin and even. Fire steadily. Don't coal all furnaces at once. Coal each furnace on one side at a time.

EMPTYING BOILERS.—*Do not empty boiler while steam* is up.

OVERHAULING, CLEANING AND INSPECTION.—Clean the boiler monthly or oftener; remove the scale while soft, if possible while emptying the boiler. Sweep the soot off the boiler plates and clean the flues every three months, as well as on the occasion of the annual inspection. All leakages should be stopped, any cause of dampness in the setting should be removed, corrosion should be arrested. The fusible plugs should be cleaned on the fire side and water side once a month, and the fusible metal should be renewed once a year at the time of the annual inspection. All cocks should be kept oiled, and, unless asbestos-packed, they should be overhauled once every month. These cocks, the feed valves, steam stop valves, and all safety valves, should be overhauled annually on the occasion of the inspector's visit.

MANHOLES.—Before opening the man-holes, ease the safety valve so as to be quite sure that there is no pressure in the boiler. Before entering a boiler secure the steam valves and blow off cocks.

SAFETY VALVES AND LOW WATER ALARMS. Never overload or tamper with safety valves or with low water alarms. Ease or test them regularly every day. Be sure that they are in working order. If they will not work properly, reduce the steam pressure and then report to the manager.

Mr. E. O. Champagne, boiler inspector for the city of Montreal, has given public notice that steam users neglecting to provide smoke consuming apparatus will be prosecuted.

MONTREAL.

(Correspondence of THE CANADIAN ELECTRICAL NEWS.)

VISIT TO THE CANADIAN GENERAL ELECTRIC COMPANY'S WORKS.

As briefly mentioned in this correspondence last month, a visit of inspection was made on December 2nd, by members of the Faculty, Professor Owen, and the advanced students of the Electrical Department of McGill University, to the works of the Canadian General Electric Company at Peterboro, Ont. The party left Montreal the previous evening in a special car on the C.P.R., the car being side-tracked on its arrival at Peterboro. The company consisted of Dean Bovey, Professors R. B. Owens (head of the Electrical Department), J. Wallace Walker, R. J. Durley, John Bell, E. Rutherford, H. Jacquays, Mr. F. R. Redpath, and the following students: Messrs. J. A. Shaw, R. E. Burgess, E. P. Featherstonhaugh, E. M. Archibald, L. Denis, L. L. Gisborne, J. C. Hyde, A. T. Grier, R. M. Wilson, H. M. Ewan, John S. Whyte, E. S. Wenger, J. W. Fraser, H. Meredith Percy, F. W. Walker, J. F. Weller, J. E. Glassco, and W. B. McLean.

These gentlemen were met on their arrival by Mr. Stephens, superintendent of the works, Mr. Watts, and other officers of the Canadian General Electric Company, who took them in charge as the guests of the company and extended to them every courtesy and hospitality during their visit.

The greater part of the day was spent in making a close examination of the manufacturing methods employed in the various departments of the works. For this purpose the visitors were divided into four groups, each group being in charge of one of the company's engineers. The meter department was first visited, where opportunity was given of witnessing the construction of the Thomson recording watt meter. Following this came an inspection of the transformer department, where the T. & H. type of transformers was seen in process of manufacture; next the department in which all kinds of fittings, such as sockets, rosettes, small switches, cut-outs, etc., are made. In the brass department the workmen were engaged on the manufacture of switchboards, including a 19-panel board for Winnipeg, designed to handle the complete electrical output of that city, including street railway, lighting and power circuits. There was also to be seen under construction in this department high tension switchboards, including a 4,400-volt board for Napanee.

All the above-mentioned departments are situated in the gallery of the main workshop. Downstairs are the armature department, test department, machine shop, tool room and commutator department. Almost every available foot of space on this floor was taken up with various classes of machinery in process of manufacture, prominent among which was to be seen a 300 k.w. single-phase rotating field alternator for the London Electric Company, a 300 k.w. monocyclic direct connected alternator for Winnipeg, several large synchronous motors for the mining districts, and a number of large induction motors for the Montreal Cotton Company, of Valleyfield, consisting of one 200 k.w., one 150 k.w., four 100 k.w., one 75 k.w. and one 250 k.w. machine; also a 475 k.w. six-pole lighting generator for the Toronto Electric Light Company.

No. 2 building, which was next visited, contains the pattern and carpenter shop, the drying ovens, and in the rear the brass foundry and compound pots for compounding wire.

In the adjoining building is the wire department, where the insulation of various kinds of wire is put on. In the upper part of the building is installed machinery for covering the finer grades of wire and for the manufacture of small armature coils, which are sent to the armature department to be assembled on the bodies. At the rear of the upper part of this building is located the incandescent lamp manufacturing department, which is perhaps the most interesting of all to the student, partly on account of the fact that the process of manufacture has in the past been more carefully guarded than in the case of many other kinds of apparatus, and also because of the many delicate and interesting operations through which the lamp passes in the process of manufacture. This department of the General Electric Company's works is in charge of Mr. Burnett, who took pains to explain as thoroughly as possible to the visitors the numerous details of the manufacturing operations. The work in this department is largely performed by young women, who are residents of the town and have been here trained to the work, which, by the way, requires no small amount of skill. The output of this department is understood to be about 1,500 lamps per day. It was interesting to learn something about the nature of the glass which is so important a material in this branch of manufacture. The visitors were informed that a great many varieties of lead glass had been experimented with, and that so great is the variation in quality that a difference of 50 per cent. in breakage has resulted from the use of different brands. It will thus be seen that the first cost of the material becomes a secondary consideration, as glass which can be purchased at a low price may in the end prove to be the most expensive, owing to its brittleness. The filament, which is so important a feature of the lamp, is in its original form a paste, which is drawn out to the required size and hardens, after which it is vulcanized and covered with a deposit of carbon. This filament is fed through a machine set to gauge, by which it is cut into proper lengths for lamps of various candle powers. The glass bulbs come from Cleveland. Among the more delicate operations connected with the manufacture of the lamps may be mentioned, the fusing of the leading-in wires into glass mounts, the making of the carbon joint between the filament and the leading-in wires, the flanging of the neck of the lamp, the inserting of the mount and filament into the bulb, and the closing up of the neck of the lamp by the fusing together of the bulb and mount. The air is afterwards extracted from the bulb and the lamp sealed up at the bottom. After this operation the lamps go into the testing department, where the vacuum and lighting qualities are tried, each lamp being compared as to its light-giving power with a standard lamp.

The visitors were also shown through the carbon and porcelain works, which occupy a separate building and embrace many interesting processes.

In the evening they were entertained at the residence of Mr. Stephens, and courtesies were likewise extended to them by Mr. Davis, the Mayor of the town.

The following morning they were driven to the Trent Valley Canal, where an inspection was made of the locks and other engineering features of the work, after which they returned to Montreal, not, however, without first having given full expression to their earnest appreciation of the kindness of the Canadian General Electric Company in affording them the opportunity of gaining much valuable information, as well as in looking so well after their comfort during their visit.

A CHARMED LIFE.

During the recent disastrous fire, one of the walls of Greenshield's warehouses toppled over into Craig street, carrying with it a great mass of electric wires and cables, the property of the electric light, telegraph and telephone companies. A day or two afterwards a gang of G.N.W. linemen, among whom was one Pierre Brouillet, were engaged in repairing the damage. Pierre was at the top of a 40-foot pole, when he fell limp across the cross arm, with his hands grasping the iron wires. His companions, with the aid of a couple of firemen, lowered the unconscious man to the ground, and the ambulance hurried him to the hospital, where, much to everybody's surprise, he soon recovered consciousness, and a few hours later walked into the head office of the company and reported for duty. It is not true, as stated in the local papers, that a current of 2,500 volts passed through Pierre's body, as the wire with which he came in contact was not capable of carrying that amount of current. For the same reason it would not be wise to hank on the conclusion that the man who gets in the path of a 2,500-volt current will escape with nothing more serious than a bad shaking up. The victim of this accident has escaped death so many times that he is regarded as the possessor of a charmed life. It is recalled that he fell into the Chambly Canal, but was fished out; that a hoist on which he was standing dropped four storeys without killing him, and that he also escaped death in a fire which destroyed the lives of two of his children.

McGILL UNIVERSITY NEWS.

Professor R. B. Owens has just returned from a trip to New York and Baltimore.

The apparatus for the new equipment of the Electrical Engineering Department is being received and put in place.

Mr. Samuel Insull, president of the Chicago Edison Co., is to lecture at McGill University during the latter part of February.

Dr. A. E. Kennelly, now of Philadelphia, and president of the American Institute of Electrical Engineers, but for a long time engaged in submarine cable work, will give four lectures on Submarine Telegraphy at McGill University about the end of January. All engineers interested are invited to attend.

NOTES.

Winter trolley parties have been introduced over the Montreal Belt Line, to Hotel Bout de l'Isle.

Mr. Normington, late of the G. N. W. Telegraph Co., this city, now with the W.U. Telegraph Co., New York, spent his vacation in Montreal. Mr. Normington was on the U. S. Signal Corps during the late unpleasantness between the United States and Spain, being stationed at Chickamauga Park.

Trade in Montreal during the fall and holiday season has been on the whole good, and there are few, if any, complaints from either the construction or supply houses. The outlook for construction after January, however, is not bright, and the supply men will be correspondingly affected.

It is with pleasure that your correspondent learns of the retention by the Canadian Pacific Railway Co. of Mr. R. A. Ross as their consulting electrical engineer. Mr. Ross is one of the few who can be depended on to act strictly in the interests of his employer and give all contractors equal opportunities in tendering. His previous experience with the General Electric Company and the Royal Electric Company would seem to serve him to good purpose in his present position with the C.P.R.

A certain up-town dry goods store has a very tasty display of table napkins and doylies forming a miniature ice palace, somewhat similar to the genuine palace we had in the good old times. The window dresser, however, can safely offer his thanks to electricity, for without its aid in illuminating the stained glass windows, the effect would be much less attractive. Various other stores display revolving turn-tables, may-poles, etc., in motion, run by motors.

If the miscreant is caught who threw the iron hoop over the transmission wires of the Lachine Rapids Company, thereby making a dead short-circuit and blowing the fuse at the generator, it will be made pretty warm for him. It was evidently the work of some one who knew something more about electricity than the average layman does, but one who, on the other hand, did not pause to think that there might be an employee a few feet in front of said fuse when it blew (as was the case) and who miraculously escaped a bad burn. A fuse blowing on a large generator under a pressure of 4,000 volts is not a pleasant thing to be near, to say the least.

The Eagle Knitting Mills Co., of Hamilton, have installed in their factory a 30 h.p. "S.K.C. two-phase induction motor, which drives their knitting machinery and has replaced their steam plant.

RATE SCHEDULES AND DIVIDENDS.

By "Economy."

Most electrical journals devote a considerable amount of space to papers by well known authorities, dealing principally with the financial side of electric lighting and power service, pointing out how expenses can be diminished and incomes increased. The authors seem to be mostly connected with very large plants, and their proposals and expedients, while theoretically sound, apply only to such large enterprises. Instead of any further trying to cut down the cost of production per k.w. in the generating plant, or of insisting upon a still higher efficiency in all parts of the producing or transmitting system, the electrical fraternity is turning its attention to the establishment of a proper basis for the formulation of rate schedules, having been forced to the conclusion that a uniform rate for all classes of customers, whether by meter or month, is not only unscientific, but actually results in selling electricity to some for less than the cost of production, while other consumers who should be encouraged pay for more than they should. Although the conditions governing the operation of large and small plants are so dissimilar that the adoption of a certain policy may be beneficial for the one, while suicidal for the other, still there are always certain broad, general principles upon which every successful business must be conducted, and which, underlying as they do the business of electric lighting, will apply to some extent to all sizes of plants.

In order that a plant may be a profitable investment, the operating expenses must be as low as possible; the business must be pushed for all it is worth, and losses must be reduced to a minimum. The various expedients for effecting economies in the power house, condensers, heaters, etc., are beyond the scope of this article, and it is assumed that everything has been done in this direction that skill and experience can effect. If without increasing the investment, the business and therefore the income can be increased, the result will evidently be in the nature of a larger dividend. If the total load is not as great as the capacity of the power house, then a vigorous canvass is the first means that would occur to everyone. But in the medium-sized provincial town, which is the condition more particularly investigated in this article, the possible business with the average rates charged has distinctly a clear limit. There is no day business such as is found in cities—in cellars, vaults, restaurants, etc. The business done is principally with stores, hotels, a few private houses, and the churches. A considerable proportion of the population of every medium and small town lives in quite small houses, and is usually considered useless for electric lighting purposes; but if they could be brought in by any means, it might be good business, even if a slightly increased investment were required. Using 10 c.p. lamps generally has a good effect in this direction. But in many cases, a general all-round reduction of rates by a small percentage is counterbalanced by an increase of business, which is of itself advantageous in improving the load and therefore raising the efficiency of operation. A considerable class of possible consumers would no doubt be attracted by proposals based on the shutting off of their lights at 10 o'clock. A 10 c.p. lamp on a 10 o'clock circuit would probably pay the power house a satisfactory sum, while offering great attractions to persons who are not willing to pay a larger rent for a lamp on the chance of wanting it to burn all night—or at odd times during the night. It is a very simple matter to calculate what it actually costs the central station to produce the energy for such a lamp, taking account of all fixed and variable expenses; the possible renting price will be found within the means of very small householders. The probabilities are that in such a case a separate circuit would be required, but only a secondary circuit, and the same transformers might by suitable arrangements be made to cover the increased service.

For stores, alternating long-burning arcs may be used when the space is free from hangings. Where, however, the full capacity of the power house is already rented, the only methods available for increasing business are either to reduce the number of less profitable lamps and cater only to the most profitable business, or to use lamps of the highest efficiency obtainable. Unfortunately, the latter course is possible only at the expense of remodelling the distributing system as a general rule. For the higher the efficiency of the lamp, the greater necessity for very close regulation of pressure applied. In order to obtain this very close regulation, the entire secondary wiring, including the house work, must be planned with very small allowance for drop, and transformers used of a low "drop" percentage. Whether, under the existing conditions of investment, etc., it is really worth the while of any particular plant to rearrange its distributing system to suit the requirements of more economical lamps, in order to enlarge its income, is a matter for careful consideration. The factors entering into the discussion are: A double benefit results from the use of higher efficiency lamps, first, the reduction of the power required per lamp, and, next, the increased number of lamps that can be supplied by the same power. In a 1,000 light plant the coal saving would probably amount in the course of 12 months to $30 by using 3 watt and 3½ watt lamps. This $30 saving would pay 6% on $500, which would go a long way towards rendering the distributing system fit for such high efficiency lamps. Or if the lines were not remodelled, then the $30 could be devoted to the replacing of such lamps as suffered by the variations in pressure. But the main advantage would be in the fact that more lamps could be supplied by the same machinery. In this sized plants the rental might be increased by at least $50, which would pay a month's wages to the engineer. It is very cheap to sneer at such small savings, but nowadays, with competition from gas and acetylene, and rates being forced down by town councils, dividends must be looked for much more closely and carefully than formerly, and the engineer who does not care to save $50 deserves to lose his place. An engineer who is not above saving $50 in one direction, is very likely to have his wits so sharpened, that he will see another $50 somewhere else.

A thoughtful consideration of the rate schedules of many medium sized plants will reveal many anomalies, and if done in a systematized way by a considerable proportion of the more progressive managers, will probably prepare the way for a more scientific and equitable method, which, after the usual grumbling attending all changes, will give more general satisfaction to both consumers and producers. It is usual to give the same meter rate to all consumers, no matter how large or small their requirements, or what the class of business, whether residential or commercial. Here is an actual case: A prominent politician in a certain town took forty 16 c.p. lamps, in billiard room, large drawing room and other public rooms seldom used, and elsewhere where their use was continuous. His family being small, he really occupied only part of the house, and the whole family always spent about half the year away from home. Paying by meter, of course there was no income from this installation half the year, when the house was shut up. During the other six months the occasions when the house was fully lighted were, as can be expected, few, and the actual consumption of energy was for at least five days a week about what an average 10-light installation should reasonably expect to pay for. This means that the consumer required four per cent. of the total capacity of the plant to be held at his disposal during the entire twelve months, while he paid for the privilege just half as much as another consumer who required only one per cent. of the total capacity. In other words, this extraordinary condition existed that the latter consumer's rate for current was eight times as much as the former's. There are many plants where all wiring is done by the company without charge to the consumer. In such a case, it will be evident that a consumer whose maximum demand bears a large ratio to his average may actually be a source of loss to the power house.

In the above instance, the power house was entitled to expect an amount of business sufficient to pay four per cent. of the entire fixed expenses of the plant, for interest, depreciation, wages, maintenance, insurance, taxes, and also the cost of the coal and water consumed in supplying the amount of energy actually used. The actual payment was, over and above the cost of coal and water consumed, just one-half of one per cent. of all the fixed expenses. The total annual fixed expenses of such a plant that could be fairly charged against the incandescent business amounted to about $2,000. The above installation should have paid four per cent., or $80; it really paid $10. In a limited sized plant, where the demand for light—or the possible demand—is a little beyond the capacity, such an installation is relatively an actual loss. It is an exaggerated case, although an actual one, but every plant that sells by meter will have some similar experience. Many a house is wired for fifteen lights, while the average consumption is reasonable for four. The maximum number burning at any time will be possibly eight or nine. Here, while the consumer should (on the above basis) pay one-eighth of the fixed expenses, he actually pays only one-sixteenth, or half as much as he should. It is true that the difference amounts only to $4, but he is paying the power house for energy $4 less than it costs to produce that energy. This is one good way to avoid being troubled with having dividends. The remedy is simple, and suggests itself at once. A minimum charge should be made to a consumer, proportionate to the size of his installation to cover his proportion of all the fixed expenses of the plant, and then the energy consumed as registered by the meter should be charged in addition. In this way only will each and every consumer pay a fair proportion of the expenses. The way of determining this minimum charge is to establish what are the fixed expenses of the plant, taking into consideration always interest on first cost, depreciation at a percentage, insurance, taxes, and dividing the total by the number of lamps which can be expected. Then each lamp must return at least this calculated minimum, in order that it may pay its way. If it does not, then it simply represents bad business.

It may be objected that to charge this minimum will cause the loss of many customers, and that such method is unnecessary because the results of the whole year's operation are a dividend; that the good and the bad must be taken together; and the policy of management must be judged in the bulk, and not piecemeal. This point is well taken where the business is not sufficient to fill the power-house up to its full capacity: but in many plants it is beyond the present capacity, but hardly enough to justify a considerable increase. In such a case the substitution of a consumer whose average consumption is nearer to his maximum for one whose installation is largely in excess of his usual requirements, is evidently a clear gain to the plant. If instead of the one 60 light customer with his six months' absence and average of 10 lights, five customers could be obtained for eight lights each with an average requirement of four all the year, the result to the plant would be twenty paying lights for twelve months, instead of only ten paying lights for six months. It is very probable that, if a minimum rate be charged for water supply, the business of some consumers would drop off altogether, because it would take some time for people to understand that if they require a certain proportion of the power house to be reserved for their use (and thus render it unavailable for other business) they should pay for the privilege whether they use it or not.

Still, it is plain that a thoroughly successful business cannot be built up on erroneous principles, and it does not seem equitable that the small consumers who really are the best paying ones—should be discriminated against so very heavily as in the above example.

The imposition of a minimum yearly or monthly sum—in proportion to the number of lights installed—to cover all the fixed expenses of the power house, should be offset by taking out that factor in calculating the cost per kilowatt hour. The resultant meter charge per k.w. hr. would be found to be so greatly reduced as to attract many new consumers, to the great advantage of the business.

CANADIAN ASSOCIATION OF STATIONARY ENGINEERS.

NOTE.—Secretaries of Associations are requested to forward matter for publication in this Department not later than the 6th of each month.

THE STEAM BOILER AND ITS SAFETY.*

By F. G. MITCHELL, M.E., London.

THE modern demand for high pressure engines is fostering sectional and water-tube boilers. The more rapid adoption of such boilers is retarded on account of so many of their parts being made of cast iron, together with so many joints and connections. These are objected to by the old type manufacturers and those unwilling to accept something new. Nevertheless, the external, horizontal, tubular boiler will soon be out of the modern class as a steam generator. It is limited in the thickness of sheet, and therefore in its diameter. Consequently, on account of its being externally fired, its pressure and power is limited. This alone has turned the attention of boiler manufacturers to a more perfect arrangement for stationary as well as marine purposes.

At the present day the demand is for high pressure in stationary boilers, embracing several designs of water tube and internally fixed boilers of different type. From an economical standpoint there is little difference, notwithstanding the claims and reports of efficient tests advanced by the makers of the different designs. On the other hand, as to the safe working pressure of the boiler, we are compelled to take the maker's figures, as there is no law in this province formulating the proper rules founded on mechanical principles to determine the safe working pressure of the steam boiler.

An instance of the above occurred to me quite recently when called upon to inspect a horizontal, tubular, externally fired boiler. The dimensions of the boiler were 72" diameter and 16' long. The plates were of steel $\frac{3}{8}$" thick, with a tensile strength of 60,000 lbs. per sq. inch. There were 114 – 3" tubes and the heads were of flange steel $\frac{1}{2}$" thick. The longitudinal joints were double riveted, the rivets being $\frac{3}{4}$" in diameter, and the pitch 3", and it is fair to suppose the holes at $\frac{13}{16}$". The efficiency of the joint so far as net sections of plate are concerned is 3" – 8125 ÷ 3" = 72.9%. The area of a $\frac{13}{16}$" hole being 0.5185 sq. in., the single shearing strength of one rivet is .5185 × 38,000 = 19,700 lbs. As there are two rivets in a unit section of the joint (the joint being double riveted), the total shearing strength of the rivets in a unit section is 39,400 lbs. The strength of a strip of the solid plate 3" wide being 3 × $\frac{3}{8}$ × 60,000 lbs, is equal to 67,500 lbs. Then, for the efficiency of the joint, so far as the rivet area is concerned, is 39,400 divided by 67,500 = 58.4%. This is much less than the efficiency of the net section, therefore it follows that the joint is badly proportioned. The rivet area is too small; notwithstanding this, the builders had no hesitation in recommending this boiler for a safe working pressure of 100 lbs. per sq. inch, whereas with a factor of safety of 5, the safe working pressure on it is 73 lbs. per sq. inch. The safety valve was set at 100 lbs. per sq. inch, and the owners of this boiler congratulated themselves on their new steel boiler. Really, the boiler was no stronger with the 60,000 lbs. steel than it would have been with 50,000 lbs. iron. Now, a proper double-riveted lap joint for this boiler would be, diameter of rivet $\frac{7}{8}$", pitch 3 – $\frac{7}{8}$"; efficiency of joint 69.4%. This would give a safe working pressure (with a factor of 5) of 87 lbs. per sq. inch.

Many years ago Sir William Fairbairn stated the efficiency of a single riveted joint to be 56%, and that of a double riveted joint to be 70%. No doubt he meant it to be understood that this was the limit practically obtainable with careful design and construction, and I am sorry to say that it is a common practice among engineers who should know better, to allow 56 and 70 per cent. for single and double riveted joints respectively, without the least regard to the actual proportions of the joint.

Another case which came under my observation not long ago was a horizontal, tubular boiler, externally fired, 48" diam. and 12' long. The plates were of steel, 60,000 lbs. tensile strength, $\frac{1}{4}$" thick and single riveted. The diameter of the rivets was $\frac{3}{8}$, and the pitch 1 $\frac{1}{4}$", and the heads $\frac{3}{8}$" thick. The workmanship of this boiler was excellent in every respect, and I believe the material was also. The only objectionable point about the boiler was the riveted joint. The diameter of the rivets being $\frac{3}{8}$", we will suppose the holes to be $\frac{13}{16}$", or 0.6875. The pitch being 1.75, the efficiency of the joint so far as the net section of the plate is concerned is $\frac{1.75" - 0.6875}{1.75} = 60.7\%$. The area of a $\frac{13}{16}$ hole being 0.3712 sq. in., the strength of one rivet (assuming the shearing strength of rivet iron were to be 38,000 lbs. per sq. inch) is 3712 × 38,000 = 14,100 lbs., and the strength of a strip of the solid plate 1.75" wide being 1.75 × $\frac{1}{4}$" × 60,000 = 32,800 lbs. We find that the efficiency of the joint so far as the rivet section is concerned is 14,000 divided by 32,800 = 43%, whereas if properly designed it should be 56%. Now, why is it that an otherwise good boiler manufacturer will allow construction such as this? He might as easily, and without any more expense, have turned out a very much better and safer boiler. It may be possible that the templets used had been arranged for 40,000 or 45,000 lbs. per sq. inch iron. But this does not explain the whole thing, for nowadays the manufacturer will go even a step closer by using only a factor of 4 with practically the same externally fired boiler.

There are many defects that are likely to be found about a steam boiler, and the ones most common are corrosion and grooving along the girth seams, generally on the bottom sheets, and cracks extending from the edge of the sheet to the rivet holes. On the outside landing, this is more often found where heavy plates are used. The most serious form of corrosion is that which attacks the plates along the water level, forming a continuous line of weakness. This is, of course, due to the acids in the feed water, and can only be remedied by improving the supply. External grooving is often due to leaky calking, and is very often caused by the use of what is known as a split calking tool having broken the skin of the metal. Buckled or boged sheets usually result from neglect in keeping the boiler clean. Soft deposits are permitted to accumulate over the fire and become hard, allowing the plates to become overheated and to be pushed down with the pressure. In iron boilers this has been attended by ruptures, while in steel boilers the buckled part grooves thinner at its lowest point until a small hole causes a leak.

I wish to mention, before closing, a very important consideration about the steam boiler, and that is, the so-called mountings. How many boilers do we meet with that have a perfect working safety valve, one that will permit the escape of steam as fast as the boiler will generate it, and not allow the pressure to exceed at most 10 lbs. above what it was set for? Anything else is only an excuse for a safety valve. It is also a common thing to see water columns connected to the boiler with $\frac{1}{2}$" and $\frac{3}{4}$" pipe and with 3 and 4 bends in it, and a small pet-cock at the bottom to blow it out? This is another excuse. Also, how often do we see a common plug-cock put on for a bottom blow-off? There are no mountings or fittings too good for a boiler, and none other should be used or allowed to be used.

* Paper read before the Hamilton Association, C.A.S.E., at December meeting.

WATER POWER ARBITRATION.

IN regard to an item in our last issue in reference to an arbitration between the Laurentide Pulp Co. at Grande Mere, on the St. Maurice river, and the province of Quebec, as to the purchase of some six islands in the river at that point, we desire to state that the great water power at Shawenegan Falls was not in any way connected with the matter in question. That part of the property at this point upon which any considerable water power development must be made is owned by Mr. John Forman, of Montreal, and he expects to be able to utilize it in the near future. Its importance may be surmised from the information given us that it is possible upon this property to create a development of 200,000 to 250,000 horse power, at a cost per horse power not approachable by any water power, so far as is known, upon this continent. For electrical developments, particularly, this property offers the most extraordinary advantages, and the recent completion and operation of the Great Northern Railway to within a mile and a quarter of the property brings these advantages within commercial reach.

As to the arbitration between the Laurentide Pulp Company and the province of Quebec, we learn that some of the islands were in the water fall of Chute de la Grande Mere, and the others in the river close by, and that the right was asked to partially fill up the bay below the falls, and so create a so-called beach lot. The arbitrators absolutely refused to commit themselves, and inasmuch as the Laurentide Co. now own the whole of the land on each side of the river, as well as all the islands in the river at that point, they can use the whole of the water in the river at that point, if this were possible, without the slightest interference from anyone, so long as they leave water enough in the channel to drive the logs of the lumbermen.

The horizontally set Crocker turbine for the electric light plant at Weedon, Que., has arrived from Sherbrooke, and is being connected to generators.

THE LONDON SPECIFICATIONS.

TORONTO, ONT., Dec. 17th, 1898.

Editor CANADIAN ELECTRICAL NEWS:

DEAR SIR,—Replying to yours of 29th August, I have been out of Toronto since then, but if of any interest at this late date, would comment on the London specifications as follows:

I don't think it right to call for tenders on work that has not been previously sanctioned by the ratepayers; it is simply intended as a menace to the existing company, and is not a proceeding creditable to the London corporation.

The specifications do not interest Canadian manufacturers, as they distinctly call for a Brush machine and an Adams-Bagnall lamp. To specify a particular efficiency is beyond the scope of an engineer's duty. Efficiency is of value merely in relation to price. A high efficiency machine may be held at so high a figure that one of lower actual efficiency and less cost may be the better investment. There is many a good machine made that will not reach 86%; these are all excluded. The amount of belting required is not mentioned, although a detail so important might be expected in a specification that considers it necessary to specify that "armatures shall be electrically and mechanically balanced." I do not believe in any such fancy tests as short-circuiting a machine for five minutes. Its imposition shows that the engineer does not understand the operation of an automatic current regulator.

As to lamps, no engineer has a right to specify any particular apparatus, more especially when, as is abundantly evident in this case, he knows nothing about it. The Adams-Bagnall lamp contains certain patented features, which the London engineer, probably after "expert" investigation, decided would render it superior to any other. And yet his investigation, while convincing him of its superiority, leaves him in the dark as to whether it contains complicated clockwork mechanism or even the usual cut-out device! This is evident, for he states it must not have the one and must have the other. The London engineer's opinion on such a point is evidently of value. Having demanded a particular lamp, can he justly hold a contractor responsible for its "flaming or hissing"?

The rest of the specifications illustrate the general principle that when amateurs go into details they are sure to leave out as much as they put in, and to leave loop-holes everywhere. It is a pure waste of time to specify the dimensions of cross-arms. I should say that the clauses covering everything but machines and lamps represent the result of a careful study on the part of the engineer of the outside work of the London Electric Co. On the whole, the specification appears to be largely composed of sentences copied out of manufacturers' catalogues descriptive of their apparatus, held together by words and conditions representing the knowledge of one who had to measure a cross-arm. It is about the most bare-faced confession of ignorance and partiality that could be decently made, and I do not for one moment believe that it is the work of the London city engineer. It is the result of collaboration between the agents of a manufacturing company and some pushing lineman.

Yours truly,

GEORGE WHITE-FRASER.

LARGE SALE OF RAILWAY APPARATUS.

MR. W. A. Johnson, of the W. A. Johnson Electric Company, reports the recent sale of Westinghouse apparatus to the Metropolitan Railway Company of Toronto, to be used in connection with the extension of the present railway to Lake Simcoe. In the power house at Bond Lake will be installed two 60-cycle, three-phase A.C. D.C. generators, each of about 400 h.p.; and a full complement of switchboard apparatus, step-up transformers, lightning protection, etc., will be provided. The transmission voltage will be 16,500. There will be two rotary transformers, 60 cycles, three-phase, giving 570 volts on direct current side. These will be located at sub-stations about 14 miles from the generating station, step-down static transformers being provided to reduce the voltage to that suitable for the rotaries. The generator switchboard will consist of eight marble panels, the sub-station switchboards of five marble panels, with non-arcing and tank lightning arresters. In addition to the above, there will be passenger and freight car equipments, including one quadruple equipment for heavy freight car and double equipments for two-light freight cars, two double equipments for ordinary passenger cars, and two quadruple equipments for heavy passenger coaches; the motors being used in these will be 38 B. 50 h.p. each. We believe this is the first installation in Canada to use a generator delivering both direct and alternating current from the same machine, as well as the first application of rotary transformers. The sale includes one 45-ton Baldwin-Westinghouse electric locomotive.

AN INCORRECT ADDRESS.

A MISLEADING error occurred in the reference to the new quarters of Messrs. Ness, McLaren & Bate, Montreal, which appeared in our last issue. Their factory, office and show-rooms are located at 419 St. James street, corner of Craig, instead of at the corner of Seigneurs and Craig streets, as given. Persons desirous of purchasing telephones, telegraph instruments, annunciators, switch-boards, fire alarm apparatus and other electrical supplies are requested to note this correction.

WARNING AGAINST ACETYLENE.

THE Rat Portage Miner & Rainy Lake Journal quotes as follows from the Boston Herald: Edward Atkinson, President of the Boston Manufacturers' Mutual Fire Company, in view of recent renewed efforts to introduce calcium carbide and acetylene gas into commercial and manufacturing establishments, has published a cautionary circular in which he says:

"*The purpose of this caution is to call upon each and all of our* members not to make use either of calcium or acetylene gas without full advisement and consultation at the time the proposed application is to be made. It may happen that the use of these materials may be made safe. At present they are not deemed so. Therefore the introduction of either, without the consent of the underwriters, would make an alteration in the condition of the risk not contemplated in the original contract. It is therefore suggested that no new method of lighting shall be permitted, even for experiment, without consultation."

ENGINEERING NOTES.

A rule by which to estimate the power of a double belt is given as follows: Divide the number of square feet that passes over one of the pulleys in a minute by 40. The result will be the power that it can develop. The authority which gives it says that it does not contain many fine points, but the results are just as reliable as those obtained by more complicated methods. Probably this is true.

OIL FOR BOILER SCALE.—The use of oil as a scale remover in steam boilers is treated in an article in a recent issue of The Locomotive, the conclusions of which are summed up as follows: Mineral oil is often useful for the prevention or removal of scale, when it is properly applied; in the prevailing method of introduction, it gives good results in many cases; but when it has not proved as effective as desired, we recommend that the boiler be dried out and that the kerosene be sprayed upon the plates and tubes. *It is important to avoid the use of open lights in or about* a boiler that is being so treated; incandescent electric lights are the safest to use. Finally, kerosene is very serviceable for removing lubricating oils from plates and tubes.

ROPE TRANSMISSION.—In a paper on power transmission by ropes and belts, read before the French Society of Civil Engineers, V. Dubreuil states that one great advantage possessed by ropes is that cyclical variations in the speed of the driving pulley are "damped" by the ropes, so that the speed of the driving pulley *is much more uniform than that of the driver. Ropes are also* useful when the two lines of shafting are not perfectly parallel. The velocity of the rope should not be less than about 4,500 feet per minute, nor more than 5,000 feet, while with belts a velocity of as little as 600 feet per minute may be used, but the maximum should not exceed 4,000 feet per minute, above which the centrifugal force prevents the proper adhesion of the belt to the pulley. For great distances between the lines of shafting ropes should be used; though in exceptional cases they may be employed *with as little as 12 feet between shaft centres*, in general the distance should not be less than 20 feet. Spans of as much as 328 feet have been worked by ropes with only intermediate support. Under no circumstances should the diameter of the smallest pulley be less than 30 times the diameter of the rope, and in general the pulley ratio should not be greater than four to one. Three standard ropes of manila, hemp or cotton may be used. Hemp is much cheaper than cotton, and usually wears longer, but is less pliable. To facilitate estimates, the approximate weight of a rope pulley may be taken as 5½ pounds per groove for each inch of diameter, though single groove pulleys will weigh double this amount.

CANADIAN ELECTRICAL NEWS AND ENGINEERING JOURNAL

PUBLISHED ON THE TENTH OF EVERY MONTH BY

THE C. H. MORTIMER PUBLISHING CO'Y of Toronto, Limited,

OFFICE: CONFEDERATION LIFE BUILDING,

Corner Yonge and Richmond Streets,

TORONTO, — — CANADA.

Telephone 2362.

NEW YORK LIFE INSURANCE BUILDING, MONTREAL.

Bell Telephone 2299.

ADVERTISEMENTS.

Advertising rates sent promptly on application. Orders for advertising should reach the office of publication not later than the 28th day of the month immediately preceding date of issue. Changes in advertisements will be made whenever desired, without cost to the advertiser, but to insure proper compliance with the instructions of the advertiser, requests for change should reach the office as early as the 26th day of the month.

SUBSCRIPTIONS.

The ELECTRICAL NEWS will be mailed to subscribers in the Dominion, or the United States, post free, for $1.00 per annum, 50 cents for six months. The price of subscription should be remitted by currency, registered letter, or postal order payable to C. H. Mortimer. Please do not send cheques on local banks unless 25 cents is added for cost of discount. Money sent in unregistered letters will be at senders' risk. Subscriptions from foreign countries embraced in the General Postal Union $1.50 per annum. Subscriptions are payable in advance. The paper will be discontinued at expiration of term paid for if so stipulated by the subscriber, but where no such understanding exists, will be continued until instructions to dis continue are received and all arrearages paid.

Subscribers may have the mailing address changed as often as desired. When ordering change, always give the old as well as the new address.

The Publishers should be notified of the failure of subscribers to receive their paper promptly and regularly.

EDITOR'S ANNOUNCEMENTS.

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.

CANADIAN ELECTRICAL ASSOCIATION.

OFFICERS:

PRESIDENT:

W. H. BROWNE, Manager Royal Electric Company, Montreal.

1ST VICE-PRESIDENT:

H. P. DWIGHT, President G.N.W. Telegraph Co., Toronto.

2ND VICE-PRESIDENT:

A. A. DION, Superintendent Ottawa Electric Co., Ottawa.

SECRETARY-TREASURER:

C. H. MORTIMER, Publisher ELECTRICAL NEWS, Toronto.

EXECUTIVE COMMITTEE:

J. J. WRIGHT, Manager Toronto Electric Light Company, Toronto.
JOHN CARROLL, Sec.-Treas. Eugene F. Phillips Electrical Works, Montreal.
ORMOND HIGMAN, Chief of Electrical Inspection Department, Ottawa.
A. B. SMITH, Superintendent G. N. W. Telegraph Co., Toronto.
WILLIAM THOMPSON, Superintendent Waterworks and Electric Light Plant, Montreal West, Que.
W. McLEA WALBANK, Lachine Rapids Hydraulic & Land Co., Montreal.
G. J. HENDERSON, Hamilton Electric Light & Power Co., Hamilton.
H. R. LEYDEN, Manager Cataract Power Co., Hamilton.
GEO. BLACK, G.N.W. Telegraph Co., Hamilton.
E. E. CARY, Manager Packard Electric Co., St. Catharines, Ont.

MARITIME ELECTRICAL ASSOCIATION.

President, F. A. BOWMAN, M.A., B.A., Supt. Elec. Light Co.,	New Glasgow, N.S.
Vice-President, H. COLPITT, City Electrician,	Halifax, N. S.
Secretary-Treasurer, J. H. WINFIELD, Local Manager Nova Scotia Telephone Co.,	New Glasgow, N.S.

CANADIAN ASSOCIATION OF STATIONARY ENGINEERS.

President, W. F. CHAPMAN,	Brockville, Ont.
Vice-President, R. C. PETTIGREW,	Hamilton, Ont.
Secretary, J. G. ROBERTSON,	Montreal Que.
Treasurer, G. C. MOORING,	Toronto, Ont.
Conductor, WILLIAM BEAR,	Dresden, Ont.
Door Keeper, JOHN WENDELL,	Waterloo, Ont.

TORONTO BRANCH NO. 1.—Meets 1st and 3rd Wednesday each month in Engineers' Hall, 61 Victoria street. Charles Moseley, President; H. E. Terry, Vice-President; J. W. Marr, Recording Secretary.

TORONTO BRANCH NO. 18.—President, John Dixon; Vice-President, John H. Venables; Recording Secretary, Thos. Graham, 570 King street west.

MONTREAL BRANCH NO. 1.—Meets 1st and 3rd Thursday each month, in Engineers' Hall, 1863 Craig street. President, Geo. Hunt; 1st Vice-President, Wm. Ware; 2nd Vice-President, J. G. Robertson; Secretary, Henry Wilson; Treasurer, Thos. Ryan.

ST. LAURENT BRANCH NO. 2.—Meets every Monday evening at 43 Bonsecours street, Montreal. R. Drouin, President; Alfred Latour, Secretary, 306 Delisle street, St. Cunegonde.

BRANDON, MAN., BRANCH NO. 1.—Meets 1st and 3rd Friday each month in City Hall. A. R. Crawford, President; Arthur Fleming, Secretary.

HAMILTON BRANCH NO. 2.—Meets 1st and 3rd Tuesday each month in Maccabee's Hall. Wm. Norris, President; G. Mackie, Vice-President; Jos. Ironside, Recording Secretary, Markland St.

STRATFORD BRANCH NO. 3.—John Hoy, President; Samuel H. Weir, Secretary.

BRANTFORD BRANCH NO. 4.—Meets 2nd and 4th Friday each month. Arthur Ames, President; T. Pigrim, Vice-President; O. S. Merrill, Brantford Carriage Co., Secretary.

LONDON BRANCH NO. 5.—Meets on the first and third Thursday in each month in Sherwood Hall. Duncan McKinley, President, William Blythe, Vice-President; W. Allan, Secretary.

GUELPH BRANCH NO. 6.—Meets 1st and 3rd Wednesday each month at 7.30 p. m. H Geary, President; Thos. Anderson Vice-President; H. Flewelling, Rec.-Secretary, P. Ryan, Fin.-Secretary; Treasurer, C. F. Jordan.

OTTAWA BRANCH NO 7.—Meet every second and fourth Saturday in each month, in Borbridge's hall, Rideau street; Frank Robert, President; T. G. Johnson, Secretary.

DRESDEN BRANCH NO. 8.—Meets 1st and Thursday in each month. Thos. Steeper, Secretary.

BERLIN BRANCH NO. 9.—Meets every Friday evening. G. Steinmetz, President; J. Heyd, Vice-President; W. J. Rhodes, Secretary, Berlin, Ont.

KINGSTON BRANCH NO. 10.—Meets 1st and 3rd Thursday in each month in Fraser Hall, King street, at 8 p.m. President, F. Simmons; Vice-President, C. Asselstine; Secretary, J. L. Orr.

WINNIPEG BRANCH NO. 11.—President, G. M. Hazlett; Rec.-Secretary, J. Sutherland; Financial Secretary, A. B. Jones.

KINCARDINE BRANCH NO 12.—Meets every Tuesday at 8 o'clock, in McKibbon's block. President, Daniel Bennett; Vice-President, Joseph Lighthall; Secretary, Percy C. Walker, Waterworks.

PETERBOROUGH BRANCH NO. 14.—Meets 2nd and 4th Wednesday in each month. W. L. Outhwaite, President; W Forster, Vice-President; A. E. McCallum, Secretary.

BROCKVILLE BRANCH NO. 15.—Meets every Monday and Friday evening, in Richards' Block, King St. President, John Grundy; Vice-President, C. L. Bertrand; Recording Secretary, James Aikins.

CARLETON PLACE BRANCH NO. 16.—Meets every Saturday evening. President, Jos. McKay; Secretary, J. D. Armstrong.

ONTARIO ASSOCIATION OF STATIONARY ENGINEERS.

BOARD OF EXAMINERS.

President, A. AMES,	Brantford, Ont.
Vice-President, F. G. MITCHELL,	London, Ont.
Registrar, A. E. EDKINS,	88 Caroline St., Toronto.
Treasurer, R. MACKIE,	28 Napier st., Hamilton
Solicitor, J. A. McANDREWS,	Toronto.

TORONTO—A. E. Edkins, A. M. Wickens, E. J. Phillip, F. Donaldson, J. Bain.
HAMILTON—R. Mackie T. Elliott.
BRANTFORD—A. Ames, care Patterson & Sons.
OTTAWA—Thomas Wesley.
KINGSTON—J. Devlin, J. Campbell.
LONDON—F. Mitchell.
NIAGARA FALLS—W. Phillips.

Information regarding examinations will be furnished on application to any member of the Board.

Electrical Students' Competition.

IN the announcement which appeared in last issue headed "Canadian Electrical Students' Competition," a typographical error was made. In the subjects of theses, No. 5 should have read, "A Concise Description of a Method of Testing Transformers for Efficiency at Various Loads, both as regards Regulation and Core Loss." Students of electricity who may not have learned of the competition mentioned are referred to our December issue for particulars, and are urged to enter the list of competitors for the prizes offered.

Settlement by Arbitration.

THE arbitrators named to adjust the difficulties between the Grand Trunk Railway Company and the telegraph operators employed on the road assumed their duties in Toronto on January 7th. The company is represented by Mr. B. B. Osler, Q. C., the telegraphers by Grand Master Sergeant, while Chief Justice Meredith is acting as the third arbitrator. The two subjects to be adjusted are a minimum rate of wages and the hours of labor, and those interested believe that an early settlement will be arrived at. That this method of reaching an understanding between the representatives of capital and labor has been decided upon, is a tribute to the greater enlightenment of the people in the closing years of the nineteenth century. The day seems near at hand when labor strikes will become relics of the past.

Long Distance Transmission of Power.

AN interesting paper on this subject was recently presented before the Society of Arts, London, by Prof. George Forbes, under whose direction the huge enterprise of the Cataract Power Co. at Niagara Falls was planned and put in operation. Prof. Forbes gives it as his opinion that electric power can be transmitted to a

distance of 500 miles, using a pressure of 20,000 to 30,000 volts, and that under certain circumstances electric power could be thus transmitted at a profit. He claims that the power of the Victoria Falls on the Zambesi river might in this manner be economically employed in the mines of Rhodesia, and that the city of Cairo could be lighted more cheaply by means of current generated at and transmitted from the First Cataract, 400 miles distant, than by steam engines on the ground.

Street Railway Organization.

Our attention has recently been called to the necessity of an organization representing the street railway interests of Canada, and we are pleased to learn that in some quarters there is a strong feeling in favor of such a movement It seems that the smaller roads are the most anxious that the formation of an association should be effected. It is pointed out that there are many questions in common affecting the operation of street railways which might with great advantage be dealt with by an association. If taken up independently, the expense and trouble of adjustment is certain to be much greater and the results less satisfactory. The difficulty, in this country, of working successfully an association composed of street railway officials is quite apparent. The limited number of railways necessarily prohibits a large membership, while the great distance from the east to west of the Dominion makes it extremely doubtful that members could be secured in British Columbia, New Brunswick and Nova Scotia. This would confine the membership, in reality, to Ontario and Quebec. The suggestion has been made that there be formed a street railway section of the Canadian Electrical Association. This would be, perhaps, the wiser course to pursue. In the past, we fear the association named has been regarded as non-representative of the street railway branch of the electrical industry, but this has been due to the fact that it received its chief support from the electric lighting, telephone and telegraph interests. Just how to effect an organization that will best serve the interests of the street railway companies cannot be easily defined, but we have referred to the matter in the hope that a discussion may be provoked, and some course of action outlined by those interested.

The Niagara Falls Power Franchise.

The time granted by the Ontario government to the Canadian Niagara Power Company for the development of a fixed quantity of power on the Canadian side of Niagara Falls expired on November 1st, 1898. The company not having fulfilled its agreement in this respect, the question was submitted to the courts to decide whether or not the franchise should be declared void. The questions which the High Court of Justice was asked to decide were as follows: 1st. Is the agreement void by reason of the failure of the Canadian Niagara Power Company to have 10,000 horse power developed and ready for use by November 1st last? 2nd. May the government declare the agreement forfeited? 3rd. If the agreement cannot be declared wholly at an end, is the government relieved from the agreement not to grant to any other person the right to use the waters of the Niagara river? To each of these questions a negative decision was given, thus permitting the Canadian Niagara Power Company to continue to hold its franchise. That all our readers may understand the situation, we will review, briefly, the circumstances of the case. In April, 1892, the Canadian Niagara Power Company entered into an agreement with the commissioners of Queen Victoria Niagara Falls Park, which agreement was ratified by the Ontario government, whereby the company secured exclusive control of the right to develop power on the Canadian side of the Niagara river, in return for an annual payment of $25,000 for the first ten years, the amount to be increased $1,000 for each year of the second decade until the annual rental shall have reached $35,000, at which figure it might be continued for 80 years. A provision of the agreement was that by November 1st, 1898, the company should have completed water connections for the development of 25,000 horse power, and have actually ready for use and transmission 10,000 horse power. Some time previous to November 1st, the company applied to the park commissioners for an extension of time, but the Ontario government, although hesitatingly, refused to grant the request. Recourse was then taken to the courts to ascertain if the Niagara Power Company still had any legal right to the franchise, with the result given above. The ruling of the court certainly seems ambiguous, inasmuch as it places the owners of the franchise in an almost helpless position. If a violation of the terms of the agreement is not sufficient to annul the contract, the entire agreement is of little value. There are some peculiar features of the case. The company contend that they have supplied the local demand, and that up to the present the problem of long distance transmission has not been satisfactorily solved. Their method of supplying the local demand was by placing two 500 horse power generators in the power house of the Niagara Falls Park and River Railway, situated within the park limits. These are belt driven by the two turbines of the railway company. This 1,000 horse power is almost entirely consumed by the Carborundum Company, the Niagara Falls Electric Light Company, and the Carmelite Monastery. It might be asked what the intention of the government was in granting to a syndicate the right to utilize the Niagara power. Was it not that the development of the power would create a growth of industrial establishments in the vicinity, the supplying of the then existing demand being of minor importance? It is noteworthy that while practically nothing has been done towards utilizing the immense water power of Niagara Falls, the owners of the franchise have permitted the Cataract Power Company of Hamilton to cut off one of their most promising fields for exploitation, namely, the city of Hamilton, while we would not be surprised if, in the near future, the same company would be supplying current to the city of Toronto. This fact, and the apparent indifference and inactivity of the Niagara Company, gives color to the suspicion expressed in some quarters that in securing control of the franchise the Canadian Niagara Power Company had some other motive than that of developing the power. What course will now be taken is a matter of interest. Should the courts not be asked to decide what time shall be given the company for the execution of the work agreed upon?

The National Carbon Company, of Cleveland, Ohio, have sent us a neat calendar, on which is shown a view of their extensive works. It also includes the moonlight schedule for the current year.

The 60 k.w. S.K.C. generator of the Dundas Electric Co. has been placed in position. They expect to have their water-power in operation in a few days, and will begin the lighting of the city by the 15th of January.

TELEGRAPH and TELEPHONE

THE TELEPHONE IN MONTREAL.

THE Montreal Telegraph Company, which had control of the Edison patents, and the Dominion Telegraph Company, which originally exploited the Bell telephone patent, both commenced operating telephone exchanges in Montreal in 1878. In 1880 the Bell Telephone Company was organized, and immediately combined these two exchanges into one, at the same time consolidating the whole telephone business of the Dominion under one head. Starting with a capital of $500,000, the progress of the corporation was extremely rapid, until now its capitalization is represented by millions. During its history the company has occupied three different buildings for its main exchange in Montreal. From 1880 to 1885 it tenanted the upper flat of the City and District Savings Bank; the upper flat of the British Empire building was occupied from 1885 to 1897, and in Jubilee year the company moved into its new headquarters on the corner of St. John and Notre Dame streets.

The new building is in every respect a credit to the city. The dimensions are 108 feet on St. John street, 35 feet on Notre Dame street, and 98 feet on Hospital street, six stories in height. On the ground floor are located the local offices of the company, the long distance telephone rooms and waiting rooms. The first

MR. C. F. SISE,
President Bell Telephone Company.

and second floors, and a part of the third, are rented as offices, etc. On the third floor is situated the battery room, chief operator's room, offices, etc. On the fourth floor is the company's work-room. The Bell Telephone Company has four other exchanges in Montreal, one at the corner of St. Catherine and St. Andre streets, one at the corner of Mountain and St. Catharine streets, one at 2452 Notre Dame street, and one at Westmount. The switchboards in these exchanges were put in at an aggregate cost of $220,000, that at the main exchange alone costing $120,000.

The business of the company is growing rapidly. Instead of receiving about 200 calls a day, as in 1880, when the exchange was opened, the average number of calls daily in Montreal is now about 117,000, and 171 young ladies are employed to answer the calls.

Previous to 1892 the Bell Telephone Company manufactured their own appliances and instruments. In that year they were succeeded by the Northern Electric Company, who have a large factory on Aqueduct street. The factory commenced operations with three men, but now employs 250. The building covers a floor area of about 30,500 square feet, and contains under one roof a mechanical department, finishing room, brass foundry, nickel-plating room, buffing room, blacksmith shop, polishing

MR. C. W. BROWN,
Superintendent Northern Electric Company

room, wire insulation department, battery department, engine room and carpenter's shop. There are upwards of 250 different machines used in the processes of manufacture.

Presented herewith are portraits of Mr. C. F. Sise, the organizer and president of the Bell Telephone Company, and Mr. C. W Brown, superintendent of the Northern Electric Company

VALUE OF TELEPHONE PLANT.

THE appeal of the Bell Telephone Company against an assessment of $636,649 on their plant in Toronto, was argued before Judges McDougall, Dartnell and McGibbon last month. Previously the plant had been assessed at $[illegible]. This year the assessment was proportioned as follows: Land, $8,750; buildings, $24,000; poles, wires, conduits, etc., $377,992; Temperance street switchboard, $177,174; Yorkville and Parkdale switchboards, $50,773. The decision of the Court of Appeal in the case of the assessment of the Bell Company's plant at Hamilton stood as a precedent. This decision held that the poles, wires, etc., could not be assessed for their value as a part of a growing concern, but only on their value when detached, or as scrap iron.

Mr. Albert L. Salt, assistant manager of the Western Electric Company, New York, was the first witness. He gave his estimate of the value of the switchboards as follows: Temperance street $10,000; Yorkville avenue, $1,900; Parkdale, $565.50.

Mr. Wm. C. Marshall, inspector for the C. P. R. Telegraph Company, said that the wires, poles, etc., of the company were of no value when detached. They would not realize, on sale, the cost of taking them down. The only articles which were of any value were the braces, which, when taken down, would realize about five cents each, half of their original cost. The wire would cost about four dollars a mile to take down, which was more than they would sell for as scrap. Mr. J. J. Wright, manager of the Toronto Electric Light Company, gave similar testimony.

Mr. Edward F. Peck, electric light superintendent at Brooklyn, N.Y., said that, as an outgrowth of his eighteen years' experience, he considered that the Bell poles could be removed, as they stood, for from 25 cents each to $2.50. It was worth $2 to erect a 25-foot pole. There was no market for taken-down galvanized iron wire. The aerial wire, he said, was valuable only as scrap iron.

Mr. Hugh C. Baker, manager of the Bell Telephone Company in Ontario, stated that the company had invested in the Dominion, in realty, $4,171,432.91. This included everything except switchboard instruments and indoor plant. He believed the average life of poles in Toronto to be about six years; they had now lived half their life; the cables, underground, had been used about four years. Cables were worth from five cents to

eleven cents per foot; some had been sold at $35 per ton. Wire was worth nine or ten cents a pound when taken down. Poles taken down found little market, and would be worth from 25 cents to $2, according to size.

Expert evidence was also submitted by Messrs. W. Bamfield, of Pittsburg, formerly manager of the Pennsylvania Telephone Company, Jno. C. Reilly, general superintendent of the New York and New Jersey Telephone Company, and others, the case occupying several days. The decision of the court was in favor of the Bell Telephone Company, the assessment being reduced to $102,550, made up as follows: Poles, wires and conduits, $53,900; Temperance street switchboard, $12,000; Yorkville avenue and Parkdale switchboards, $3,900; land and buildings, $32,750.

The court found as follows: "The wooden poles are valued at 25 cents each; the rails and iron poles, considered as "scrap," what the market allows, including cost of removal, etc., are put at $3.50 per ton net; the wire is rated as second-hand and is worth nine cents a pound, while the attachments are valued at seven cents a pound—all considered as scrap."

MR. FREDERIC A. HAMILTON.

FEW persons in Canada have had a more extensive experience in sub-marine telegraphy and general cable work than the subject of this sketch, Mr. Frederic A. Hamilton, M.I.E.E., M. Can. Soc. C.E. A brief resume of his services in this connection will no doubt interest many of our readers. He was born at Dover, England, in the year 1843, and after leaving school engaged in the mercantile marine, sailing to India, Australia, New Zealand and the Mediterraneum. He served as a volunteer in the war for Italian Unity under General Garibaldi.

Mr. Hamilton first entered the telegraph field about 1868, studying as a probationer with the Sub-Marine Telegraph Company,

MR. FREDERIC A. HAMILTON.

one of the oldest companies working between Great Britain and the continent of Europe, until a vacancy offered in the service of the Anglo-Mediterraneum Telegraph Company. He was employed on their Susa-Modica line, at the stations at Naples and Messina, and was appointed manager at Florence, but being desirous of gaining experience in sub-marine telegraphy, resigned and returned to England, and received an appointment in the Telegraph Construction and Maintenance Company as assistant electrician. Whilst in this company's service he was employed in the factories at Greenwich during the manufacture of the Falmouth, Gibraltar and Malta cables, and on the expeditions engaged in laying the Mid-Channel cable, Lisbon-Falmouth, Batavia-Singapore, Singapore-Penang, Penang-Madras, Singapore-Hong-Kong, and Batavia-Singapore sections, both on shore and ship. He was also engaged in removing faults from subterraneum cables.

Mr. Hamilton was also identified with the manufacture and laying of the Ireland-Newfoundland cable and the Newfoundland-Cape Breton cables, being on board the ship laying the Sydney-St. Pierre section, and on shore at St. Pierre during the submersion of the St. Pierre-Placenbia section, as well as executing other responsible commissions. He was on board the "Great Eastern" in expedition for repair of the 1865 Atlantic cable in Mid-Atlantic, and was chief electrician on the Cuba cable repairs and in laying shore-end of Brazilian cable at Pernambuco.

In the year 1875 Mr. Hamilton was employed in the traffic manager's department of the Direct United States Cable Company, and in the following year was appointed electrician-in-chief to the Anglo-American Telegraph Company, being sixteen years in this company's service. During the above period he was engaged in numerous undertakings in cable laying and repairing, and in other operations at sea and on shore, in connection with the telegraph system of the North Atlantic. This experience afforded a wide range of knowledge with regard to the various methods of working sub-marine cables, both long and short by Simplex and by Duplex, and especially embracing the important considerations involved in the question of the selection of tracks, a feature closely connected with the study of the principal causes of rupture and injury to sub-marine cables. His services in this capacity were greatly appreciated, and upon several occasions the late Sir John Pender and Mr. Henry Weaver, late managing director of the Anglo-American Telegraph Company, took occasion to commend him upon the ability displayed. Since resigning from the above company in 1892, Mr. Hamilton has been practising as an electrical engineer in Halifax, N.S. He has had considerable experience in the installation of electric light plants both afloat and on shore, and in his private practice has introduced the same degree of thoroughness which was one of the chief factors of his success in telegraph work.

Mr. Hamilton was elected an associate of the Institution of Electrical Engineers in 1873, and was advanced to member in 1886. He is also a member of the Canadian Society of Civil Engineers and the Maritime Electrical Association. It will be remembered that at the convention of the latter society in September last, he presented an interesting paper on "Electric Gong Buoys- Audible vs. Visual Signals." He has also contributed to the Journal of the Institution of Electrical Engineers papers on "Submarine Cables," "Shipping Buoys from Cable Ships," and "Repairs to Submarine Cables," and to the Canadian Magazine an article on "Laying a Sub-Marine Cable."

SHORT-CIRCUITS.

Mr. Fred. Cleveland, formerly of the Great Northwestern Telegraph Company, Montreal, spent a few days in that city at Christmas, visiting his friends.

The Victoria Telephone Company held its annual meeting at Beaverton, Ont., last month, at which it was decided to extend the system to Pefferlaw, Beaverton and Bolsover.

The Department of Public Works at Ottawa has invited tenders for the construction of a telegraph line from Alberni to Cape Veale, in British Columbia, a distance of 36 miles.

Mr. R. B. McMicking, manager of the Victoria and Esquimault Telephone Company, Victoria, B.C., was recently presented by his employees with a pretty cane, ornamented with silver bands and tips, and suitably engraved.

Mr. William H. Hayes, assistant manager of the Bell Telephone Company at London, Ont., has been transferred to Windsor, where he will assume the position of local manager. Mr. Hayes is to be congratulated upon his promotion.

It is said that four Ottawa barristers will seek incorporation at the next session of the Dominion parliament as the Royal Telegraph Company, with a capital of $1,000,000. It is proposed to construct and operate telegraph and telephone lines throughout the Dominion.

The Merchants' Telephone Company, of Montreal, was organized in 1893 by Messrs. A. S. Moisan and J. M. Marcotte, now president and secretary respectfully of the company. The exchange was opened on January 1st, 1895, with 472 subscribers. Since that time the number has increased to 1,800, twenty-two operators being employed.

Mr. Charles R. Hosmer, manager of the C. P. R. Telegraph Company, returned to Montreal a fortnight ago after a six weeks, visit to London and Paris. Shortly after his arrival home he received a cablegram announcing the dangerous illness of his daughter, whom he had left in Paris to complete her education, and was compelled to return again to Paris.

While repairing the wires of the Great Northwestern Telegraph Company, in Montreal, after the recent sleet storm, Pierre Brouillet, who had ascended a pole on Craig street, in company with two other linemen, came in contact with a live wire. The Montreal Gazette states that, although he received a shock of upwards of 2,500 volts, the only visible signs are two slight black lines on each hand.

REPORT AS TO ELECTRIC LIGHTING IN PEMBROKE.

BELOW will be found a copy of the advisory report of Mr. Roderick J. Parke, E.E., submitted to the municipal council of Pembroke, Ont., regarding electric lighting. Mr. Parke was retained by the Council to assist them in overcoming a difficulty with the Pembroke Electric Light Company, and in that connection to furnish estimates of the cost of a municipal plant. The report is a particularly interesting one, and although taking a neutral standpoint, is none the less valuable :

In formulating this report, advising you as herein, I assume a strictly neutral standpoint between the two principals concerned, namely, the citizens or corporation of Pembroke, represented by your honorable body, and the Pembroke Electric Light Company, controlling the supply of electrical illumination in Pembroke. This position I take upon my own responsibility, as in taking it I can the better assist and advise you toward the attainment of the most desirable results in dealing with the company, while at the same time respecting its lawful rights, as you desire to do. It is not my intention to interfere with the rights or operations of the company, beyond that degree affecting the just and legal rights of the corporation of Pembroke. This point I desire to draw particularly to your attention, as on this basis alone is this report submitted, and on the same basis must all negotiations be conducted or actions taken by yourselves or by any other duly authorized representative of the corporation, whether negotiating with the company regarding an extension or continuation of its contract, or whether concerning the purchase and installation of a corporation plant.

The estimates herewith submitted show, firstly, the cost of purchasing and installing an electrical plant as part of the water-works plant now owned by the town, this electrical plant to be capable of supplying both street and private illumination services of sufficient extent to meet the probable requirements of the town, with provision for an increase in capacity should such be made necessary through a considerable increase in population ; and, secondly, the approximate cost per annum of thirty arc street lamps of 2,000 nominal candle power each, the approximate cost per lamp per annum of 16-candle-power incandescent lamps for house and store illumination, both services operated in conjunction with the water-works system, and finally, the approximate charges necessary to be asked for private illumination service in order that the revenue therefrom may be sufficient to provide free street lighting and at the same time cover all expenditure in connection with the incandescent system. Your attention is respectfully called to the fact that the estimate of cost of installing the street lighting plant includes an ultimate capacity for fifty lamps of 2,000 nominal candle power, and further provides for the adoption of a much more economical type of lamp than the one now in use on the streets of many towns and cities, and one capable of furnishing a much more satisfactory, better diffused, and steadier illumination than can be furnished by the older type.

Your attention is further called to the fact that the estimate of operating expenses and approximate necessary revenues is based on the operation of the electrical plant as part of the water-works system, which necessarily places the municipal electrical plant at a considerable advantage over that of the company, owing to the possibility of eliminating and dividing certain expenses among the street, private incandescent, and water-works systems.

Where no industrial system or service has already been established in a municipality, and that municipality desires to undertake to supply itself with any or all of these services, the question of control or ownership, private or public, can of course be more easily dealt with, but in the case of Pembroke, where we find that a private plant has already been installed and is now in operation as any other commercial enterprise, controlled by, and therefore involving more or less, private capital, justice demands that the owners thereof shall receive due consideration, such consideration, however, to be secondary to that due the majority of tax-paying citizens as a whole.

While the estimates given show approximately, and within as close a degree of accuracy as can be, what the town can do for itself in the event of installing and operating a municipal plant, it must be borne in mind that the same plant or system under private control cannot reasonably be expected to supply illumination for the same relative cost to the taxpayer, on account of requiring a larger staff of employees, hence heavier operating expenses, and, having as well to fulfill the intention for which the system is created, namely, payment of dividend on the capital invested therein. In view of the fact, therefore, that vested interests demand fair consideration and an opportunity for self-protection in your town, the following advice is respectfully offered, in the full belief that your hearty co-operation in it will be assured so long as there is a reasonable chance of the interests of the citizens as a whole being properly protected :—

I would advise : Firstly, that the Pembroke Electric Light Co. be asked to confer with your honorable body at some mutually convenient time, with a view towards eddeavoring to come to an understanding along the lines concerning the rates for incandescent lighting for private consumers, as described under Estimates of Operating Expenses, sec. (c), Combination Services, sec. (d), Rates and Revenues ; and, further, with a view toward arriving at some definite annual charges for street lighting, at so much per given candle power of lamp per annum, both street and private rates to be compatible with the payment of a reasonable dividend, (specific), on that amount of capital actually necessary to install the same capacity in a municipal plant, together with the bona fide operating expenses of a municipal system having therein the highest efficiencies obtainable in electrical, steam, water-power, transmission and translating devices, such as generators, engines and boilers, water-wheels (if water-power be adopted), distribution lines, transformers, and arc lamps. In connection with the subject of bona fide expenses, I would advise your insisting, with all due deference to the company, that all books, office records, vouchers, etc., in relation with the actual operation of the system be constantly accessible to the duly authorized representatives of the corporation. Secondly, that the company be required to enter into an agreement in proper form, with the corporation, concerning the basis on which future charges shall be calculated as the demand for lighting increases throughout the town, during the term of the agreement or contract.

I would further advise that the corporation guarantee the company a full and absolute protection from other competition, municipal or private, during its faithful compliance with the terms and conditions of the agreement, this protection to be guaranteed through the contract covering a period of not less than five years, nor more than ten years.

In order that the circumstances surrounding the respective positions of the corporation and the company may be the more readily understood and appreciated by yourselves, the company, and the citizens, the following considerations must be allowed their full value in each case :

(1). Any municipality has an equal right with the private purchaser or consumer to obtain the supply of any commodity or article having a commercial value, from that source which can or will supply such article at highest attainable quality and lowest cost to the purchaser.

(2). A municipality, having the right and power to not only purchase its industrial services and supplies from the most reliable, convenient, efficient and economical sources, but to undertake to supply itself with such services under municipal ownership and control, thereby affording to its citizens, under proper management, a service at lower cost than that afforded by the privately owned system, would most certainly be unlikely to knowingly choose the more expensive source of supply. Therefore, if it grant protection to a private enterprise, allowing it to exist as a monopoly within the limits of the municipality, it has every legal right to insist on being supplied with a service as efficiently and as economically as can possibly be obtained through any other private source or system operating under similar circumstances or comparative conditions. The private enterprise accordingly owes its existence in a very large measure to the good will of a majority in the municipality. If the private company will not supply the best services obtainable under the existing conditions, or under remedied conditions, and at the lowest consistent cost to the consumers compatible with a fair return on the capital invested, then the municipality can with justice take such action toward bettering the conditions as it may deem advisable, whether by cancelling all rights and privileges accorded the company and granting a franchise to any other company or body capable of and willing to undertake such supply, or by entering into the manufacture and sale of the service on its own account.

The corporation of Pembroke has, therefore, a legal right to deal as may seem best with the Pembroke Electric Lighting Company in the interests of the citizens as a whole. If the company will

not enter into a fair, just and equitable contract with the corporation, after being allowed every opportunity for so doing at the hands of your honorable body, it should be evident to every fair-minded citizen of Pembroke that you can only proceed to discharge your duty to those for whose interests you are acting by arranging for the purchase and installation of a municipal lighting system. As I have already advised, it will be more in the interests of justice to all concerned to endeavor as far as possible to deal with the company, at the same time showing your willingness to grant favorable terms and conditions in return for equally good faith on the part of the company. If the company, after due negotiations, will not enter into a fair agreement with the corporation—an agreement which can be proven by a disinterested authority to be practicable to both sides—the choice as to the next action to be taken in the matter of obtaining a better and more efficient lighting system will have to remain for yourselves to decide.

INSALLATION COSTS.

1. STREET LIGHTING SERVICE (Capacity, 50 Arc Lamps, 2,000 c.p., of improved type):

(Estimate calculated without regard to any other electrical plant, such as private lighting, etc.)

Arc Generator, capable of supplying fifty 2,000 c.p. lamps..	$2,000
Arc Lamps, suitable for street service (30 installed)	900
Arc Distribution Wiring, including cost of placing on poles	1,950
Poles installed for entire arc circuits, @ $3 each set...	960
Steam Engine—high speed—to be installed in W.W. station	800
Boiler Plant—present boilers can be used to advantage.	
Foundations, for generator and engine, including addition to present waterworks station.....	2,100
Belting, including other accessories to steam plant.....	130
Incidental expenses, including engineering supervision...	1,200
Approximate total cost of plant installed complete..	$9,140

2. PRIVATE LIGHTING SERVICE (Capacity, 2,500 16 c.p. lamps).

(This estimate calculated without regard to any other electrical plant, such as street lighting system, etc.)

Alternator, capacity 2,000 to 2,500 lamps, installed . .	$4,000
Transformers, sufficient for the first two years' supply....	1,000
Incandescent Lighting Distribution, including poles set	8,800
Steam Plant, slow-speed engines, condensing, highest quality, including countershafting and belting, installed	6,500
Foundations and Lighting Station Building, ext'n to W.W.	4,000
Incidental expenses, including engineering supervision...	1,687
Approximate total cost for separate incand'nt plant,	$25,987

3. COMBINED INSTALLATIONS:

By combining the street and private lighting plants under one roof and management, the costs of installing can be materially reduced. Under the same combination the costs of operating can be very considerably reduced.

Arc and Incandescent Plants installed as one whole system, all in complete running order and comprised of materials of the highest obtainable quality and durability, and machinery of highest efficiencies, including addition or extension to permit waterworks pump-house to accommodate electrical plant, can be purchased and installed at a cost not exceeding	$30,000

OPERATING EXPENSES.

(a). STREET ARC LIGHTING (2,000 c.p. lamps):

This estimate is calculated on the basis of the streets being illuminated by fifty arc lamps of 2,000 nominal candle power each, from dark of moon until daylight, every night in the year, and including cloudy nights which would otherwise come under the moonlight schedule. The estimate is further based on the adoption of the latest, most approved, and most economically operating and proportionately small expense for trimming and attendance, the plant to be operated in conjunction with the waterworks system.

Interest, on cost of plant, 5% per annum.....	$457
Depreciation, on cost of plant, 5% per annum.....	457
Carbons and Trimming, Attendance, etc.....	500
Fuel (wood at $1.50 per cord, delivered).....	900
Contingencies (oil, waste, repairs), ample allowance, annual	600
	$2,994
Total cost per annum for 50 lamps of 2,000 candle power,	$2,994.00
Annual cost per 2,000 candle power lamp..	59.88

(b) PRIVATE INCANDESCENT LIGHTING (2,000 16 c.p. lamps):

This estimate is calculated on the basis of a very probable demand during the first years of operation, of not less than 2,000 lamps of 16 candle power each. Also, that the plant be operated in conjunction with the waterworks system, but without regard to street lighting. Highest qualities and efficiencies of apparatus used throughout.

Interest, on cost of plant, 5 % per annum.....	$1,499.35
Depreciation, on cost of plant, 5 % per annum.....	1,499.35
Fuel (wood at $1.50 per cord, delivered)	1,350.00
Labor and Attendance (2 men, at $600 and $360)	960.00
Contingencies (oil, waste, repairs), annual allowance	600.00
	$5,908.70
Total annual cost for 2,000 lamps of 16 c.p..	$5,908.70
" " one lamp "	2.96

(c). COMBINED PUBLIC AND PRIVATE SERVICES:

This estimate is based on the operation of the street and incandescent lighting plants as one system, in conjunction with the waterworks plant, under the one staff of employees, *sufficient for* all practical purposes. Owing to larger steam units required for the combination plant, the consumption of fuel can be very materially reduced through the adoption of engines and steam generating plant of higher efficiencies. The interest on the combined costs will also be below that of the total cost of two separate plants.

Interest on combined cost, $30,000 @ 5 % per annum.....	$1,500
Depreciation on combined cost, $30,000 @ 5 % per annum	1,500
Carbons for arc lighting plant, @ $35 per M.	160
Fuel for two plants—compound condensing engines.....	1,600
Wages—2 men. Lamp trimmer dispensable on account of enclosed type arc lamp, requiring trimming 4 times *per month. Assistant can easily attend to lamps.*	
Wages at rate of $600 and $360 per annum.....	960
Contingencies, under combined operation, annual...	900
	$6,620
Total cost per annum, 2 plants under combined operation,	$6,620

(d). RATES TO CONSUMERS AND APPROXIMATE REVENUES.

The following schedule shows approximately the charges necessary to be exacted for private incandescent lighting in order to cover operating expenses of that system, and at the same time afford free street lighting to the corporation:

	Per Lamp per Annum.
Average rate with 2,000 incandescent lamps in use....	$3.30
" " 2,500 " " "	2.80
" " 3,000 " " "	2.40

The above rates are approximate, but correct within 10 per cent. As the operating expenses do not increase in direct proportion to the number of lamps in use, the greater the number of lamps used in the one plant the lower the price per lamp until that point of demand is reached whereby an increase in capacity of plant and number of attendants is required. Hence the rates to users of incandescent lamps can be proportionately reduced so that the service can be placed within reach of every citizen, and yet the revenue therefrom will always be amply sufficient to afford free street lighting besides covering the private lighting operating expenses. It is on these lines that the negotiations with the Pembroke Electric Light Company should be conducted, particularly with a view toward securing for the majority of the citizens who cannot afford to use the private lighting service at the present rates, a price so that all can ultimately obtain some practical personal benefit from the system which they are now protecting through the medium of the company's franchise.

MOONLIGHT SCHEDULE FOR JANUARY.

Day of Month	Light.	Extinguish.	No. of Hours.
	H.M.	H.M.	H.M.
1....	P.M. 5.10	P.M. 10.30	5.20
2....	" 5.10	" 11.30	6.20
3....	" 5.10	A.M. 12.30	7.20
4....	" 5.10	" 1.30	8.20
5....	" 5.10	" 2.40	9.30
6....	" 5.10	" 3.50	10.40
7....	" 5.10	" 4.50	11.40
8....	" 5.20	" 6.00	12.40
9....	" 5.20	" 6.20	13.00
10	" 5.20	" 6.20	13.00
11....	" 5.20	" 6.20	13.00
12....	" 5.20	" 6.20	13.00
13....	" 6.30	" 6.20	11.50
14....	" 7.40	" 6.20	10.40
15	" 8.50	" 6.20	9.30
16....	" 10.00	" 6.20	8.20
17 ...	" 11.00	" 6.20	7.20
18....	" 11.10	" 6.20	7.10
19....	"	" 6.20	6.10
20 .	A.M. 12.10	" ...	
21....	" 1.20	" 6.20	5.00
22....	" 2.20	" 6.20	4.00
23....	" 3.20	" 6.20	3.00
24....	No Light.	No Light.	....
25....	No Light.	No Light.	.....
26....	No Light.	No Light.	.....
27....	No Light.	No Light.	....
28....	P.M. 5.40	P.M. 8.20	2.40
29....	" 5.40	" 9.20	3.40
30....	" 5.40	" 10.20	4.40
31....	" 5.40	" 11.20	5.40
		Total.....	213.30

SPARKS.

Mr. C. E. Nailor, of Essex, Ont., intends putting in a new incandescent electric light plant in his flour mill.

Mr. W. T. Douglas has resigned his position as manager for the Bell Telephone Company at Stratford, Ont.

The business men of Baldur, Man., are considering the advisability of constructing a telephone system for the town.

At Prescott, Ont., the by-law to raise $15,000 for a municipal electric light plant was carried by a majority of 37 votes.

The village of Forest, Ont., defeated two by-laws, at the municipal election, providing for the establishment of a municipal electric light plant.

The citizens of Ottawa, Ont., have declared in favor of a Sunday street car service. The result of the vote was 4,628 for and 1,664 against.

It is announced that the Richelieu & Ontario Navigation Co. purpose placing an electric light plant and boiler in the steamer "Saguenay" this winter.

The ratepayers of St. Thomas, Ont., have voted down the by-law to provide funds for the installation of an electric light plant, to be operated under civic control.

It is said that representatives of the Toronto Railway Co. were recently in Whitby in connection with a proposal to extend the system to that town and Oshawa.

A by-law to authorize the city council of Winnipeg, Man., to install a municipal electric light plant, at a cost of $50,000, was voted down by the ratepayers last month.

The efforts of certain citizens of Nelson, B. C., to have the electric light by-law declared invalid have been defeated. The Electric Light Co. will, therefore, get $35,000 for their plant.

Mr. Thomas A. Low has secured an option on the water power of the late M. L. Russell, at Renfrew, Ont. It is said that the town may purchase the power and establish an electric light plant.

Municipal control does not seem to have been a success in the town of Richmond, Que., as we observe that the corporation is offering for sale their dam, water-wheels, dynamos, machinery, etc.

The John R. Scott Co., of Napanee, Ont., are increasing their plant by putting in another "New American" water wheel, which will give them 500 horse power. The company intend to extend their line to Arthur and Colebrook next spring.

Messrs. Daly & Hamilton, of Rossland, B.C., are asking for the incorporation of the British Columbia Electrical Supply Co., Limited, to supply electric light, heat and power, and construct railways, telegraph and telephone systems, and other works.

The W. A. Johnson Electric Company are installing an alternating plant for the corporation of Acton, Ont., including 55 street lamps and all wiring for the town. The generator will be one of their inductor type alternators, which are meeting with much success.

At the next session of the Ontario legislature a company will seek incorporation as the Haliburton, Whitney and Mattawa Railway Company, with power to build a steam or electric railway from a point on the G. T. R. at Haliburton to Whitney and Mattawa.

Letters patent of incorporation have been granted to the Metropolitan Electric Co, of Ottawa, with a capital of $500,000. This company, as mentioned previously, are developing a water-power at Britannia, and purpose supplying light and power throughout the city of Ottawa.

The Grand River Electrical Power Co. has been organized by Messrs C. H. Carroll, J. F. Bolthee and A. N. Parney, of Paris, and W. J. Clark and Thomas McLaughlin, of Toronto. The capital is $90,000, and the company have power to supply electric light, steam, heat, and natural gas.

The directors of the Hamilton, Chedoke & Ancaster Railway will apply to parliament for an amended charter, giving them power to build a line to Brantford, to change the name to the Hamilton, Ancaster & Brantford Electric Railway Co., and to increase the capital stock from $100,000 to $200,000.

A son of Mr. William Williams, manager of the Gas & Electric Light Co., Sarnia, Ont., had a narrow escape from suffocation by gas recently. He had descended into a trench to examine a break in the main when he was overcome by the fumes of the gas. Fortunately, his condition was observed by his fellow workmen.

Mr. R. Weddell, who owns a controlling interest in the Trenton waterworks, is at present negotiating for an amalgamation of the electric light and waterworks companies there, with a view to increasing the power plant so as to operate both and supply power to manufacturers. It is also proposed to light the city of Belleville, 12 miles distant.

The electric light plant at Granby, Que., is now partly in operation, and will soon be entirely completed. A pair of 30 inch Crocker wheels are being untilized at present, plenty of water being available, while the 250 h.p. Corliss engine is being set up. The whole plant is modern, and the arrangements reflect credit on the Jenckes Machine Company, contractors for the plant equipment.

The Alliston Electric Light Company, of Alliston, Ont., are making changes in their lighting station, and have decided to increase their incandescent lighting capacity. For this purpose they have placed their order with the Royal Electric Company for one of their 60 k.w. "S.K.C." two phase machines, from which they will serve both arc and incandescent lights as well as power, which has heretofore been served by both machines.

A syndicate, at the head of which is Mr. George Skead, the original discoverer of Lake Girard mica mine, is engaged in opening up a new mining district on the Big Blanche river, near Thurso, Que. The syndicate have secured several thousand acres of mining land in that vicinity, and are now taking out about five tons of culled mica per week. Associated with Mr. Skead are Messrs E. A. Blakeney and H. K. Lee, of Ottawa.

Mr. Alex. Pushle, an engineer of the Dominion Coal Co., of Cape Breton, has gone to South Africa, where he will superintend the experiment of using the patent fuel manufactured in Cape Breton on locomotives and for general steam purposes. About two months ago 250 tons of this coal were shipped to South Africa by the Dominion Coal Co. If found satisfactory, an extensive field will be opened up for the waste product of the coal mines of Cape Breton.

The Jenison by-law was carried by the ratepayers of Port Arthur, Ont., on the 2nd inst. By this the town agrees to pay Mr. E. S. Jenison the sum of $10,000 per annum for 40 years for 750 electric horse power and 250,000,000 gallons of water per year. The scheme, already familiar to our readers, involves the construction of a canal from Kakabeka Falls to Port Arthur. This canal, it is said, will develop 20,000 horse power, and have a head of water at Port Arthur of 300 feet.

The Canadian, British Columbia & Dawson City Telegraph Company, Limited, has been formed, with a capital of $1,500,000, to construct a telephone system to the mining districts of the Yukon river. The directors of the company are: Sir James Grant, K.C.M.G., Ottawa; Sir Adolphe Caron, K.C.M.G., M.P., Ottawa; J. H. Turner, M.L.A., ex-premier British Columbia; Ald. John Hyde, of Banbury; W. H. J. Fawcus, director Edison & Swan United Electric Light Co., Limited, Dartmouth House. W. Young, 64 Victoria street, London, is the secretary.

According to the London Electrical Review, one of the most novel systems of electric canal towage that has yet been tried is meeting with such great success that the line is to be extended some fifty miles. Small track tricycles, equipped with six horse power motors, run along a French tow-path, taking their current from an overhead wire. These are sufficiently powerful to draw a 300 ton boat at a speed of 1.5 miles an hour. While the system is not cheaper than animal haulage, yet the speed is greater and the service very regular. There are two generating plants, each of 200 horse-power, one at each end of the line.

Tenders for the proposed electrical power transmission plant at Orillia, Ont., were opened by the council a fortnight ago. For the electrical machinery three tenders were submitted, from the Canadian General Electric Company, Toronto, Royal Electric Company, Montreal, and Westinghouse Electric & Manufacturing Company of Pittsburg, Pa., through the Central Construction Company of Buffalo, N. Y. For the transmission line supply and construction, tenders were submitted by the Canadian General Electric Company, Central Construction Company, and C. H. Patriarche, contracting electrical engineer, Toronto. Three tenders were also submitted for the hydraulic machinery and construction, from William Kennedy & Sons, of Owen Sound, Ont., Central Construction Company, and P. H. Patriarche. No decision has been reached as yet, but it is believed that the council favor the tenders of P. H. Patriarche, for the whole equipment, including electrical apparatus of the Royal Electric Company's manufacture, at $66,680, and the Central Construction Company, of Buffalo, including Westinghouse electrical apparatus, at $67,200.

SPARKS.

Some of the residents of Thessalon, Ont., are in favor of taking steps to introduce the electric light.

The capital stock of the Imperial Oil Co., Petrolea, Ont., has been increased from $500,000 to $1,000,000.

A project is on foot to build an electric railway between Trenton and Westville, N.S., via New Glasgow and Stellarton.

The merchants of Souris, P.E.I., are considering the advisability of having the town lighted by electricity. Oil lamps are now used.

Mr. J. M. Clark is a farmer just outside the town of Smith's Falls, Ont., who has just had his buildings wired for electric light.

The town of Barrie, Ont., has entered into an agreement to take over the plant of the Barrie Electric Light Co., at the price of $22,501.

Mr. Thomas Chater, chief engineer for the Windsor Electric Light Co., Windsor, Ont., was caught by a shaft and slightly injured recently.

The by-law to raise $5,000 for the extension of the electric light plant at Thorold, Ont., was defeated by the ratepayers at the municipal elections.

The first narrow gauge railway train operated by electricity in Europe was given a trial on a short road between Dusseldorf and Kerfeld, Germany.

The C.P.R. steamship fleet will receive a general overhauling at Owen Sound, Ont., during this winter. An electric light plant will be installed on the "Alberta."

The Wallaceburg Electric Light Co., of Wallaceburg, Ont., has been granted an extension of time to February 1st, for the installation of an incandescent lighting plant.

At a meeting of the directors of the St. Catharines Electric Light Co., held on December 30th, it was decided to add to the plant a new engine and boiler, at a cost of $6,000.

The Lake Megantic Pulp Company, of Lake Megantic, Que., will ask the government for an increase of its powers, with a view to supplying electric light and power and constructing tramways.

The first annual dinner of the employees of the Winnipeg Street Railway was held in Winnipeg on January 2nd. In order that most of the employees might attend, the dinner was held at midnight.

The electric light plant at Stanbridge East, Que., will be in operation in a few days. The feeder pipe for water wheel is now being laid in, and the Crocker turbine, furnished by the Jenckes Machine Company, of Sherbrooke, Que., has arrived.

Tenders for the electric wiring for the new city hall at St. Thomas, Ont., were received as follows: Rogers & Co., London, $395; H. L. Gray, Toronto, $409; Matthew Stearns & Son, St. Thomas, $368. The tender of H. L. Gray was accepted.

It is reported that the widow of the late John W. Keeley has entrusted to a former Canadian, in the person of Mr. T. Burton Kinread, late of Moncton, N. B., the task of completing and perfecting the Keeley motor. Mr. Kinread is now located in Boston, Mass.

Mr. Charles MacBeth has established business in the Masonic Temple building, London, Ont., under the name of the Ontario Electric Company. The new firm will keep in stock a supply of electrical apparatus, and will give special attention to electric wiring.

The electric lighting plant recently sold to the corporation of the town of Campbellton was started up for Christmas lighting. The driving power is water, and the electrical apparatus is of the Royal Electric Company's "S.K.C." two phase type, for arc and incandescent lighting and power.

The Niagara Falls Park & River Railway Co. have brought action against the town of Niagara Falls, Ont., to recover the sum of $124.42, paid as taxes by them to the corporation on a $6,000 assessment on their roadway. The company claim that the property is a public highway and therefore exempt.

The Chicago Record states that the Count de Jotemps, of Jarls, France, has closed a contract with the Fischer Equipment Co., of Chicago, under which the latter agrees to furnish 500 horseless vehicles each year for the next ten years. It is also said that the count has closed other contracts for 1,500 vehicles.

The General Electric Co., of Schenectady, N.Y., has received an order from the company which is constructing the underground street railway in Paris, for eight electric locomotives and necessary equipment. The locomotives will be of the same type as those on the Central London Underground Railway. The length of the Paris road is three miles.

The Gendron Manufacturing Company, of Toronto, recently decided to install a direct-connected 600 light generator for lighting their factory. The order was placed with the W. A. Johnson Electric Company for a generator and the wiring of factory. They will use a 10 x 10 Ideal engine, manufactured by the Goldie & McCulloch Company, of Galt, Ont.

The corporation of Beeton, Ont., recently decided to install an electric light plant. It was put in about two months ago, and since then the number of lights has increased to nearly the capacity of their present machine, which is one of the W. A. Johnson Electric Company's inductor type of alternator, suitable for a plant where a repair shop is not near by.

The council of the town of Dartmouth, N. S., will ask power from the provincial legislature to issue $150,000 of bonds for the purpose of operating a street railway in Dartmouth and vicinity. A bill will also be submitted empowering the issuing of bonds to the amount of $50,000 to establish an electric light plant for lighting the streets and public buildings.

The Wallaceburg Electric Light Company, of Wallaceburg, Ont., have been supplying arc lights for the town of Wallaceburg for a number of years. Now they have decided to go into the incandescent lighting business, and have placed their order with the Royal Electric Company for a 30 k.w. alternator and 900 light capacity in "S.K.C." transformers and material.

A rumor has been current that the street railway at Sherbrooke, Que., had been purchased by Messrs. Frank Thompson & Co., financial agents of that city. This company is said to have secured the Brompton Falls water power, and to have decided to proceed at once to extend the line to North Hatley and other points. The report, however, has not yet been confirmed.

The ratepayers of the city of Hull, Que., carried a by-law on January 2nd to raise $8,000 for the installation of an electric light plant for street and city lighting. The plant will include two 50-light dynamos, seventy-five 1,200 c.p. arc lamps, and some eight miles of line. Tenders for same will be invited and the work proceeded with at once. The city owns a suitable water power, which will be utilized for the purpose.

At the ensuing session of parliament, Mr. George E. Kidd, of Ottawa, acting for a syndicate, will apply for a charter incorporating a company to construct a steam or electric railway from the city of Ottawa to Meach's Lake, with branches to Graham's Bay, Aylmer and Hull. Should a charter be granted, the work of construction will be commenced in the spring. The capital stock of the company is placed at $500,000.

Mr. Percy Domville, of Hamilton, Ont., has presented to the city council of St. Thomas, his report on the cost of installing a civic lighting plant. His estimates for 100 arc-light plant are as follows: Steam plant, $7,550; electric plant, $13,571.50; buildings, $9,300; duplication of plants, $8,000. For installing in connection therewith an incandescent plant of 3,000 lights the cost is given as follows: Steam plant, $9,550; electric plant, $18,225.

There is an arrangement between the Dominion government and the street railway companies operating in most of the large cities in Canada, by which the letter-carriers use the street cars in the performance of their duties. For this consideration the Montreal Street Railway Co. have been paid the sum of $200 per month, but the Postmaster-General was notified some time ago that the service would not be continued upon this basis. The company claim that a record of the work performed shows that at regular fares the sum to be charged would be over $1,000 per month, and hence their refusal to renew the contract on the former terms. In Toronto the price paid is said to be $400 per month.

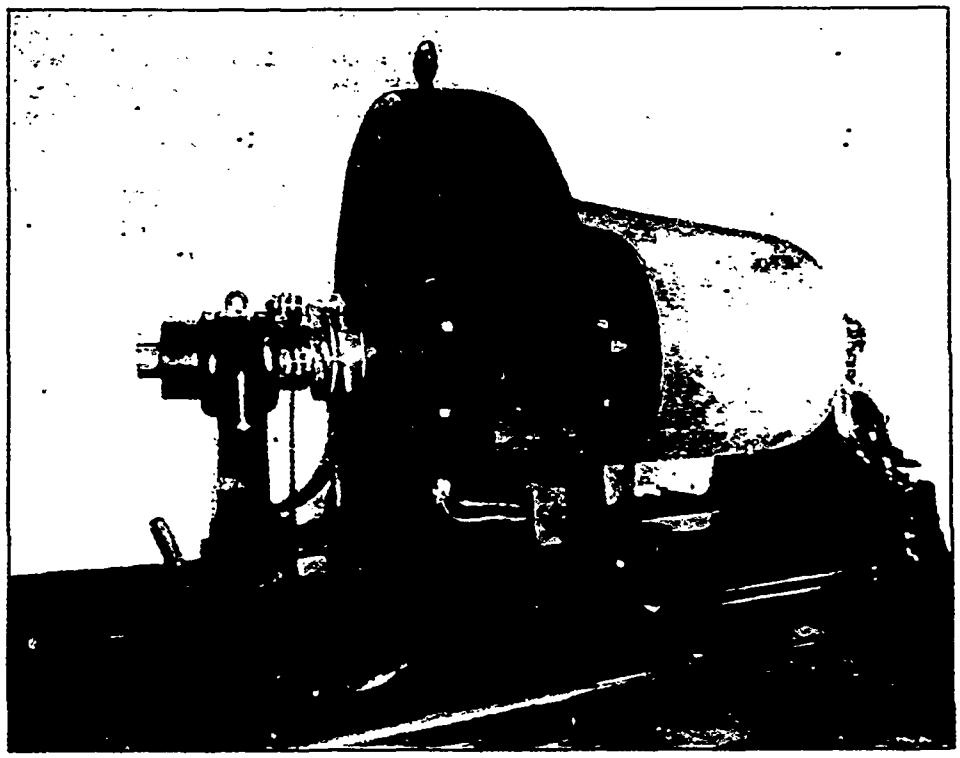
In the December number of the Street Railway Journal, of New York, appears an article by Mr. William Banks, of the Toronto Railway Co., dealing with the methods of increasing street railway traffic. After referring to the necessity of creating traffic by establishing parks and other places of amusement, Mr. Banks says: "This city has an extensive water front and a beautiful island summer resort within the city limits, and it is anticipated that at no distant date boat trolleys will be placed in operation along the water front by our company to carry passengers to and from and around the island." Mr. Banks describes methods of co-operating with steam railways and boats to handle excursion parties and people arriving to attend unusual entertainments,

LARGE ELECTRIC LIGHT DYNAMO.

THE illustration on this page represents what is claimed to be the largest dynamo which has yet been installed in Canada for electric lighting service. It is one of the latest type of Westinghouse alternators, and was installed in the power house of the Ottawa Electric Company by Messrs. Ahearn & Soper, of Ottawa, Canadian agents for the Westinghouse Electric & Manufacturing Company.

The voltage is 1,200; alternations, 16,000; speed, 445 r.p.m.; capacity, 420 k.w.; weight (alternator and exciter together), 33,500 lbs. A particularly noticeable feature of the machine is its low temperature. It was guaranteed to deliver 420 k.w. continuously at a temperature rise not exceeding 40° C. The test made by the Ottawa Electric Co. gave 488½ k.w. on a ten-hour run, with a temperature rise of only 11° C.

The field poles of Westinghouse alternators are built up of thin sheets of steel and then placed in the mould, and so cast into the cast iron yoke or field frame. In this way the field poles are constructed of the best possible material, an extremely powerful magnetic field being secured, while the losses due to eddy currents, which are sometimes very serious where solid field poles are used, are eliminated by the use of the laminated poles. The armature is absolutely iron clad, and can be readily handled without danger of damage to the winding. The construction is such as to facilitate insulation against high potentials, while in case of accident coils may be removed and replaced without difficulty.



LARGE ELECTRIC LIGHT DYNAMO.

COMPARATIVE COSTS AND PROFITS OF CABLE, ELECTRIC AND HORSE CAR OPERATION.

SOME interesting figures are published in the Street Railway Journal showing a comparison of the relative cost of operation of the cable, electric, and horse-car systems of the Metropolitan Street Railway Company of New York. The data was obtained from the private cost sheets and other records of the company, and covers a period of twelve months, ending June 30, 1898. The experience of the Metropolitan Company points unmistakably to the great superiority of electricity over both horses and cable, not only in traffic handling capacity, but in economy.

The relative traffic densities measured by the receipts per mile of track and per car mile as shown in one-quarter's report are as follows: Cable, $39,000 per mile of track and $.333 per car mile; electric, $17,000 per mile of track and $.260 per car mile; horse, $8,000 per mile of track and $.288 per car mile. The average earning power of the entire system was about $14,000 per mile of track and $.29 per car mile. These figures are for one-quarter only.

It is shown that 11% of the company's entire mileage which is operated by the cable system is earning 28% of the total passenger receipts; the 28% which is operated by the electric system is earning 32% of the total passenger receipts, and the 61% which is operated by horses is earning but 30% of the total passenger receipts. For the year, the operating expenses of the cable line were 16.424 cents per car mile, of the horse lines 17.87 cents, and of the electric lines 10.23 cents. The electric lines during the twelve months earned 16.67 cents net per car mile, or but 1.25 cents less than the cable system, in spite of the fact that the latter has 7.434 cents per car mile greater receipts.

From a careful study of the figures, it is believed that were all the lines in New York city to be equipped with a single motive power, electricity would have a permanent advantage over the cable of at least 3.05 cents per car-mile in maintenance of way, a slight disadvantage in maintenance of equipment, and an advantage of at least 1.25 cents in power, of 1.5 cents in transportation, and of .5 cent in general expenses—a total of nearly 6.75 cents per car mile. In comparison with horse traction, electricity would be at a disadvantage of perhaps .5 cent per car mile in maintenance of way and .5 cent in maintenance of equipment; while it would have an advantage of at least 6 cents in motive power, 1.5 cents in transportation and 5 cents in general expenses—a net difference of 7 cents. Besides this, electric cars would earn more than either horse or cable cars with equivalent mileage.

In the transportation expenses it was found that electric traction is the cheapest of the three motive powers, the reason for this being in the greater speeds of cars possible with electric traction. In every division of operating expenses electricity has a decided advantage over the cable system, and in every division except maintenance of equipment it has an advantage over the horse system. During the twelve months' period the cable lines operated at 47.7 per cent. of their passenger receipts, the electric lines at 37.9 per cent., the horse lines at 65.3 per cent., and the entire system at 53.3 per cent.

AN INTERNATIONAL ELECTRIC RAILWAY

THE Niagara Falls Park & River Railway has the honor of operating the first international electric railroad between the United States and the Dominion of Canada. This notable line is run across the greatest steel arch bridge in the world, which spans the Niagara Gorge at Niagara Falls, very close to the great cataract. The line has a double track, and the cars that are operated on the bridge connect at the Canadian end with the cars of the road running between Chippewa and Queenston, along the top of the high bank on the Canadian side of the river. On the bridge the centre pole system is employed, and the cars speed across the structure every few minutes. Under the present arrangement the bridge tickets purchased by strangers allow them the use of the trolley cars; that is, they ride free if they so elect. Residents of Niagara Falls who pay ten cents for crossing the bridge are forced to pay an addilional five cents to ride in the cars, making the price for crossing the bridge in the cars fifteen cents for both strangers and residents. The power for operating the cars on the bridge is supplied from the railway company's power station in Queen Victoria Free Park. This crossing of the steel arch by the Niagara Falls Park & River Railway, places it in close business touch with the crowds of people in both of the great free parks at Niagara- the New York State reservation on the one side and the Queen Victoria Niagara Falls Free Park on the Canadian side. It is reasonable to suppose that all the people who go to Niagara sight-seeing go to these beautiful parks, and therefore the advantages of the road for catching travel are extremely good. Then again, the New York State end of the line is right at Prospect Park, and its cars afford rapid transit between the free parks. The cars now run right up to the Riverway, a street within the limits of the New York State reservation. In time it is expected that connection will be made between the Niagara Falls Park & River Railway and some line on the New York State side, either the Niagara Falls & Suspension Bridge Railway Company or the Buffalo & Niagara Falls Railway, which could be accomplished by the construction of a few hundred feet of track up to Niagara street and across the Riverway to the tracks of the Niagara Falls Park & River Railway Company.

The Winnipeg Electric Railway Co. will be requested by the council to equip their cars with fenders.

It is understood that M. F. Beech & Co., of Winchester, Ont., purpose putting in a larger dynamo in their factory.

The Cataract Power Company of Hamilton, Ont., is understood to be considering the construction of an electric railway to Guelph and Berlin.

The Montreal Street Railway Company has made application to the provincial legislature for permission to increase its stock from time to time and to authorize the extension of its lines to any point within ten miles of the city of Montreal.

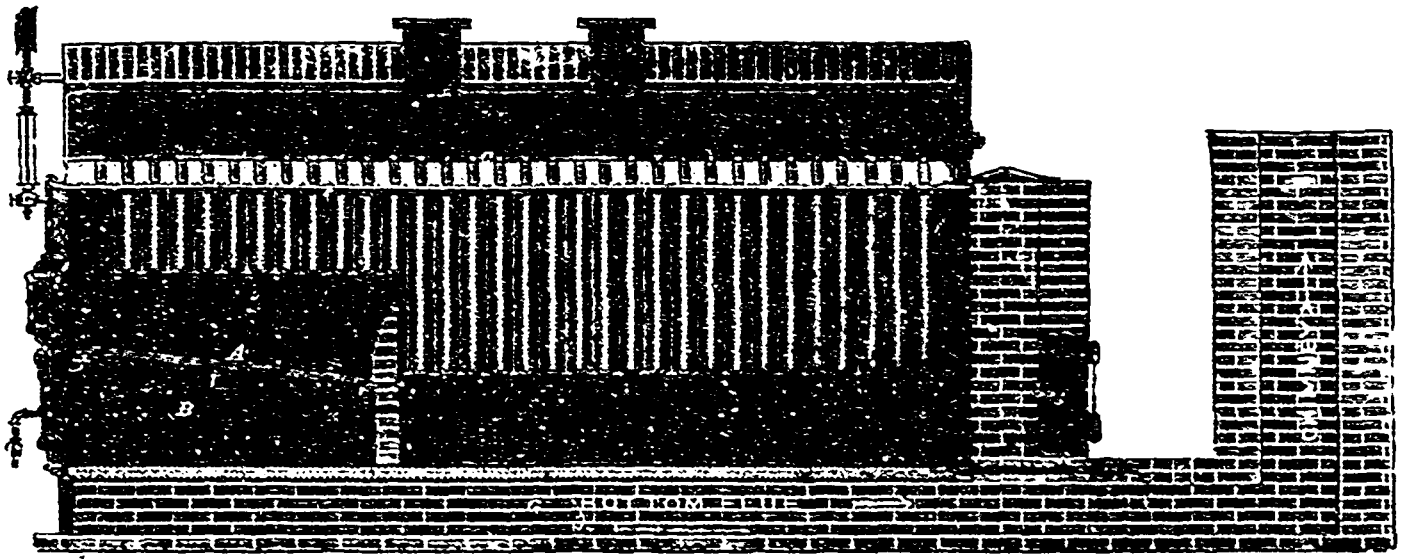
Messrs. Nesbitt, Gault and Dixon, solicitors, will apply to the provincial legislature for an act to incorporate the Hamilton and Caledonian Railway Company, to build an electric railway from St. Catharines to Caledonia and Selkirk.

About 100 employees of the Quebec Street Railway, the Quebec, Montmorency & Charlevoix Railway, and the Montmorency Electric Power Company, have formed an athletic association, with Mr. E. F. Wurtelle as president, and Mr. L. D. Jencas, jr., as Secretary.

KINGSLEY

Water Tube Steam Boilers

For Power and Marine Purposes Adaptable to the Highest Pressures.



HIGHEST ECONOMY GUARANTEED PRICES MODERATE

Manufactured in Montreal, Toronto and Ottawa.

Head Sales Office for Canada :

E. A. WALLBERG, C.E., Bell Telephone Building, MONTREAL

CATALOGUE FREE

PUMICE STONE IN STORAGE BATTERIES.

It has long been the desire of electricians to perfect a practical storage battery, but of all the different systems that have been devised since the days of Faure and Plante, each and all have presented internal infelicities which have prevented their coming into general use, much as they have been desired. The Germans, however, have made a long step towards solving the problem of a practical storage battery, and one factory now in Germany turns out fifty tons of batteries per day. One of the most ingenious innovations in the storage cells has been the admixture of granulated pumice stone with the lead from which the storage plates are to to be molded. The heat from the molten lead expands the air contained in the pores of the pumice stone, and in this way an infinite number of cells are formed throughout the mass of lead. The porosity thus obtained is so great that a plate $9 \times 7\frac{1}{2}$ inches will absorb five and one-half ounces of water. If desired, the pumice stone can be removed at will, but as a matter of fact, being electrically inert, and as there is but 10 per cent. of solid matter, its presence is of little account either one way or the other. By this method an enormous range is available, both in the elements of weight and porosity. It is hoped that by the use of this spongy form of lead a return may be permitted to the earlier and simpler Plante type of cell, which of late has given way to the Faure system, in which the active material is mechanically applied to the plate. The new spongy cell has a large natural surface of "active material," whether the plates be thick or thin, and it is held with absolute security in the innumerable pockets of the body of the plate The use of pumice stone is certainly a most ingenious application of means to an end. Stonemason.

CLEANING THE GLOBES OF ENCLOSED ARC LAMPS.

In an article in the Electrical World, Mr. J. H. Hallberg remarks that the trimming and cleaning of the inner globes on enclosed arc lamps is of the utmost importance, as the efficiency and candle power depend, to a large extent, on the transparency of the inner globes. It will be found that most of them are covered inside with a grey-white dust, or film, which comes off if the globe is washed in clean water; but some, even if they are washed in water, show a brown-black stain around the top of the globe which apparently will not come off, no matter how much it is washed; in fact, it appears as though it were a natural color in the glass itself. This is due to several causes. The most common is the impurity of the carbons, which contain too much metallic material; another is too great a length of the lower carbon, which brings the arc too near the neck of the inner globe; or the cause may be too much current flowing across the arc, especially during the few minutes after trimming the lamp with new carbons, this causing an excessive flame that gets in contact with the globe, and in that way stains it. The only way to clean a globe in this condition is by dipping the burned part in hydrofluoric acid. This acid is very dangerous to handle, and much care should be exercised when it is used. As this acid will eat through almost every material except lead and wax, it must be kept in a jar of either of those materials. Mr. Hallberg prefers lead, as the acid gets warm when it acts on the glass, and he has seen cases where the wax melted and let the acid run out.

PERSONAL.

Mr. J. H. Meikle, electrical engineer of Willoughby's Consolidated Company, Buluwayo, South Africa, is on a visit to his home in Morrisburg, Ont.

Mr. Burgess, engineer at the electric light plant, Toronto Junction, Ont., is at present visiting friends in England, having been granted leave of absence by the council.

Mr. John Rowley, superintendent of the Belt Line Railway, Montreal, has been appointed manager of the Bout de l'Isle hotel, which has recently been taken over by the Montreal Belt Line Railway Company.

The employees of the Chambers Electric Light and Power Company, Truro, N. S., evidenced the good feeling existing between them and their manager, Mr. S. G. Chambers, by presenting him with a gold-headed cane, accompanied by a complimentary address, as a Christmas gift.

Mr. P. F. Hodgson, chief signal engineer of the Grand Trunk Railway, recently resigned his position to go to England, and has been succeeded by Mr. W. H. Patton, of Montreal. Mr. Patton is a graduate of McGill University, and has been employed under Mr. Hodgson.

Mr. Letheule, an electrical engineer of Paris, France, paid a visit to Canada recently. He was commissioned by the French government to visit this country for the purpose of reporting as to the application of electricity for industrial purposes. He is said to have been highly pleased with the result of his research, and it is probable that his report will induce French capitalists to look to Canada as a favorable field for investment. Mr. Lethuele will probably return to Canada in the near future, on a more extended visit.

A well-known member of the Canadian Association of Stationary Engineers passed away at Stratford, Ont., recently, in the person of Mr. John Hoy. Mr. Hoy had been ill for a number of years. He was born in South Easthope 44 years ago, and had lived in Stratford the greater part of his life, having been an engineer in the woolen mills for about 15 years. He took an active interest in benevolent societies and in the welfare of the city, being a member of the separate school board. Engineers in general will learn of his demise with sincere regret.

SPARKS.

Mr. C. J. Smith, of Cleveland, Ohio, is superintending the work of replacing the old street lamps in London, Ont., by Adams-Bagnall Lamps.

There is a movement on foot in Victoria, B. C., for the compulsory inspection of stationery boilers. The matter has been taken up by the city council.

Mr. Thos. Marshall, engineer, Orillia, Ont., in remitting his subscription to the ELECTRICAL NEWS, writes: "I find it one of the best engineering and electrical journals I have ever read."

It is probable that Mr. Warsap, manager of the cement works on False Creek, B.C., recently secured by a New York syndicate, will recommend that electrical machinery be installed for operating the works.

The building of a steamer at Westport, Ont., is said to have been decided upon by Captain Noonan, of Ottawa. The new craft will be fitted with an electric light plant, and will have a 12 x 12 compound engine.

The pioneer electric plant of the Boundary Creek district, in British Columbia, has been installed. It consists of an Edison dynamo and a Lively engine, furnishing 50 16 c. p. lights, and has been put in by the Mother Lode Mine in Deadwood camp.

The Guelph Light and Power Company recently added a new 1,000 horse-power incandescent dynamo, purchased from the Canadian General Electric Co. The necessary pulleys and castings were furnished by the Goldie & McCulloch Co., of Galt, Ontario.

A number of gentlemen purpose installing a new telephone system in the counties of Inverness and Victoria, in Nova Scotia. The proposal is to connect Northeast Margaree, Middle River, Big Baddeck, Baddeck, Nyanza, and Whycocomagh with Orangedale, on the Cape Breton railway. Professor Bell, of Baddeck, is interested in the company.

CANADIAN GENERAL ELECTRIC CO'Y

(LIMITED)

Head Offices: TORONTO, ONT.

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

WORKS:
PETERBORO', ONT.

MANUFACTURERS OF ALL KINDS OF

Electrical Machinery and Supplies

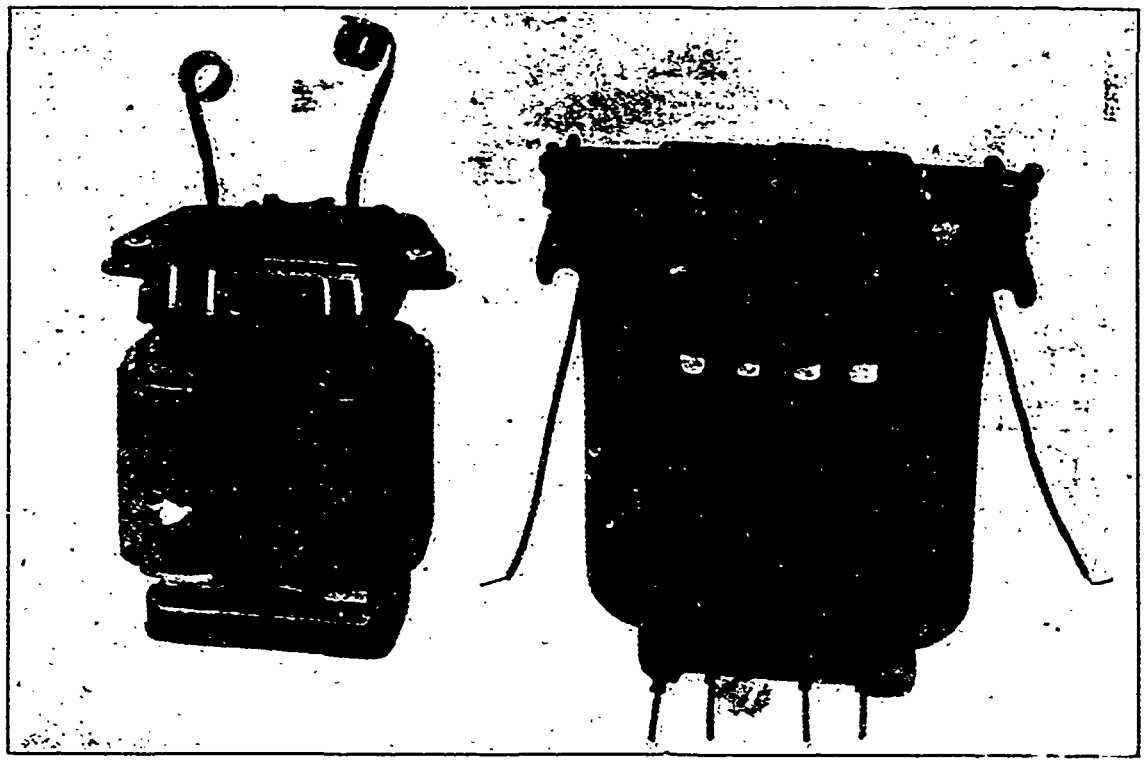
OUR TYPE "H" TRANSFORMERS

ARE THE

STANDARD OF THE WORLD

BECAUSE OF

Careful Design
High Insulation
Low Core Loss
Thorough Construction
High Efficiency
Close Regulation
Convenience in Installation
Weatherproof Construction
Low Temperature Rise



TYPE "H" TRANSFORMER, SHOWING CORE AND WINDING.

During the past three years we have sold in Canada over 200,000 light capacity in Standard Transformers. WRITE FOR PRICES

Central Station Men install Type "H" Transformers

TO SECURE SUPERIOR REGULATION AND USE HIGHER EFFICIENCY LAMPS
TO SECURE LOW TEMPERATURES AND DIMINISH OPERATING EXPENSES
TO SECURE LOW CORE LOSS AND INCREASE LIGHT CAPACITY WITH SAME STATION MACHINERY

TRADE NOTES.

E. Leonard & Sons, of London, Ont., have supplied a new boiler for the pumping station at Fredericton, N. B.

The large elevator of the J. C. King Company, of Port Arthur, Ont., is being lighted throughout by electricity, the entire plant being furnished by the Royal Electric Company, of Montreal.

The Royal Electric Company are furnishing an electric light plant for the C. P. Railway elevator at St. John, N.B., and for this purpose have ordered one of the Dake patent engines from the Jenckes Machine Company, Sherbrooke, Que.

The plant for the town of Norwood, Ont., recently installed by the W. A. Johnson Electric Company, is said to be giving much satisfaction. The machine is one of their single phase inductor alternators, which are claimed to be practically indestructible, and have the advantage of a very low speed.

Mr. E. A. Walberg, of Montreal, has secured the contract for heating the Canada Atlantic shops at Ottawa, Ont., by the Buffalo Forge Company's system of fans. Kingsley Water tube boilers will be employed. It is said that the Canada Atlantic Railway Co. have under consideration a proposal to operate their shops by electricity.

The Packard Electric Co., of St. Catharines, Ont., have sent to their friends a daily note book for the month of January, on the front page of which is extended New Year greetings. Accompanying this booklet is an attractive circular making the important announcement that the Packard Company have arranged with the makers of the "Diamond c.p." supplies to handle these goods exclusively in the future.

In connection with the consolidation of the Westinghouse Manufacturing Company, of Pittsburgh, and the Walker Company, of Cleveland, we are advised that the Canadian representatives of the latter company, the W. A. Johnson Electric Company, of Toronto, will continue to represent the combined interests of the aforesaid companies in Western Canada. The advantage of this arrangement is evident, as the Westinghouse Company manufacture a most complete line of apparatus for long distance power transmission, including the A.C.D.C. generators, rotary transformers, induction and revolving field generators, etc.

WHAT AN ADVERTISEMENT SHOULD BE.

MR. Frank A. Munsey, in an address before the Sphinx Club of New York on "Advertising in Some of its Phases," says: There are just two things to be kept in mind in the preparation of an advertisement—first, something to fix the reader's attention upon your particular advertisement, and second, the talk to the reader. What you say, your argument, your talk to the reader, should be attractively set, plain, neat, simple, short sentences and short paragraphs, and large clear type, well leaded. Cramped space does not give scope for well-set advertisements containing any considerable argument. Fine type closely packed together is unattractive, forbidding, and suggestive of hard work. The reader does not want hard work; he wants good easy reading—reading so easy, so attractive, so alluring, that he slides down a page without having intended to read it at all; but once having read it, it matters not what his intention was, the advertiser has got in his deadly work. He has begun to make himself known to that particular reader, has laid the foundation for future intercourse.

Mr. G. Whitaker, of Toronto, has been appointed assistant superintendent of the street railway at London, Ont.

Mr. Chas. E. Schooley has been appointed agent at St. Thomas, Ont., for the London Electrical Construction Company.

The Greenwood Water Power Company, of Greenwood, B.C., has been sustained in its right to the power at Boundary. The Greenwood Company had already expended about $4,000 in constructing a large dam above the falls, when the Cascade Water and Light Company asked for permission to use the power. The commissioner refused to grant the request.

Mr. I. H. Breck, electrician, of Kingston, Ont., has been exhibiting in a store window a small motor and dynamo, with complete electrical attachments. The dynamo is of his own make and contains four feeds, with 16,000 feet of wire in each, and 720 feet of wire in the armature. It will supply four standard lamps or their equivalent, and provides an alternating or direct current. The motor is of two horse power.

WANTED

Second-Hand Constant Current, Shunt-Wound Dynamo, to give about 1000 amperes at 30 volts. State maker's name, lowest price, condition, etc. Address,
THE LAKE SUPERIOR POWER CO.,
Sault Ste. Marie, Ont.

WANTED

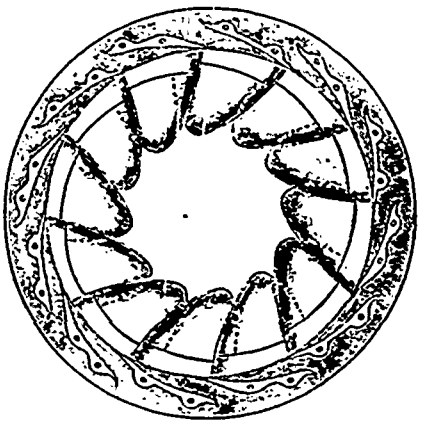
Two Dynamo Tenders experienced in handling Alternating Machinery driven by water power; also two Assistant Dynamo Tenders. Good wages and steady employment to the right men. THE CATARACT POWER COMPANY, of Hamilton, Limited.

FOR SALE

Electric Plant and Business in live western town—a splendid chance for any one to get a good paying business. Satisfactory reasons for selling. For further particulars apply to Box 100, ELECTRICAL NEWS office.

Manufacturers will find it to their advantage to use the columns of the ELECTRICAL NEWS in making announcements.

BARBER'S CANADIAN TURBINE
As an ELECTRICAL DRIVER is giving the Very Best Satisfaction.

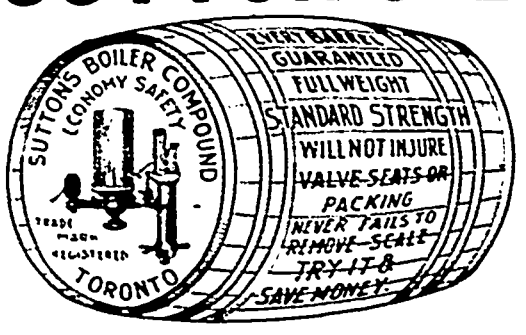


We are now driving Meaford, Thornbury, Markdale, Durham, Parry Sound (repeated order), Hanover (repeated order), Caledonia, Preston and Blair.
Governs Perfectly, Absolute Guarantee, Lowest Prices.
C. BARBER - Meaford, Ont.

TENDERS WANTED
A Weekly Journal of advance information and public works.
The recognized medium for advertisements for "Tenders."
CANADIAN CONTRACT RECORD
TORONTO.

DO YOU KNOW that the STORAGE BATTERY saves you 16 per cent. of cost of operating an Electric Light Plant . . . . . ?
The Croftan Storage Battery Company
can supply you with Batteries of any desired capacity. Their STORAGE BATTERIES are Light, Efficient and Cheap.
Office and Works:
22 Sheppard Street, - TORONTO, ONT.

SUTTON'S BOILER COMPOUND



PREVENTS
Boiler Explosions, Loss of Life and Property.
EVERY BOILER SHOULD BE KEPT FREE FROM SCALE AND CORROSION
SAVES FUEL, TIME AND REPAIRS
The Wm. Sutton Compound Co.
of Toronto, Limited, Consulting Engineers,
206 Queen Street East, TORONTO, CANADA

ALEX. BARRIE & CO.
MANUFACTURERS OF
RUBBER INSULATED ELECTRIC WIRES
and CABLES
Tel. 1074 ✦ 589 St. Paul Street, MONTREAL

TELEPHONES

Send for our Illustrated Catalogue and Price List of

"Unique" Telephones

For Main Line and Warehouse Use.

Only Telephone made that does not get out of adjustment.
Satisfaction Guaranteed.
Sold Outright at Low Prices.
No Exorbitant Royalties.

Sole Manufacturers....
JOHN STARR, SON & CO., Limited.
P.O. Box 448 - HALIFAX, N.S.

If you want to . . . . .
SELL ANYTHING
to the wholesale and retail hardware merchants and manufacturers
ANYWHERE
in Canada, you can reach them through
THE CANADIAN
HARDWARE AND METAL MERCHANT
MONTREAL and TORONTO
Circulates in Every Province.

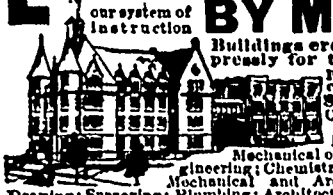
TENDERS WANTED

A Weekly Journal of advance information and public works.
The recognized medium for advertisements for Tenders.

CANADIAN CONTRACT RECORD
TORONTO.

EDUCATION BY MAIL

Thousands have been helped to better pay & positions through our system of instruction



Buildings erected expressly for this purpose at a cost of $225,000
Courses of Steam, Electrical, Mechanical or Civil Engineering; Chemistry; Mining; Mechanical and Architectural Drawing; Surveying; Plumbing; Architecture; Metal Pattern Drafting; Prospecting; Bookkeeping; Shorthand; English Branches.
$2 A MONTH pays for a College Education at Home. 45,000 Students and Graduates.
Circular FREE. State subject you wish to study.
THE INTERNATIONAL CORRESPONDENCE SCHOOLS
Box 1004, Scranton, Pa.

The Packard Electric Co., Limited
MAKERS OF
Lamps and Transformers

SOLE AGENTS FOR. . . .
Ssheeffer Recording Watt Meters
ST. CATHARINES, ONT.

WESTON ELECTRICAL INSTRUMENT CO.
114-120 William Street,
NEWARK, N.J., U.S.A.

WESTON STANDARD PORTABLE
Direct-Reading
VOLTMETERS, MILLIVOLTMETERS,
VOLTAMMETERS, AMMETERS,
MILLIAMMETERS, GROUND DETECTORS AND CIRCUIT TESTERS,
OHMMETERS, PORTABLE GALVANOMETERS

Weston Portable Galvanometer—for Bridge Work.

Our Portable Instruments are recognized as THE STANDARD the world over. Our STATION AMMETERS and VOLTMETERS are unsurpassed in point of extreme accuracy and lowest consumption of energy

An advertisement in the ELECTRICAL NEWS brings prompt returns.

JUST PUBLISHED

THE CANADIAN HAND-BOOK OF STEAM AND ELECTRICITY

By William Thompson

170 Pages Illustrated

In Strong Cloth Binding

THE preparatory chapters are devoted to a concise explanation of the foundation principles of Mathematics, a knowledge of which is absolutely necessary to the study of Electricity and Engineering. In the succeeding chapters the student is led by gradual stages to a more complete acquaintance with these subjects, and is equipped with knowledge to enable him to pursue his researches to any further extent.

Price - 50 Cents

THE
C. H. MORTIMER PUBLISHING CO.
of TORONTO, Limited
TORONTO - CANADA

Ness, McLaren & Bate

SUCCESSORS TO T. W. NESS & CO.

MANUFACTURERS OF TELEPHONES AND ELECTRICAL SUPPLIES.

SOLE AGENTS for the "Milde" Microphone. The best TRANSMITTER in the World

QUEBEC AGENTS for the Easton Dynamos & Motors.

Switch-Boards and Annunciators

FIRE ALARM APPARATUS and TELEGRAPH INSTRUMENTS

Cable Address: "Nessphones," Montreal.

419 St. James St., Cor. Craig, MONTREAL

Telephone No. 1100.

ELECTRICAL SUPPLIES

OF ALL KINDS

Induction Alternators (No Moving Wires) Transformers

Watt Meters, Lamp and Ampere Hour Meters

Wiring Supplies, Etc., Etc.

MUNDERLOH & CO.

61 St. Sulpice Street - MONTREAL

OAK TANNED BELTING

TORONTO
22 FRONT STREET EAST
Telephone 475

THE J. C. McLAREN BELTING CO., MONTREAL

THE OTTAWA PORCELAIN & CARBON CO., Limited. OTTAWA, ONT...

MANUFACTURERS OF

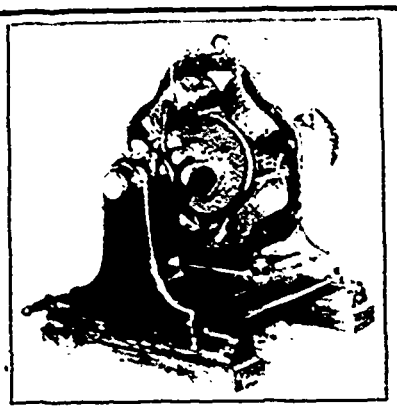
Carbon Points for all kinds of Arc Lamps, including cored and solid carbon for incandescent circuits.

. . ALSO . .

Motor Brushes and Specialties in Carbon for Telegraph, Telephone and Electric Light Supplies . . .

Porcelain Insulators, Cleats, Door Knobs, and all kinds of Pressed Porcelain for Electrical and Hardware Lines . . . .

ALL GOODS GUARANTEED TO GIVE SATISFACTION



The Electrical Construction Co'y

of London, Limited

LONDON, CANADA

Toronto Office: 42 York Street.
Halifax Office: 134 Granville St.
Winnipeg Office: 760 Main St.

MANUFACTURERS OF

ELECTRICAL MACHINERY AND SUPPLIES

Repairs to any system on Short Notice at Reasonable Rates