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CANADIAN
ELECTRICAL NEWS
AND STEAM ENGINEERING JOURNAL

OLD SERIES, VOL. XV.—No. 6.
NEW SERIES, VOL. VIII.—No. 11.

NOVEMBER, 1898

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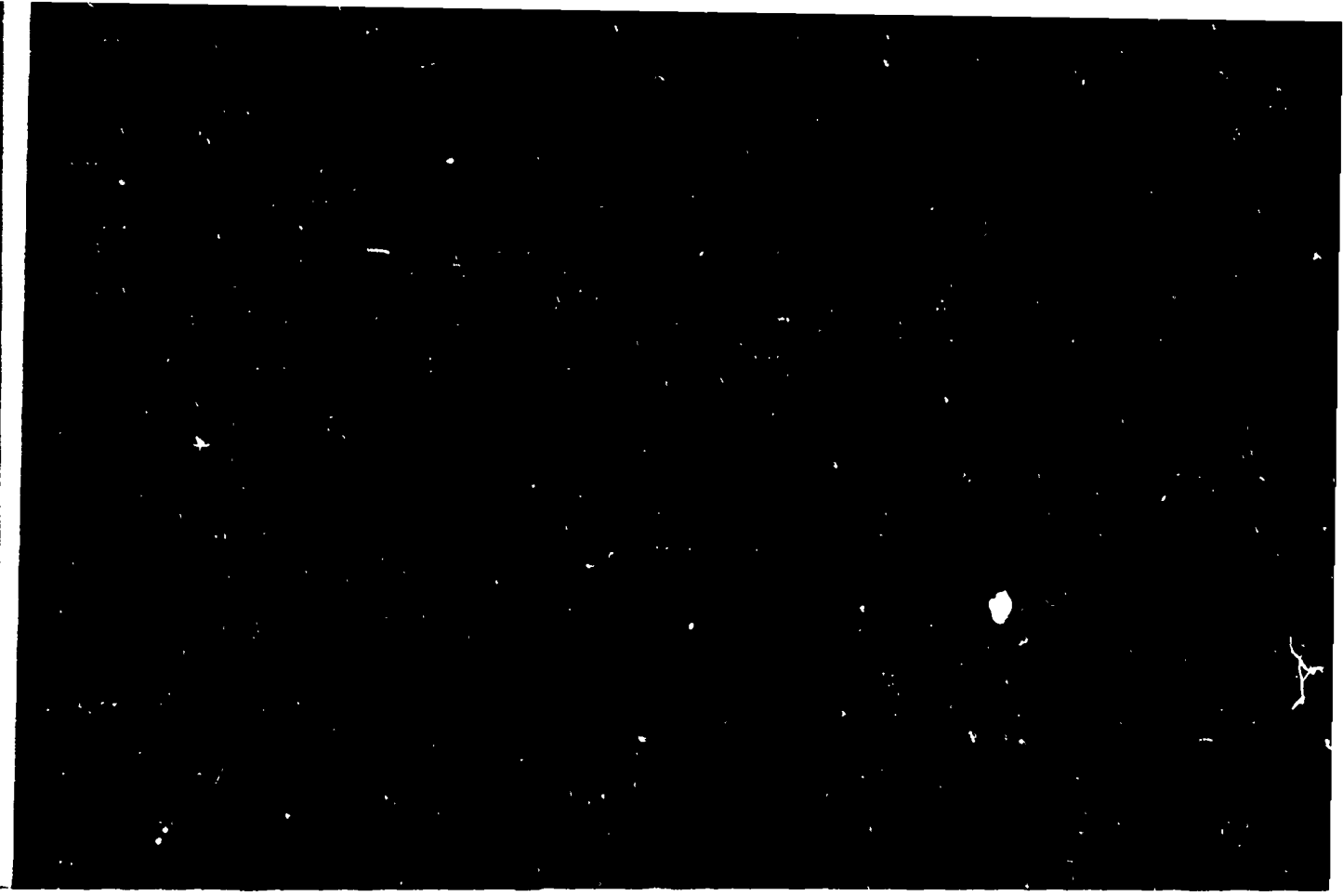


TO THE TRADE:

We desire to announce the Registration under the Canadian laws of the designation "K.W." as the Trade Mark of this Company, No. 28/6630, dated October 3, 1898. All Bryant goods of our manufacture will in future be sold under this Trade Mark. The sale of Electrical Goods, not of our manufacture, under this designation "K.W.", will be an infringement of our Trade Mark rights, and will be prosecuted in the Courts by action for injunction and damages.

THE CANADIAN BRYANT ELECTRIC COMPANY.

No. 301 ST. JAMES ST.,
MONTREAL, QUE.

CANADIAN

ELECTRICAL NEWS

AND

STEAM ENGINEERING JOURNAL.

VOL. VIII. NOVEMBER, 1898 No. 11.

NOVEL MOUNTAIN RAILWAY.

IN the July issue of the World Wide Magazine, published in New York, we find an article on "Mountain Railways," by Mr. Salvatore Pannizzi, who describes and illustrates some of the novel railroads built over precipices and mountains in different parts of the world. One of these, in the Australian Alps, is operated by a balloon, as shown by the accompanying illustration. Concerning this peculiar railway the writer says:

The last mountain railway we have to deal with is, perhaps, the most extraordinary of all, the motive power being not steam, nor electricity, but a balloon! Stranger still, the official stamp of approval has just been put upon this marvellous railroad, which goes to and from the summit of Hochstauffen Mountain at Bad-Reichenhall, the well-known watering place in the Austrian Alps. The Aerostatic Railway — to give it its correct designation—owes its inception to the well-known inventor, Herr Volderauer, who had long ago convinced the experts that his scheme was perfectly feasible and safe. A single rail guides the cars, and keeps the balloon with its load captive, the cars gripping the rail at the sides and underneath the flange. At about every 15 feet the line is firmly anchored. In descending the mountain, of course, gravity is the propelling force, water-ballast being taken aboard at the upper end to counterbalance the buoyancy of the balloon. The cock on the water-tank of the car can be opened by the operator at any time. The tank carries about 800 lbs. of water, and tank and car together weigh about 600 lbs. The balloon is 67 feet in diameter, and exerts a lifting capacity of something over 11,000 lbs. Weights, also, can be taken aboard and discharged at the various stations along the line. At the foot of the track are the gas-tank and generator. The summit of the Hochstauffen offers a sublimely beautiful view; but before the advent of the Aerostatic railway the climb was both long and tedious. It was only attempted by experienced mountaineers. The illustration shows the balloon dragging up its car on the single rail.

NOVEL MOUNTAIN RAILWAY.

THE GAS ENGINE.

In a paper read before the North British Association of Gas Managers, Mr. W. C. Peebles thus spoke of the gas engine: "There can be no doubt that a great deal *has yet to be done to improve* the action of the gas engine. The main direction in which a change must be looked for is, I think, in the *cycle. But this would* seem almost impossible without introducing complicated mechanism. At present—at least with the smaller sizes — the *successful competition of the* gas engine with the steam engine is chiefly due to the convenience and economy with which the gas engine can be operated, *especially for intermittent* work. With engines above 40 or 50 horse power, using producer gas, the cost of working is greatly in favor of the gas engine, as has been proved time after time. We shall find, therefore, that large gas engines will not stop at 400 or 500 horse power, but increase gradually year by year until they compete in power with the largest steam engines made. What the gas engine has done for the benefit of small masters it is impossible to estimate. Many hundreds of these employers were driven out of existence by the introduction of the steam engine. But they are gradually springing up again, and, with the aid of the gas engine, they are able to secure a respectable share of the trade. That the gas engine will rank in the near future as one of the chief sources of power there can be no doubt."

REPORT ON LIGHTING PLANT FOR CITY OF HAMILTON.

A REPORT has been presented to the city council of Hamilton, Ont., by Mr. Percy Domville, on the cost of installing and operating a municipal electric lighting plant. For the purpose of comparison the report is in two divisions: First, description and cost of installing and operating an arc plant for lighting of city streets, with an addition to arc plant for civic incandescent lighting; and second, description and cost of installing and operating an electric incandescent lighting and power plant, for both commercial and civic purposes, in connection with an arc lighting plant.

ARC LIGHTING PLANT.

In describing the proposed arc lighting plant for 500 lights, Mr. Domville states that one 500 horse power tandem compound condensing engine and condensor, capable of supplying power for 550 arc lamps of 2,000 c.p. each, or 650 arc lamps of 1,200 c.p. each, will be required. The necessary boiler capacity is given as 636 h.p., in three units. Two boilers would be sufficient, but he deems it advisable to have one in reserve. Five 125 light self-regulating series arc dynamos, capable of sustaining a steady current of 9.6 amperes, or 2,000 c.p. per lamp, are provided for, leaving one dynamo to spare. With the increase of the number of lights to 700, another dynamo would be required, but in view of the improvements being made, he recommends the postponement of the purchase until such machine is required. Five hundred double carbon arc lamps of the clutch type, each of 2,000 c.p., with globes, cut-outs, etc., fitted for 5/8 carbons, are specified. The lamps are to be divided into nine circuits of 55 lamps each. As to maintenance, Mr. Domville states that by locating the plant adjoining the sewage interception works, the present engineer and fireman could be used, and, with an assistant, would be sufficient to operate both steam plants. With the latest type of compound condensing engines, fitted with economizers, etc., a great saving of fuel could undoubtedly be effected. The amount of coal required is variously estimated from 5 pounds per horse power per hour for a simple non-condensing engine to 1,765 pounds per horse power per hour for a triple compound condensing engine. Taking 4 pounds per horse power per hour as a fair estimate, assuming the efficiency of engines and generators to be 90 per cent., and efficiency of line to average 93 per cent., one pound of coal will, the report states, produce 140.49 watt hours. The estimate provides for four generators running ten hours per day, each 9.6 amperes, 6,250 volts, or a total output of 2,400,000 watt hours per day. Estimating 140.49 watt hours per pound of coal, the amount consumed daily would be 17,083 pounds, or an annual consumption of about 3116 tons.

An addition to the above plant for the purpose of supplying 1000 lights for civic incandescent lighting would, it is stated, necessitate increasing the size of the engine from 500 to 600 horse power, and installing a 50 k.w. alternating dynamo of 1000 light capacity, with exciter and small switchboard. Additional wires, transformers and poles would also be required, and the cost of operation would be slightly higher. The present consumption is 125,000 watt hours. Assuming that one pound of coal will produce 140.49 watt hours, an additional consumption of 888 pounds per day, or 162 tons per annum, is figured upon.

Estimates of the cost of installation and operation of a plant as above are given as follows:

APPROXIMATE COST OF INSTALLING A CIVIC ELECTRIC ARC PLANT OF 500 LIGHTS.

STEAM PLANT—		
One (1) 500 horse power tandem compound condensing engine and condensor, erected and connected ready for operation	$5,000 00	
Three 212 horse power boilers, erected and connected ready for operation	11,550 00	
One boiler feed pump	300 00	
Contingencies	2,000 00	
		$18,850 00
ELECTRIC PLANT—		
Five (5) self regulating series arc lighting dynamos, 125 2,000 c.p. lights capacity, at $2,750	$13,750 00	
One (1) ten circuit switchboard, complete	300 00	
500 double carbon arc lamps, with globes, at $25	12,500 00	
500 lamp hangers, at $5	2,500 00	
50 miles of line No. 6 B. & S. weatherproof wire, at 16 cents per pound	4,000 00	
1,750 cedar poles, with one cross arm, at $3	5,250 00	
Setting same, at $1	1,750 00	
Insulators and pins	150 00	
Erecting wire, $10 per mile	500 00	
		40,700 00
BUILDING, ETC.—		
Building and chimney	$30,000 00	
Belting	830 00	
Pulleys	250 00	
Shafting, etc.	500 00	
Publishing by-law and incidental expenses	1,000 00	
Contingencies	5,000 00	
		37,580 00
Total		$97,130 00

ANNUAL COST OF OPERATING CIVIC ELECTRIC ARC PLANT OF 500 LIGHTS.

Coal, 17,083 lbs. per night, or 3,117 tons per annum, at $2 per ton	$6,234 00	
Carbons, 500 pair per night, at 1½c. per pair	2,737 00	
Oil and waste	300 00	
LABOR. — 1 superintendent and electrician	1,800 00	
1 chief engineer	900 00	
1 assistant engineer	700 00	
1 fireman	600 00	
1 dynamo tender	600 00	
1 lamp repairer and tester	600 00	
3 trimmers, at $500	1,500 00	
2 linemen, at $500	1,000 00	
1 patrolman	500 00	
1 laborer	450 00	
Keep of 4 horses	500 00	
Office expenses, stationery, etc.	600 00	
Depreciation, 5% on $97,130	4,856 50	
Interest on $97,130 at 3½%	3,399 55	
		$27,277 05
Cost of arc light per annum	$54 55	
" " " " night	.1493	

The following is given as the comparative cost of installing and operating 1,200 and 2,000 c.p. lamps for one circuit—60 2,000 c.p. 75 1,200 c.p. lamps:

60 double carbon arc lamps, 2,000 c.p., at $25	$1,500 00	
75 " " " " 1,200 c.p., at $25	1,875 00	
MAINTENANCE—		
Carbons, 2,000 c.p. =	328 50	
Repairs, 2,000 c.p. =	65 00	
		$393 50
Carbons, 1,200 c.p. =	410 62	
Repairs, 1,200 c.p. =	93 75	
		503 37

CIVIC INCANDESCENT PLANT.

Following is the additional cost of installing and operating an electric incandescent lighting plant for civic purposes only 1,000 incandescent lights:

STEAM PLANT—Size of engine increased from 500 h.p. to 600 h.p.	$1,000 00	
Boiler h.p. increased proportionately	1,750 00	
		$ 2,750 00
ELECTRIC PLANT—One 50 k. w. = 1,000 light alternator	2,500 00	
40 transformers, 25 lights, at $32.50	1,300 00	
10 miles of feed wire No. 00 B. & S., at $300 per mile	3,000 00	
Erecting wire	100 00	
Belting and pulleys	100 00	
Cross arms, pins, insulators, etc.	125 00	
Extra poles	150 00	
Setting same	50 00	
		$ 7,325 00
Total		$10,075 00

ADDITIONAL OPERATING EXPENSES.

Coal, 888 lbs. per night, or 162 tons per annum, at $2	$324 00	
Interest on $10,075 at 3½%	352 00	
Lamp renewals, sundry expenses, depreciation, etc	324 00	
		$ 1,000 00

COMMERCIAL LIGHTING AND POWER PLANT.

At the outset, Mr. Domville states that while the original cost of the installation of an incandescent and arc lighting and power plant for commercial purposes would be high, the city would be more than compensated for the same by the receipts from the sale of light and power. The principal addition to the power station would be the duplicating of the steam plant and the introduction of one alternator, one power generator and one arc dynamo, together with the necessary switchboards and connections. The principal outside item would be the cost of wire, transformers and additional poles required. The addition to the cost of operation would be coal, extra carbons, the employment of two men for indoor wiring, depreciation, and interest on bonds.

The cost of installation and operation of an incandescent and arc lighting and power plant of 3000 incandescent and 125 arc lights, for commercial purposes, in connection with the civic arc plant, is estimated as below :

COST OF INSTALLING INCANDESCENT AND ARC LIGHTING AND POWER PLANT FOR COMMERCIAL PURPOSES.

STEAM PLANT—		
One (1) 500 horse power tandem compound condensing engine and condensor erected and connected, ready for operation	$5,000 00	
Two (2) 212 horse power boilers, erected and connected ready for operation	7,700 00	
One boiler feed pump	300 00	
Contingencies	1,000 00	
		$14,000 00
ELECTRIC PLANT, INCANDESCENT—		
One (1) 150 kilowatt = 3,000 lights, alternator complete, with exciter and switchboard	$4,000 00	
Transformers of sufficient capacity for above	3,000 00	
Approximate cost of line wire, about 25 miles	9,000 00	
Extra poles	800 00	
Setting same	150 00	
Erecting wire, $10 per mile	250 00	
Belting and pulley	200 00	
Cross arms, pins, insulators, etc.	291 00	
		$17,691 00
ELECTRIC PLANT, ARC—		
One (1) self regulating series, arc lighting dynamo, 125 2,000 c.p. lights capacity	$2,750 00	
125 single carbon arc lamps with globes, at $15	1,875 00	
10 miles line No. 6 B. & S. weatherproof wire, at 16 cents per lb	800 00	
Insulators and pins	20 00	
Erecting wire, $10 per mile	100 00	
Pulley and belting	80 00	
		$ 5,625 00
ELECTRIC PLANT, POWER—		
One (1) 100 k.w. multipolar generator, complete with switchboard	$3,000 00	
Belting and pulley	200 00	
		3,200 00
Total		$40,516 00

ANNUAL COST OF OPERATING INCANDESCENT AND ARC LIGHTING AND POWER PLANT FOR COMMERCIAL PURPOSES.

Coal, incandescent plant, 3,555 lbs. per night, or 648 tons per year	$1,296 00	
Coal, arc plant, 2,135 lbs. per night, or 389 tons per year	778 00	
Coal, power plant, 7,110 lbs. per night, or 1,066 tons per year	2,132 00	
Carbons, 63 pair per night, 300 nights, at 1½ cents per pair	283 50	
2 men for indoor wiring, at $600	1,200 00	
Interest on $40,516 at 3½%	1,418 00	
Depreciation, 5% on $40,516	2,025 00	
Lamp renewals and sundries	200 00	
		$ 9,332 50

A rather unique application of electricity has been made at Sacramento, Cal. A Westinghouse alternating current induction motor of 2 h.p. capacity is direct connected to a centrifugal pump. The machines are operated from place to place in the operation of pumping wine from one vat to another. Receptacles for electrical connections are provided at convenient points throughout the winery, and the motor connected by means of flexible cable to the circuit of the Central California Electric Company, whose power is generated 30 miles distant. The motor has neither commutator nor brushes, and there is no connection between the revolving part and the electric current.

DEVELOPMENT OF WATER POWERS.

In the province of Quebec three projects to develop water powers for the generation of electricity have of late taken definite shape. The most extensive is at Shawenegan Falls, where it is proposed to utilize the water power of the St. Maurice river, at a point where there is a fall of 169 feet. Messrs. A. F. Gault and Mayor Prefontaine, of Montreal, together with other equally well-known capitalists, are the promoters. Tenders were recently invited for the excavation work, power house, etc., and it is understood that the contract has been awarded to Messrs. Barry, Ross & McRae, of Niagara Falls, Ont. The contract, which will occupy several months in completion, represents an amount between $300,000 and $400,000, but the total development, including machinery, will cost nearly one million dollars. The scheme also includes the building of an electric railway from Shawenegan Falls to Three Rivers, a distance of 19 miles, and the transmission of the power to the latter place.

The contracting firm of Barry, Ross & McRae are also engaged on the hydraulic work of a development scheme at St. Catharine, 16 miles from the city of Quebec. The promoters are chiefly New York capitalists, Mr. E. W. Cooke, of that city, being the general manager. The proposed point of utilization is a fall on Jacques Cartier river at the outlet of Lake St. Joseph. The company will enter the city of Quebec in the same way that the Lachine Rapids Co. entered Montreal. In both cities existing companies thought they had monopolies, but some years ago the Standard Electric Company was incorporated by the legislature with most extraordinary powers. One of them was that it could supply electricity to any plant in the province and make the constructions necessary for such purposes. The Standard charter was absorbed by the Lachine Company, which was thus enabled to defy opposition and enter Montreal. The Lachine Company, or rather the Standard Company, has now sold a similar privilege to the Jacques Cartier Company for the sum of $8,000, and the latter will be able to enter Quebec. The company also intends to utilize part of its power in the manufacture of pulp and paper, and to erect factories on the same scale as those erected by the Laurentide Pulp Company at Grand Mere, on the St. Maurice river.

The Canadian Electric Light Co., of which Mr. Wilson Smith, of Montreal, is president, will undertake the third project to which we refer, the Chaudiere Falls, near Quebec, being the point of development. It is proposed to light the town of Levis, to pump water for it from the St. Lawrence, to generate electric light for the cars of the Intercolonial and other railways at Levis, and to cross its wires into Quebec as well. It is estimated that the falls will give 5,000 horse power.

The Metropolitan Electrical Company of Ottawa, Limited, have made application to the Dominion government for a charter of incorporation. The capital stock of the company is placed at $500,000, and the provisional directors are: Thomas Lindsay, merchant, William Arnold and A. B. Broderick, of Ottawa, and James Robinson and Frederick Cains, of Montreal. It is proposed to engage in a general electric light and power business. The company are taking tenders on the supply of 4,000 poles. They have purchased a water power at Britannia from Mr. J. R. Booth. Mr. John Aylen, hydraulic engineer, has made an estimate of the water power available, which he gives as 40,000 horse power. Mr. Aylen will supervise the rebuilding of the dams, which he hopes to have completed by next spring.

MONTREAL.

(Correspondence of the CANADIAN ELECTRICAL NEWS.)

NEW ELECTRICAL EQUIPMENT AT MCGILL.

THANKS to the munificence of Mr. W. C. McDonald, who recently gave $30,000 for the purpose, the Electrical Department of McGill University is being newly equipped with thoroughly up-to-date electrical apparatus for experimental purposes. The new apparatus, most of which has already been purchased, will comprise the following.

One 100 h.p. high speed single cylinder side crank engine, 200 11 E chloride cells, one m.p. 75 k.w. 125 volt direct current dynamo, one m p. 30 k.w. 500 volt direct current dynamo, one m.p. 40 h.p. 125 volt direct current motor, two m.p. 25 h.p. 125 volt direct current motors, two m.p. 20 h.p. 125 volt direct current motors, two m.p. 15 h.p. 125 volt direct current motors, two m.p. 10 h.p. 125 volt direct current motors (the motors are compound wound, with shunt to series turns t) vary degree of compounding, and with shunt rheostat to vary speed); one 6-pole 25 k.w. 220 volt revolving field A. C. generator, arranged to deliver single, two or three-phase currents, one two-phase 20 k.w. inductor alternator, one single phase 15 k.w. inductor alternator, two single phase induction motors, one 15 k.w. rotary convertor, one capacity set, one 10 h.p. induction motor, arranged to be used either as two or three-phase machine, with secondary provided with collector rings, so that motor can be used as frequency changer, three 3 k.w. potential regulators, two 5 k.w. 2-phase 3-phase transformers, one phase shifter, one 1 k.w. constant current transformer, five current transformers, one special transformer for A. C. ammeter testing, one 2 h p two-phase induction motor, one 200,000 volt testing set, one motor dynamo with double field for battery charging, one motor dynamo with double field for instrument calibration, two small synchronising motors, one electric welding outfit, one electric plating and typing outfit, four electric speed indicators, one laboratory standard volt-meter, one laboratory standard ammeter, one continuous rheostat, one potentiometer, ten standard cells, thirty volt-meters, ammeters and watt-meters, for general laboratory use, thermometers, one photometer and attachments, one conductivity bridge, two standard megohms, one standard condenser, one hysteresis tester, and various fittings and attachments.'

The principal laboratories are: Dynamo laboratory, standardizing laboratory, laboratories for advanced investigation.

A 75 k.w. direct connected unit will be installed in the service plant for current supply, and a 75 k.w. hour storage battery in three sections in battery room, adjoining laboratory. There will be a distributing board for 36 circuits. It has been decided to abolish shafting in the dynamo laboratory; every machine will have a separate motor for driving. None of the machines will be fixed permanently in place, but will be mounted on testing blocks, so that they may be readily moved from place to place, for which purpose the laboratory will be equipped with travelling cranes. The low voltage A. C. machines will supply two and three-phase current. Permanently wired testing tables will be used to facilitate work. The standardizing laboratory contains all instruments necessary for the accurate measurement of electrical and magnetic quantities. The new equipment is expected to be in working order on the re-opening of the school after the New Year vacation, although a longer period will be required to thoroughly complete the work.

Prof. Owens, who has recently been appointed head of this important department, has already shown himself to be possessed of a great deal of energy, and *is setting a high standard for his department, which he will* spare no effort to achieve. He has already arranged for visits of inspection by his students to some of the leading electrical manufactories and installations. A visit of this character was recently made to the Royal Electric Company's works and lighting stations in this city, and another will shortly be paid to the works of the Canadian General Electric Company at Peterborough, Ont. Following this, the power transmission works at Chambly and other important plants will be inspected. Great benefit must accrue to students who are thus brought in contact with the practical application of the science. It is understood to be the purpose to supplement this by a series of lectures during the coming winter by well-known electrical authorities. *It is gratifying to learn that* the attendance of third and fourth year students is double what it has been in former years.

LACHINE RAPIDS HYDRAULIC AND LAND COMPANY.

MR. Wallbank informs me that his company have just received the contract for lighting the city and suburban depots and workshops of the C. P. R., and that during the last month they have made contracts for upwards of 4,000 lights, including the new theatre on Guy street, which will be the first building to be served from an underground conduit connected with the terminals of the transmission line from Lachine.

ELECTRICITY IN COPPER MINING

Experiments are to be made with a view to the introduction of electricity for lighting the copper mines of the Eustis Mining Co. These mines are situated at the town of Eustis, on the Boston and Maine Railroad, about a mile from Capleton, Que. The Eastern Townships Electric Light, Power & Carbide Co., who operate an electric plant at North Hatley, are already supplying light to the houses and other buildings at the mines, and, as stated, the company are negotiating with the company to light the mines also, for which purpose about 200 lights would be required. There is a difficulty in the way, however, which it is hoped may be overcome. In the mining of the copper, sulphuric acid gas is liberated, and its action upon electric wires and other metals is so destructive that unless means can be found for their protection the equipment would be rendered useless in a very short period. An iron smoke stack has had to be replaced by one of clay, owing to the action of the gas. In connection with the proposal to light the mines by electricity, experiments are about to be made with special forms of insulation which it is believed will suffice to protect the conductors.

NOTES.

The machine tools in the new workshops of the Central Quebec Railway, opposite Sherbrooke, Que., are to be operated by direct-connected electric motors.

The Chambly Manufacturing Company's power and light transmission plant is rapidly approaching completion. The generators are in working order, the transmission wires are being strung, and a transformer station is nearing completion at the Royal Electric Company's works on Queen street. The current will here be reduced from 12,000 to 2,000 volts.

Messrs. W. W. Gamwell and Henry E. Hine, president and general manager respectively of the Stanley Electric Manufacturing Co., of Pittsfield, Mass., were in Montreal last week. Accompanied by Mr. W. H. Browne, general manager of the Royal Electric Co., they visited Chambly and inspected the works of the Chambly Manufacturing Co. They afterwards spent a day in Quebec.

The Dominion Cotton Mills Company are now operating one department of their factory by electricity, a 250 h.p. motor being employed for the purpose. It is the intention ultimately to operate the whole of the *works by electric power. Every precaution is being taken against fire,* n view of the combustible nature of the manufacturing material. With this object, towers are being built separate from the main building, in which the motors will be installed. The electrical work is being carried out under the direction of Mr. P. G. Gossler, of the Royal Electric Co.

INSPECTION OF ELECTRICAL WORK IN WINNIPEG.

FOLLOWING is a copy of a by-law recently passed by the city of Winnipeg, Man., providing for the appointment of a city electrician and for the inspection and regulation of electrical apparatus:

INSPECTION AND REGULATION OF ELECTRICAL APPLIANCES.

There shall be an inspector of electrical installation and appliances for the city, who may be called the City Electrician, and until further or other appointment the chief of the fire brigade shall be such City Electrician.

ELECTRIC CURRENT.—No electric current shall be used for illumination, decoration, power or heating, except as hereinafter *provided.*

APPLICATION, CONTENTS, PERMITS.—All persons, firms or corporations desiring to install wires or other apparatus for the use of electric currents for any of the purposes mentioned in the preceding section of this by-law shall, before commencing or doing any electrical construction work of any kind whatever, either in installing new electrical apparatus or repairing apparatus already in use, file an application for a permit therefor with the City Electrician, which application shall describe in detail such material and apparatus as it is desired to use, with a full description of the same, giving the locality by the street and number, and upon receipt of such application, if found proper, such permit shall be given.

DUTIES OF CITY ELECTRICIAN.—The said City Electrician shall then have power, and it shall be his duty when by him deemed necessary, to carefully inspect any such installation previous to and after its completion, and it shall be competent for him to remove any existing obstructions which may prevent a perfect inspection of the current carrying conductors such as laths, plastering, boarding or partitions; and if such installation shall prove to have been constructed in accordance with the rules and requirements of the fire department of the city, and the rules and regulations forming part of this by-law, he shall issue a certificate of such inspection, which shall contain a general description of the installation and the date of such inspection. The use of electric current is hereby declared to be unlawful previous to the issuance

of said certificate, provided however, the City Electrician may issue a temporary permit for the use of electrical current during the course of construction or alteration of buildings, which permit shall expire when the electrical apparatus for such building is fully installed.

PRELIMINARY AND FINAL CERTIFICATE.—A preliminary certificate may be issued by said City Electrician in the case of completed installations, but upon which no current will be used in the immediate future. Such preliminary certificate shall show that at the date of inspection the installation was erected in accordance with the terms of this by-law. Prior to the introduction of electric current into the said premises, a second inspection shall be made, when, if the said installation is still in accordance with the terms of this by-law, a complete and final certificate shall issue. Any owner or owners of property installing electric wires to be hidden from view shall, prior to such installation, give said City Electrician a reasonable notice in order to give ample time for inspection.

POWERS OF CITY ELECTRICIAN—PENALTY.

The said City Electrician is hereby empowered to inspect or reinspect all overhead, underground and interior wires and apparatus conducting electric current for light, heat or power, and when said conductors or apparatus are found to be unsafe to life or property, shall notify the persons, firms or corporations owning, using or operating them to place the same in a safe and secure condition within forty-eight hours. Any person, firm or corporation failing or refusing to repair, change or remove the same within forty-eight hours after the receipt of such notice, shall be liable to a penalty of $50.

POLES, COVERS, WIRES, BRANDED AND TAGGED.—All poles now standing or hereafter erected, and all covers for manholes now in service, or hereafter placed in service for the use of electric conductors, shall be branded or stamped with the name of the person, firm or corporation owning the same; and all electric service entrances shall have attached to the conductor or conductors, in a conspicuous place, a substantial tag designating the owner of, and giving such a full description of the conductors as shall meet with the approval of said City Electrician.

RECORD, ANNUAL REPORT.—It shall be the duty of the said City Electrician to keep records containing a full and accurate account of all inspections made and of all moneys received; he shall annually on or before the first day of February in each year, prepare and present to the city council a report showing the entire work of his department during the previous calendar year; and he shall at the same time send to the comptroller a full and comprehensive statement of all matters pertaining to his department, together with an estimate in detail of the appropriations required by the department during the next municipal year.

ALTERATIONS.—No alterations shall be made in any installation without first notifying the said City Electrician and submitting the same for similar inspection, as above provided.

PENALTY.—Any person or persons who shall use electric current in violation of any of the provisions of this by-law shall be subject to a penalty of fifty dollars. Said City Electrician may for any violation of this by-law order and compel the cutting off and stopping such current until the provisions of this by-law are fully complied with.

The schedule of rules and regulations governing electrical work, as adopted by the Canadian Fire Underwriters Association, is also given as a part of the above by-law.

WIRELESS TRANSMISSION.

"THE Electrical Transmission of Messages without Wires" was the subject of a lecture delivered before the Applied Science Society of McGill University, Montreal, recently by Professor Rutherford, McDonald Professor of Physics, who has done much original research along that line.

The subject, Professor Rutherford said, was still in its infancy, and it would probably be many years before it would be applied to practical use, if, indeed, it ever would be. Dealing with the history of the subject, he said that over twenty years ago Prof. Clark Maxwell pointed out the similitude existing between electrical vibrations and light waves. Prof. Hertz, of Bonn University, however, was the first to actually demonstrate the similarity of the two waves. Until Prof. Hertz's time, electrical waves were known to exist, but had not been detected; he, however, in a wonderful series of experiments, detected these waves, and showed that in their behavior they acted exactly like light waves, except that they had a greater wave length. The lecturer then explained at some length the method used by Hertz to show the presence of these electrical vibrations.

From 1888 to 1894, he went on, much work was done with regard to electrical waves, and upwards of twenty different means of showing their existence were devised. Professor Lodge, in the course of experiments carried on in this direction, discovered that the passage of an electrical current between two knobs caused cohesion, and as a result of this discovery he devised what is known as the coherer, the most delicate means of detecting electrical vibrations.

Professor Rutherford then explained minutely the principle of the coherer, and successfully demonstrated its remarkable action by means of the light spot of a galvanometer. An instrument invented by the lecturer was next explained, in which fine steel wire took the place of the iron filings of the coherer, and acted by demagnetization. This instrument was so small that its entire length was not over one-third of an inch, and its thickness did not exceed that of an ordinary knitting needle. With this he had, in Cambridge, detected electrical vibrations at a distance of half a mile.

The more recent work of Marconi, a student of Bologna, was then dealt with. With the aid of Sir Wm. Preece, of the English post office, Marconi conducted an elaborate series of experiments, all based upon the use of the induction coil and coherer. By means of these he detected and recorded electrical vibrations at distances up to ten miles, and with very minute efficiency up to 20 miles.

By means of a decoherer, such as an electrical hammer, the recording of these vibrations could be used as a telegraphic code, and this is all that has so far been achieved in the matter. In conclusion, Prof. Rutherford dealt with the future possibilities of electrical transmission without wires. He thought that ten miles, the distance achieved by Marconi, was in all probability the limit, as the distance through which the waves can be detected is very much in proportion to the size of apparatus used, and Marconi is now using the largest instrument possible. As there has not, so far, been devised any means of controlling the vibrations, which must be sent out in every direction, messages sent must be, in a measure, public property. It is, nevertheless, possible that a reflector may yet be devised, which will act for the electric wave in the same way that the parabolic mirror does for light waves. In the case of electrical vibration, however, the mirror would have to be carried out on a very much larger scale.

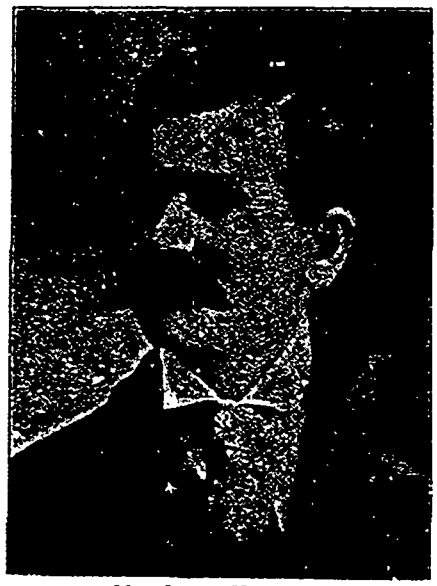
A discussion followed the lecture, and was joined in by some of the professors and students present. During this, the blowing up of the powder magazines of warships by means of an electrical wave was referred to. Professor Rutherford reassured his audience upon this most interesting point, by stating that he did not think it possible that an electric wave could penetrate a properly closed vessel.

A donation of $30,000 is said to have been made recently by Mr. W. C. McDonald to the Department of Electrical Engineering at McGill University, Montreal.

ENGINEERING PLANT IN FREEHOLD LOAN COMPANY'S BUILDING.

One of the largest and most modern office buildings in Canada is that of the Freehold Loan and Savings Company, corner Victoria and Adelaide streets, Toronto, the engineering plant in which is under the superintendence of Mr. James Huggett. A few particulars of this plant, as gleaned from a personal inspection, may be interesting. The building is lighted by electricity, but gas may also be used if necessary. It is said that the wiring of the building for electric lighting cost upwards of $4,000. The elevators are hydraulic, of improved design, and the best that could be purchased, being capable of operating at a speed of 700 feet per minute, but the usual speed is scarcely above 450 feet per minute. The elevators, boilers, pumps, plumbing, steam heating, etc., cost in the neighborhood of $50,000, the Bennett & Wright Company being the contractors for plumbing and steam fitting.

All power is generated on the premises, the boiler capacity being capable of developing 200 horse power. Both water tube and tubular boilers are used. These



Mr. James Huggett.

are so arranged as to heat the building by low pressure, at the same time carrying high pressure for power purposes. The exhaust steam is used for heating the building, and returns are controlled and pumped back to the boilers. There are seven steam pumps, of all sizes, from 22 gallons to 500 gallons capacity per minute, manufactured by the Northey Company, of Toronto; one large compound pump weighing five tons. The capacity of the pumping plant for elevators alone is nearly three-quarters of a million gallons per day. There is an auxiliary pump for elevator service, which is used for heavy lifts. Smaller pumps are provided for other purposes, including an air pump in connection with temperature regulation. The temperature in each room is regulated by what is known as the Johnson electric air pressure controller, having thermostat in each room and diaphragm over each end of radiator to control the valves, which has been found to be a great convenience to tenants. This system is controlled from the boiler room, where electric batteries, air pump, etc., are placed, and in the hands of the present superintendent has been a complete success. All water is filtered by a large filter with a capacity of 200,000 gallons per day, and hot water is supplied to all parts of the building.

The building is heated by steam by direct and indirect radiation, both systems being controlled. The ventilation of the building appears to be first-class, the method adopted being to bring in fresh air and take out foul air by a large fan placed on roof and operated by steam power. Fire protection is also provided by a stand-pipe and branches on each floor, with hose to reach to any part of the building, while a fire brigade, well drilled, reduces the danger of fire to a minimum. The fire system has also been connected with the pressure tank at top of building, so that at any time the large pumps in the basement may be started, thus, in case of fire, providing greater pressure than can be obtained from the city water service.

Mr. James Huggett, the chief engineer, whose portrait we present, has had charge of this plant since it was installed, and, by the aid of his assistants, keeps the building and equipment in first-class condition. Indeed, the general appearance of the building is often favorably commented upon by visitors. Mr. Huggett, for a number of years, has been a member of the Canadian Association of Stationary Engineers, and for some time past chairman of the Trustee Board. For three successive years he has been elected a delegate to the annual convention, showing the esteem in which he is held by his brother engineers. He was born in Chatham, Kent, England, where he obtained his first engineering experience, at the Naval Dock Yard. He has resided in Canada for the past twenty-eight years, during which time he has gained much practical experience. Before coming to Toronto to accept his present position, Mr. Huggett was for fifteen years in the employ of the A. S. Whiting Mfg. Company, of Oshawa. His present duties include the general superintendence of the building as well as of the engineering plant, and he has proved himself to be the right man in the right place.

MOONLIGHT SCHEDULE FOR DECEMBER.

Day of Month.	Light.	Extinguish.	No. of Hours.
	H.M.	H.M.	H.M.
1....	P.M. 5.00	P.M. 9.00	4.00
2....	" 5.00	" 9.40	4.40
3....	" 5.00	" 10.50	5.50
4....	" 5.00	" 11.50	6.50
5....	" 5.00	A.M. 12.50	7.50
6....	" 5.00	" 1.50	8.50
7....	" 5.00	" 3.00	10.00
8....	" 5.00	" 4.00	11.00
9....	" 5.00	" 5.00	12.00
10....	" 5.00	" 6.00	13.00
11....	" 5.00	" 6.20	13.20
12....	" 5.00	" 6.20	13.20
13....	" 5.00	" 6.20	13.20
14....	" 5.00	" 6.20	13.20
15....	" 6.20	" 6.20	12.00
16....	" 7.40	" 6.20	10.40
17 ...	" 8.50	" 6.20	9.30
18....	" 9.50	" 6.20	8.30
19....	" 11.00	" 6.20	7.20
20....	" 11.00	" 6.20	7.10
21....	" 11.40	" 6.20	6.40
22....	" 5.00	" 6.20	13.20
23....	" 5.00	" 6.20	13.20
24....	" 5.00	" 6.20	13.20
25....	No Light.	No Light.	.....
26....	No Light.	No Light.	.....
27....	No Light.	No Light.	.....
28	No Light.	No Light.	.
29....	P.M. 5.10	P.M. 10.00	4.50
30....	" 5.10	" 10.00	4.50
31....	" 5.10	" 10.00	4.50
		Total.....	253.40
		Grand Total...	2208.00

The Canadian General Electric Company have sold an electric plant to the Oxford Mfg. Co., of Oxford, N.S.

MACHINERY BEARINGS.

ANY mechanic will inform you that the common plummer-block should be a little easy at the sides, and that the bearing should receive oil from the top. He seldom knows the reason for this rule, however, and though his ignorance does not prevent his mill shaft bearings running cool, not "knowing why" makes him experience trouble with many bearings not so simply loaded.

John Dewrance, in a paper on the subject, detailed experiments which ought to clear ideas and rectify erroneous practices.

Bearings were clamped upon a shaft so that the load upon its underside was this same clamping pressure, while on the top this was augmented by weight of brasses, clamps and springs.

An oil hole at the top refused entirely entry to oil, which could be given, however, at either side. The bearing—which ran fairly cool—ejected oil under a pressure of 2,300 lbs. per square inch through the upper oil hole. The bearing was then taken out and surface dressed in order to obtain still greater pressures; but when replaced, instead of this great positive ejecting pressure, there was a suction at the upper oil hole measured by a vacuum gauge at thirty nches; the whole still running cool and well. The blocks when taken out showed at first sight no explanation for so great a change in pressure, but close examination made the matter clear. The under side of the top brass at first was not quite flat, the central portion taking all the load; this sprung the brass and ground the central part; so, when replaced under diminished load, there was a vacant space around the oil hole, where formerly had been the greatest pressure.

In any bearing to run cool and well means that a film of oil keeps forcibly apart the sliding pieces. The total pressure on this oil must be the total load. The surface tension of the oil and capillarity alone provide the power the oil has to resist this pressure, therefore the pressure is the greatest where space between the surfaces is least. And since, moreover, oil is carried on by sliding, it follows that to keep up the supply the space must taper to the point of greatest pressure.

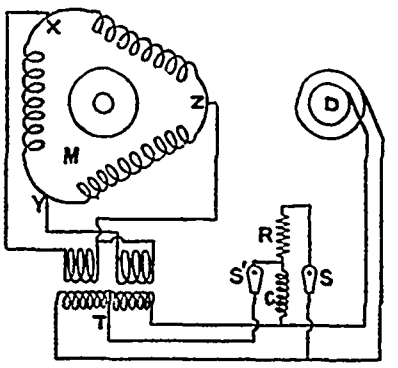
If we lay a flat plate on a well oiled shaft, and gauge the pressure at a hole drilled through it, as we approach the point of nearest contact pressure will rise, to fall again—and fall down below zero as we pass it.

Tapering spaces must then be provided in all our bearings of this class; and oil supplied at that point where the load is least. The series of experiments referred to was first taken up in order to discover whether "brasses" of different metals differed in their capacity for bearing loads without increase or friction. As one might have anticipated, it was found that no such difference existed; so long as a sufficient film of oil remains it matters little—in this connection—what the metals are. Given that they are strong and stiff enough the one great point is that the bearing should be softer than the shaft; for then at times of failure in the oiling the shaft is coated with the scraped-off softer metal, more or less evenly around its surface. But if the shaft should be the softer of the two, its heaped-up scraping will accentuate local unevenness in the bearing.

The main point in the paper is, however, the light thrown on the simple point of oiling. In ordinary mill shaft plummer blocks this is done rightly from the top. At first our railway axle bearings were likewise—but wrongly—fed; that fault was soon detected and set right; but still mechanics' ignorance upon the subject causes much trouble with some engine bearings; and since it is a fact that pressures over one ton per square inch can be endured by properly constructed brasses, while costly troubles are often caused by far less loads, *the question certainly deserves attention until our errors* are set right.

PHASE TRANSFORMERS.

THE usefulness of some simple form of phase transformer enabling single-phase currents to be split up into polyphase currents, and thus permitting the use of a simple conducting system of one wire, would be especially appreciated in the field of railway work, where any attempt to use polyphase currents for power purposes is met at the outset with the difficulty of a double trolley system. In a very valuable paper in Zeitschrift fur Elektrotechnic, Herr Gustav W. Meyer discusses all the forms of phase transformers, with special reference to



this application. An ingenious device for operating a three-phase motor on a single-phase current supply is *illustrated above. The motor, M, has the usual field wind*ing and a three-phase winding on its rotor. The stator is connected as shown to the two ends and the middle point of the secondary of an ordinary split transformer, and in the primary circuit with this is connected a non-inductive resistance, R, and a self-induction coil, C, as shown. By the switches, S and S¹, these can be cut in or out of the circuit. At starting they are cut in, as shown, and produce a sufficient displacement of phase to start the motor. After the motor attains speed the switches are opened, and the reaction of the three-phase winding on the rotor induces a current in the part X Y of the stator winding, the machine continuing to run as a three-phase motor, though supplied with single-phase current. *The American Electrician says that it is* claimed that this method surpasses the rotary phase transformer of Arno and Ferraris, on account of its simplicity and cheapness and absence of moving parts.

RECENT CANADIAN PATENTS.

PATENTS for the following electrical and engineering devices have been granted in Canada: A. F. Hack, Melbourne, Aus., steam boiler furnace arch; American Electric Heater Co., Detroit, Mich., electric heater; M. E. Thompson, Ridgeway, Penn., and Charles L. Cornell, Hamilton, Ohio, dynamo electric machine; Theophilus D. Farrell, London, Eng., electric lamp; Philip H. Patriarche, Toronto, street annunciator for cars; John F. Lister and Wm. S. Chamberlain, Cleveland, Ohio, incandescent lamp; Charles M. Gould, assignee of Wm. F. Richards, Buffalo, electric lighting apparatus for railways; Electrical Vehicle Syndicate, London, Eng., electric carriage safety device; Charles T. Monroe, Silas C. Dishno and Narcisse Deloge, Jackson, Montana, water wheel; O. H. Michaelson, Charleston, U.S., electric lamp; Alex. H. Canning, Toronto, rotary engine; Geo. M. Lane and Elisha Stout, electric arc lamp; John Abell, Toronto, engine cut-off.

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Appointment of City Electricians.

ELECTRICAL companies will welcome the growing disposition on the part of municipal authorities to appoint properly qualified electricians to protect the interests of municipalities in the matter of electric wiring and other electrical work. The municipalities are realizing that this course is, in the end, the most economical, while encouragement is also being given by the electrical companies, who will no longer be called upon to execute unnecessary work, as is often the case when the decision of an incompetent and inexperienced person is allowed to govern work of this description.

Efficiency of Coals.

A REPORT on the steam-making value of coals has been issued by the Boston Mutual Boiler Insurance Company, by which it is shown that a large quantity of stone and dirt is mixed with nearly every variety of coal, thus reducing its efficiency. Tests of samples of coal as delivered by dealers showed proportions of earthy and stony matter varying from one and one-half to forty-six per cent. Taking the principal varieties of coal as burned in the Eastern States, the consulting engineer of the company found that, rating the evaporative power of Cumberland coal at one hundred as the standard, the comparisons were as follows: *Pocahontas coal, 102; Clearfield,* Wyoming, New River and Lykens Valley coal, 97 to 98; Schuylkill, 95; Lehigh, 93; Nova Scotia, 85. The average percentage of ash was: New River, 5½ per cent.; Cumberland and Pocahontas, 7½ per cent.; Clearfield and Nova Scotia, 10 per cent.; other qualities, from 15 to 18 per cent. The anthracite coals were found to be much less clean than the soft coals. Subtracting the ash, so as to compare results for the combustible portion of the coal, there is little difference between the heating power of the various classes, the

Nova Scotia—the lowest on the list—rating only a trifle below Lehigh, and but ten per cent. below Cumberland and Pocahontas, which are the highest. As the cost of shovelling coal into a furnace, and of removing ashes and cinders, is an item of considerable expense in operating a steam plant, it becomes the duty of the manager thereof to give strict attention to the quality of coal burned.

Electrical Water Power Developments.

If indications count for anything, the utilization of water powers for the development of electricity is only in its infancy in Canada. Recent years have witnessed the harnessing, for electrical purposes, of several large water powers, while in some instances skilful engineering has permitted of comparatively small water powers being used, under a high pressure, to develop a considerable output of current. These conditions, so widespread throughout Canada, would, as stated, indicate their future utilization on a large scale. The extent of this development will depend, almost entirely, upon the demand for electricity for light, heat and power purposes. As to the former, there are numerous municipalities which would, without doubt, welcome the advent of electric light, but which are too small to support a private company. This business might be secured, with profit, by a company operating long distance circuits and supplying a number of municipalities. For heating purposes the use of electricity is steadily increasing, but being looked upon as an innovation, we do not anticipate an immediate extensive demand for its use. It is in the direction of furnishing power for manufacturing establishments that we look for the widest field for electrical transmission plants. Canada is becoming more and more of a manufacturing country, and capitalists are being attracted here as a promising field for investment. The number of water power development projects that have already taken definite form is in itself significant. The most important is at Shawenegan Falls, Que., where the water of the St. Maurice river is to be utilized to develop 30,000 horse power to operate pulp mills, saw mills, factories, etc., at Three Rivers and other places. Near the city of Quebec there are two projects to be carried out, on one of which work is now progressing. At Port Arthur, Ont., Mr. E. S. Jenison is negotiating, with good prospects of success, for the development of the water power of the Kakabeka Falls, on the Kaministiquia river, and transmitting the electricity to Port Arthur and Fort William, at an estimated cost of one million dollars. Similar undertakings are contemplated at Grand Falls, N.B., and in British Columbia, all of which bear testimony to the improved conditions now prevailing in Canada.

CANADIAN ELECTRICAL NEWS STUDENTS' COMPETITION.

In pursuance of the preliminary notice published last month, we had hoped to be able to announce in this number full particulars of the competition which the publishers of this journal propose to institute among the electrical students in Canadian colleges. While progress has been made with the details, it has been found impossible to complete all the arrangements, and we must ask readers who may be interested to await the publication of our December number, in which the terms of the competition will be fully explained.

HAMILTON ELECTRIC LIGHTING REPORT.

Particulars of the report of Mr. Percy Domville to the council of the city of Hamilton, as to the cost of lighting the city by a plant to be owned and operated by the corporation, are given elsewhere in this number. The report goes pretty fully into the various items which enter into the determination of these costs, with the result that the citizens of Hamilton are assured of their lighting being done for $54.55 per 2000 c.p. lamp per year for all night running. It may be of interest to refer to some of the salient features of the report. Looking at the figures, we are interested in knowing that one 500 h.p. tandem compound condensing engine, with condenser, is to be used, and can be erected and connected in running order, with foundations complete, for $5,000, and to be of such a superior type, apparently, as to obviate all chances of breakdown, as no allowance is made for another engine to cope with such an emergency. The simplicity and cheapness of this single unit and faith system will appeal to the average station manager whose contract depends upon the ability of his plant to keep the lights running every night and all night.

It will be observed that in the operating expenses the largest item is that for coal, which can be laid down at the furnace doors apparently for two dollars per ton, which it is probably worth, as we are assured that one pound will give 140 watt hours at the lamp, with four pounds consumption per h.p. and with 90 per cent. efficiency in engine and arc dynamos, and 93 per cent. in line. The experienced station manager, accepting the coal consumption given, would figure about as follows: Engine, 90 per cent. efficiency; arc dynamos, 88 per cent. (that being the maximum claim made by the makers); countershaft efficiency, 90 per cent.; belting, 95 per cent.; line, 93 per cent. as before. This gives 118 watts per pound, instead of 140, increasing the coal consumption by 15 per cent. The experienced manager would also make an allowance of about 10 per cent. for banking or starting fires and to cover shrinkage in the coal pile, all of which he has to pay for, thus increasing the coal cost by 25 per cent.

The next largest item is depreciation, at 5 per cent. We welcome this figure as indicating a recognition of the fact that depreciation of a municipal plant does exist, it being frequently omitted altogether in such reports. As no other allowances are made, we infer that this five per cent. is intended to cover repairs, antiquation and possibly insurance, as well as the depreciation due to gradual wearing out. Most authorities would consider that 5 per cent. on buildings, 7 per cent. on steam machinery, and 10 per cent. on electrical apparatus, pole lines, etc., would be a very modest estimate to cover these items, which are placed by Mr. Domville at 5 per cent., and to be safe they would figure interest and depreciation on extra engine in case of trouble. Considering only these three items of cost, coal consumption, depreciation and an extra engine as above indicated, we find that the cost per lamp has gone up from $54.55 to $64.30. We need scarcely enquire further into the costs, the unreliability of the above items indicating what may be expected of the others. We observe, however, that no allowance is made for stock of coal, wire, poles, extra lamps, etc., which must be kept on hand, nor for meters,

transformer erection, and many other items which appear against the capital account of the ordinary station. The solitary dynamo tender provided for in the estimates has our sympathy. He will have on his hands the complete responsibility of the operation of a five hundred light plant. His shift will be 16 hours long during the winter months, for seven days per week, and presumably he will have to spend a portion of the remaining eight hours of the 24 in adjusting and making small repairs to the machines in his charge. We think that services of this kind merit more reward than $600 per year.

Seriously, we hope, for the reputation of all concerned, that the Hamilton authorities will look more carefully into the matter, and not be led to expect impossibilities, even when backed up by nicely arranged figures. This report is typical of that class of statements by means of which municipalities have been induced to undertake responsibilities with which they were not familiar, and frequently with disastrous results. In drawing up a report of this kind, it is comparatively easy to figure the cost of a system ready to run, but it requires a thorough knowledge of operating conditions to predict with any certainty the operating costs, and, as in this case, it is in this respect that many such reports are unreliable. We do not wish to be understood as condemning every case of municipal control off-hand, but we do say that in the majority of cases it has been found to be a mistake. Given the same system under municipal and under private control, and assuming that the management in both cases has the same dividend making efficiency, the former will have an advantage, for whereas the municipal plant is capitalized on money borrowed at 3.5 per cent., the private plant is expected to pay, say, 8 per cent., and the difference of 4.5 per cent. is in favor of the first. Again, a new municpal plant properly engineered and managed, has, by reason of its greater efficiency of operation, a decided advantage over an old and inefficient plant which it is to replace; but old age comes to even the municipal plant, and in ten or fifteen years consigns it to the scrap heap, and depreciation to correspond must be allowed. In any case, the difference in cost of operation will not be so great but that by improper management the positions may be reversed, and municipal management, hampered as it usually is by local politics, is not in the best position to make the most of the above advantages. It is to be hoped that before taking action upon the report the authorities of Hamilton will submit it to competent criticism.

THE OLDEST STEAM ENGINE.

THE oldest engine in the world is in the possession of the Birmingham Canal Navigations in England, and was constructed by Bolton & Watt in the year 1777, the order being entered in the firm's books in that year as a single acting beam engine, with chains at each end of a wood beam, and having the steam cylinder 32 inches in diameter, with a stroke of 8 feet, and erected at the canal company's pumping station at Rolfe street, Smethwick. During the present year this remarkable old engine, which has been regularly at work from the time of its erection to the current year, a period of, say, 120 years, was removed to the canal company's station at Ocker Hill, Tipton, there to be re-erected and preserved as a relic of what can be done by good management when dealing with machinery of undoubted quality. It is worthy of note that the Birmingham Canal Navigations favored Bolton & Watt, in 1777, with the order for this engine, and, in 1898, or 120 years afterward, the company have entrusted the same firm, James Watt & Co., Soho, Smethwick, with the manufacture of two of their modern triple expansion, vertical engines, to be erected at the Walsall pumping station, having 240 horse power and a pumping capacity of 12,713,600 gallons per day.

TRANSMISSION SCHEME AT GRAND VALLEY.

THE opening of a thirteen mile transmission line for electric lighting purposes only between Grand Valley and Arthur, Ontario, marks a new era in electric lighting in Canada. The village of Grand Valley is situated on the Canadian Pacific railway, about 100 miles from Toronto, and has a population of 800 people. The residents of this village desired electric lighting, but the municipality was rather small for the investment to be made for electric lighting only. However, Mr. John Philip, who owns and operates a saw mill at Grand Valley, was enterprising enough to give the people incandescent electric lights. For this purpose he installed in his saw mill an S.K.C. two-phase generator with a capacity of about 750 or 800 incandescent lamps. He found that after supplying the wants of Grand Valley, he still had a capacity to spare on his dynamo, engine and boiler of about 400 lights, and as the electric lighting at Grand Valley was not sufficient to pay him a fair income on the money investsd, he cast about for other means of utilizing the current. He consulted one of the engineers of the Royal Electric Company, who suggested the idea of transmitting the current from one phase of his machine to the village of Arthur, about 13 miles distant, and using the other phase for the lighting of Grand Valley.

When the scheme was mooted and the people of Arthur approached on the subject, they were willing to fall in with the idea, but were very doubtful if the current could be carried that distance; in fact, some electricians laughed at the idea. Nevertheless, Mr. Philip being a sturdy Scotchman, and having confidence in his advisers, undertook the work, and on the evening of October 20th the lights were turned on in the village of Arthur, and have been in operation since that time.

The entire loss in the transmission is said to be less than 5 per cent., and the lights are equally as good in Arthur as they are in Grand Valley, close to the machine. In this way Mr. Philip has converted a non-earning property into one which will in future pay him a handsome sum.

There are many existing plants in Ontario now which could, in the same manner, increase their revenue, and we would commend this installation to their careful consideration. The conception and carrying out of this work is certainly a credit to the Royal Electric Company, and doubly so to the person who was willing to invest his money in an enterprise when he was advised that the scheme was not feasible. He certainly deserves to be classed in the front rank of central station men in Canada.

Rev. Father Quay, of Gracefield, Que., has shipped five tons of amber colored mica to the United States, to be used for electrical purposes.

NOTES ON BELTING.

Tests of Leather, Rubber, Cotton and Other Belts.

By G. R. MacLeod, McGill College, Montreal.

For transmission of power by belting various materials are used. Among the most important are: Leather, rubber and cotton belts.

The material considered most favorable for belting is probably leather. It is very efficient and wears well, but is more expensive than rubber or cotton. In certain situations where it would be exposed to moisture, great heat, etc., its efficiency and durability are reduced.

Another weakness is that it must necessarily consist of short strips of about five feet in length, joined in various ways, which will be noticed later. The belt is therefore subject to failure in as many places as there are joints. Some methods, however, make the joints almost as strong as the solid leather, but the presence of the joint may cause the belt to fail, not from tension, but from a tendency to wear or crack at that point.

The best belts are made from oak-tanned ox-hide, the strongest part of the hide being the back. The belt can be made in long strips by taking a wide disc of leather and cutting it in a spiral direction. The strip thus cut is stretched taut and rubbed to make it straight. From a disc 4 ft. 9 in. wide a strip over 100 feet long of 2 inch belt can be made. If greater width is desired several strips can be sewn together side by side. A double belt of this kind has been used 75 inches wide and over 150 feet long.

The grain or hair side of the leather is put next the pulley. It would appear at first sight as if this were a mistake, since the grain side is the smoother and would therefore give less friction.

Mr. Arthur Archard, of Geneva, in a paper before the Institute of Mechanical Engineers, 1881, says:

"If the belt is wide, a partial vacuum is produced between the belt and the rim of the pulley, by the aid of an adequate velocity which causes the atmospheric pressure to press the belt close against the pulley; an adhesion is thereby produced which is totally independent of friction, and enables the tensions to be considerably reduced." This is very important, because the less the tension on the belt, the less will be the friction on bearings, and, hence, the greater power derived. A wide, thin belt is therefore better than a narrow, thick one, and this is so not only for the reason that it gives less tension on the belt, but because it also gives greater flexibility.

Mr. D. A. Low, in his Machine Designing, also states that the smooth side is the better "because it gives greater driving power," reasoning probably in the same way as Mr. Achard.

Mr. J. Tullis, of Glasgow, however, states that the belt will last longer if the grain side is out, and that coatings of curriers' dubbin and oil will make the flesh side as smooth as the other. All writers seem to agree that the adhesion of the belt to the pulley depends very little, if any, on friction, and that, therefore, a rough surface is more injurious than useful.

Rubber belting is superior to leather in damp places. The part of the belt that gives it strength is not the rubber, but the cotton framework.

It is made by taking a wide strip of cotton duck and folding it into as many plies as desired, with rubber in between, with a thicker coating of rubber on the outer side.

The rubber is in a liquid state when applied to the cotton, and when the belt is finished it consists of a strong, solid, flexible belt, having the appearance of solid rubber. There is almost no limit to the length that can be made in one piece, so that there is only one joint in any piece of belt in use. Even this can be avoided by ordering an endless belt for special cases. The manufactured product is usually very uniform in quality. Extremes of heat and cold have very little effect on it, and it has very little tendency to slip on the pulley. It should be kept free from all animal oils or grease, as these are injurious to the rubber. Rubber belting seems to be especially adapted for such purposes as elevators, for railways, pulp mills, mines, etc.

Cotton, that is cotton without rubber or any other material, makes an excellent belt. In can be made stronger than leather of the same cross-section, and of great length without joints. It is better than leather in moist places, and is less expensive. It was formerly made in the same way as cotton and rubber belting—that is, by laying one ply of cotton duck on top of another till the desired thickness was attained, and then sewing the whole together. The more modern method is to make the whole thickness together at one operation, each ply being interwoven with the one next to it. The process of manufacture is rather complicated, but this does not make the belt expensive.

An improvement on the plain cotton belt is made by soaking it in a mixture of red lead and linseed oil. This process has the same effect as it has in preserving wood. The cotton belt is then more efficient in moist places or in conditions which are found very unfavorable to the use of leather or even rubber. Some modifications of this kind of belt are made by substituting for part of the cotton a woof of hair and other materials. An example of this is the "Camel Brand," tests of which are reported below.

Gutta percha has been used as a substitute for rubber, and has been found to be a good protection to the cotton. A special brand of this, called "Balata Belting," was tested. It is manufactured in England, and has a rather thick coating of gutta percha on the outer side, and thin layers between the layers of cotton, while the side next the pulley is coated with a solution called "Balata."

STRESSES IN BELTS.

Belts are subject to two kinds of stress, viz., tension and bending, but the most serious strain is caused by bending round the pulleys. If the pulleys are small, the only way is to use the most flexible material. This will probably be the cheapest in the long run.

A good rule is given by Lineham in his Mechanical Engineering, viz., the distance from centre to centre of pulleys should not be less than six times the diameter of the larger pulley.

A most important matter is that the edges of the belt should wear well. If the edge is not good it will soon become frayed by contact with the rim of the pulley, and will cause failure of the belt. The best edges that the writer has seen on any belt are on good oak tan leather, and on rubber. The structure of the latter (folding), together with a strong covering of rubber, secures a good, compact edge.

Belts of paper have been made and used in the United States with success. They are very strong and durable if not exposed to moisture, and they stretch very little while at work.

So far nothing has been said with regard to stretch of belts under tension. This will be treated along with the results of the tests.

Creep in belts is due to the belt stretching on the tight side. If the belt stretches easily this is very serious. For every foot of belt that goes on the driver less than a foot goes off and goes on to the follower. If the diameters of the pulleys were equal the driver would make a greater number of revolutions in unit time than the follower would. Hence, if there is much stretch in the belt there is a loss of speed. This loss amounts to 1 per cent. to 3 per cent., depending on the elasticity of the belt; since the tension on the belt is kept as low as possible to prevent too much friction on bearings of the pulleys, the belt that is least extensible at low tensions is the one which is most valuable in this respect.

JOINTS AND FASTENINGS.

Joints form the weak feature of belts, so far as tensile strength and wear are concerned, especially in the case of leather belting. They are of two kinds, (a) permanent, (b) temporary.

Permanent joints take many different forms. In leather belting the most common is the laced joint (Fig. 1.) A lap-joint splice is made and cemented together; then two or three rows of rawhide lacing is put in. The holes for the lacing are not punched, but two sharp cuts are made for each stitch. The cuts should lie diagonally so as to injure the longitudinal fibres as little as possible.

Copper riveting is used as a substitute for lacing, the belt being spliced, as before, and a number of rivets inserted (Fig. 2.) This joint shows a tendency to break across a row of rivets, and is only about two-thirds the strength of the solid belt.

Harris metal plate fastener (Fig. 3) consists of a slightly curved plate, same width as the belt, with a number of spikes. The belt is cut with square ends, and the spikes are driven first through one piece and then the other. As the plate is curved and the spikes are perpendicular to it, they take a good firm grip on the leather. The spikes are clinched after connection.

In Lagrelle's fastener (Fig. 4) the ends of the belt are cut square and bent up. Strips of steel or iron are run through the holes cut for the purpose, each strip having two eyes to hold pins. These pins run through strips at each end, and form a wide link. In fasteners such as this the strain is distributed over the width of the belt, and there is also not the same tendency o cut through in front of the holes as in many other kinds.

TEMPORARY FASTENINGS.

The fastener shown in the accompanying sketch (Fig. 5) consists of a curved strip of iron. The ends of the belt are cut square

and holes are made to receive the fastenings, which are inserted and hammered flat.

Laced Joints. There are many forms of laced joints. The simplest is shown in Fig. 6.

Fig. 7 is the same joint as Fig. 6, but double laced.

Fig. 8 is a double laced joint with only one strand in each hole.

In the joint shown in Fig. 9 the holes are staggered; there is only one strand in each hole, and the strands do not cross on each other.

These are the commonest forms. Fig. 6 has hardly enough lacing; Fig. 7 has twice as much lacing as Fig. 6, but concentrates all the stress on a single row of holes. Joints like Fig. 8 and Fig. 9 give about the greatest possible strength of lacing.

The holes for the lacing are usually round punched. Awl holes are not so good. D. A. Low, Machine Designing, says that the holes should be oval punched, and should have the long diameter parallel to the edges of the belt. And on the face next the pulley the lacing should be as nearly parallel to the edge as possible. It is also better if the lacing does not cross on itself.

Double belting, generally speaking, is not so good as single, since flexibility is what is required. It has been found, however, in certain cases, such as the belt for a return saw, that a double belt wears best, being better able to stand the alternate stretching and buckling.

RELULTS OF TESTS.

Tests of belting were made in McGill College testing laboratory in 1896-7 on the Emery testing machine. When pressure from the accumulator is admitted gradually the diagram curve of extensions is quite smooth and regular, but when the machine is fed rapidly

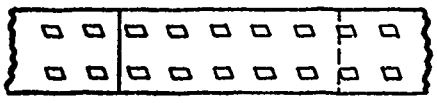

FIG. 1.

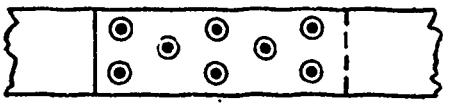

FIG. 2.

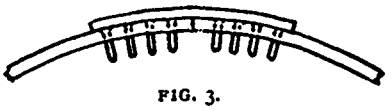

FIG. 3.

FIG. 4.

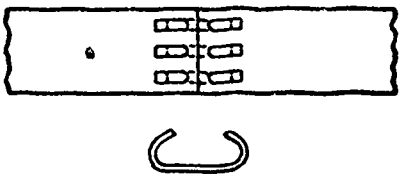

FIG. 5.

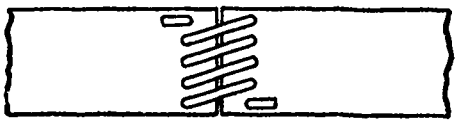

FIG. 6.

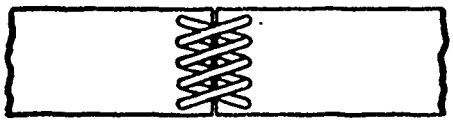

FIG. 7.

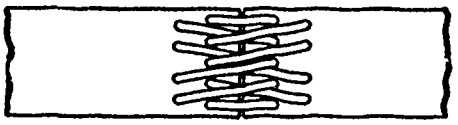

FIG. 8.

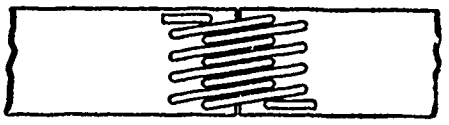

FIG. 9.

the extensions are less; this becomes more noticeable in belt testing. It shows as a sharp change in the curve, but when the feed is again better regulated the curve resumes its former course. In some cases these sharp changes in the curve may be due to lack of uniformity in the material, particularly in the case of belting composed of cotton and hair. Extensions were read at every 200 pounds increase of load, except in some of the larger specimens, where readings were taken every 500 pounds increase.

Leather Belting.—Specimens were procured from a dealer in Montreal.

NO. 1.—ENGLISH OAK TAN LEATHER.

Width, 2 in. Sectional area, .453 square in.
Weight, .213 lb. per lineal foot.
Cost, 23 cents per ft.
Total stretch in 24 in. was 2.15 in. = 9 per cent.
Permanent stretch, 0.2 per cent.
Maximum strength, 2,210 lbs. per square in.

This specimen contained a spliced cemented joint and laced in *the same manner* as first example described under "Joints." It broke straight across the middle of the joint.

No. 2.—(Same belt as No. 1, but without joint.)

Maximum strength, 4,640 lbs. per square in.

This shows that the strength of the joint is about one-half the strength of the solid belt.

NO. 3.—HEMLOCK TAN LEATHER.

Width, 3½ in.
Sectional area, .798 square in.
Weight, .206 lbs. per ft.
Cost, 43 cents per ft.
Total extension was 3.11 in. in 18 in. = 18.3 per cent.

This specimen has a cement splice without lace or rivets. It failed at 3,300 pounds per square inch.

Fracture took place, not in joint, but immediately at its edge.

A solid piece of this belt stood 4,000 pounds per square inch.

An unlaced cemented joint is stronger than a laced one, but lacing is necessary where the belt is exposed to heat or moisture.

RUBBER BELTING.

The specimens tested were manufactured by a Canadian company.

The curve of extensions is almost a straight line with a slight tendency to turn upwards immediately before fracture. This straight line indicates that the extensions are about the same for each increment of load, and hence that the material is very uniform. Another fact that shows the uniformity of the material is that the fracture in each case was clear and straight across the belt. It was not a tear but a break.

The method of measuring the extensions is shown by Fig. 10. Two pencil lines are ruled square across the belt exactly thirty inches apart. A scale graduated to hundreths of an inch is clamped with one end at the lower mark.

A long steel pointer is clamped at the other mark. As the belt stretches this pointer moves along the scale, thus giving the amount of stretch, which can be read in hundredths.

Fig. 11 shows the method of holding the specimen. A piece of steel rod a is placed in the loop of the belt, to take up the pressure from the two rods bb, whose section is a semi-circle; bb are fitted into grooves and are free to move, so that the pressure from them is always directed towards the center of a. A separate piece of belting c is placed between the jaw and the specimen to protect the latter from being cut by the jaws. Four bolts d are used to tighten the jaws. When the belt stretches its thickness is diminished. The bolts are then tightened more to prevent slipping. The jaws are connected to the piston of the ram by a ball and socket joint. They can thus adjust themselves to any unevenness in tension.

SPECIMEN NO. 1.

Width, 4 in. Sectional area, .84 square in.
Weight, .4768 lb. per lineal ft.
Cost, 42 cents per ft.
Broke at 4,170 lbs. per square in.
Total extension in 30 in. = 3.00 in. = 10 per cent.
Permanent extension, 0.13 per cent.

SPECIMEN NO. 2.

Width, 5 in. Sectional area, 1.1 square in.
Weight, .635 lb. per lineal ft.
Cost, 52 cents per ft.
Broke at 4,270 lbs. per square in.
Total extension, 14.9 per cent.
Permanent stretch, 3.0 per cent.

SPECIMEN NO. 3.

Width, 6 in. Section, 1.505 square in.
Weight, .844 lb. per lineal ft.
Cost, 62 cents per ft.
Broke at 3,790 lbs. per square in.
Total stretch, 16.4 per cent.
Permanent stretch, 3.0 per cent.

SPECIMEN NO. 4.

Width, 8 in. Section, 1.92 square in.

Weight, 1.032 lbs. per ft.
Cost, 84 cents per ft.
Broke at 3,700 lbs. per square in.
Total stretch, 17.0 per cent.
Permanent stretch, 1.9 per cent.

SPECIMEN NO. 5.

Width, 10 in.
Weight, 1.1434 lbs. per lineal ft.

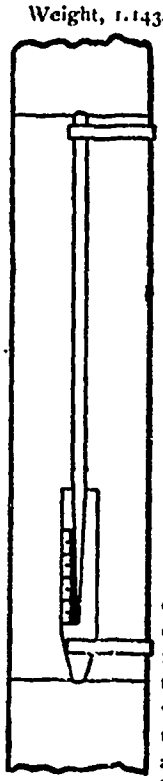

FIG. 10.

Cost, $1.07 per ft.
Maximum load, 3,320 lbs. per square in.
Total stretch, 13.9 per cent.
Permanent stretch, 1.6 per cent.

SPECIMEN NO. 6.

Width, 12 in.
Weight, 1.2806 lbs. per lineal ft.
Cost, $1.30 per ft.
Maximum load, 3,540 lbs. per square in.
Total extension, 14.5 per cent.
Permanent extension, 2.4 per cent.

SPECIMEN NO. 7.

Width, 14 in.
Weight, 1.812 lbs. per ft.
Cost, $1.54 per ft.
Maximum load, 3,620 lbs. per square in.
Total extension, 15.8 per cent.
Permanent extension, 2.0 per cent.

CAMEL BELTING.

This belting is made partly of cotton and partly of coarse camel hair, said to be the combings of camels. The cotton is the material which forms the chief strength, and therefore the longitudinal fibres are cotton. The hair yarn forms a woof, although in some of the specimens tested there were strands of hair running longitudinally as well as transversely. The two materials being interwoven in several plies, the belt is soaked in red paint and allowed to dry. The paint forms a good body coating, which protects the belt from moisture and makes it very durable. To prevent the belt from becoming stiff and hard an occasional coating of castor oil and tallow should be applied; but any resinous mixture is injurious. In making the lace holes a sharp awl should be used instead of a punch, as the latter cuts the threads and thus weakens the belt.

SPECIMEN NO. 1.

Sectional area, 4.35" × 29" = 1.262 square in.
Weight, .5717 lbs. per ft.
Cost, 33 cents per ft.
Total extension, 31.9 per cent.
Permanent extension, 11.6 per cent.
Maximum load, 5,960 lbs. per square inch.

SPECIMEN NO. 2.

Section, 5.07" × .24" = 1.22 square in.
Weight, .599 lb. per ft.
Cost, 39 cents per ft.
Total stretch, 35.1 per cent.
Permanent stretch, 4.45 per cent.
Maximum load, 5,570 lbs. per square in.

SPECIMEN NO. 3.

Section 6.1" × .28" = 1.71 square in.
Double or "Russian Brand."
Weight, .7995 lb. per ft.
Cost, $1.00 per ft.
Total extension, 24.5 per cent.
Permanent extension, 7.1 per cent.
Maximum load, 5,900 lbs. per square in.

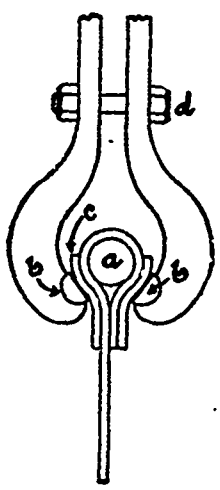

FIG. 11.

SPECIMEN NO. 4.

Section, 5.95" × .22" = 1.31 square in.
Weight, .599 lb. per ft.
Cost, 48 cents per ft.
Total stretch, 27.6 per cent.
Permanent stretch, 12.9 per cent.
Maximum load, 5,650 lbs. per square in.

SPECIMEN NO. 5.

Section, 6.1" × 30" = 1.83 square in.
Weight, .781 lb. per ft.
Cost, 58 cents per ft.
Total stretch, 20.6 per cent.
Maximum load, 5,360 lbs. per square in.

SPECIMEN NO. 6.

Section, 12.20" × .31" = 3.78 square in.
Weight, 1.705 lbs. per ft.
Cost, $1.33 per ft.
Total stretch, 38.0 per cent.
Permanent stretch, 19.3 per cent.
Maximum load, 5,160 lbs. per square in.

A glance at the curves shows that for small loads the extensions are uniform and even have a tendency to decrease until a certain limit is reached. The elastic limit comes much sooner than in rubber and leather, and there is an enormous extension at the ultimate strength.

The ultimate strength is much greater than that of rubber and leather, etc., but the belt would never be used in such high tension.

PATENT "BALATA" BELTING.

This kind of belting already described seems to be very good. It is very strong, and the amount of stretch is small.

The gutta percha is said to bend over small pulleys with more ease than rubber, and it is also claimed it resists heat and moisture better. It has cheapness in its favor, and is likely to become a popular belt. Only one specimen was tested:

Section, 4.45" × .22" = .979 square in.
Weight, .433 lb. per ft.
Cost, 46 cents per ft.
Total stretch, 15.7 per cent.
Permanent stretch, 4.4 per cent.
Maximum load, 5,210 lbs. per square in.
Table showing comparative value of belts:

Kinds of Belts.	Ultimate strength. Per Square In.	Ultimate strength. Per Lb. per Ft.	Total Stretch.	Stretch at 400 Lbs. per Square Inch.	Permanent Set.
Leather.	4,320	12,200	10.5 to 18.3%	1.0%	0.5%
Rubber.....	3,773	7,296	14.6%	2.2%	2.05%
"Camel".....	5,860	12,050	29.6%	2.25%	13.1%
"Balata".....	5,210	11,750	15.7%	1.16%	4.4%

The column "Strength per lb. per ft.," gives a fair idea of the proportionate driving power that can be got out of the same weight of different kinds of belt.

The last two columns show the comparative values with regard to stretch.

PRICES.

Leather.....10 cents per ft. for 1" belt, to $12.00 per ft. for 72"
Rubber.....21 cents per ft. for 2" belt, to $6.72 per ft. for 52"
"Camel".....12 cents per ft. for 2" belt, to $1.33 p r ft. for 12"
"Balata".....21 cents per ft. for 2" belt, to $1.30 per ft. for 12"

The "Camel" belting is by far the strongest, but its stretch is greatest. Where it can be used, the leather is probably the most economical, although it is very expensive in large widths. It is the lightest, and less power is lost by stretch.

The gutta percha comes next for lightness and driving power, and would therefore seem to be the most serviceable belt of all. But it is hardly fair to come to such a conclusion when only one specimen was tested.

The Montreal Cotton Company, of Valleyfield, Que., in addition to the very large increase order placed in August, have given a further order to the Canadian General Electric Company for a 150 h.p. induction motor.

In France two methods of electric traction on canals have been tried. In the one, a special form of electric car is propelled along the towing-path, and is connected to the barge by a rope. In the other, a detachable screw propeller worked direct by an electric motor is used. The current in either case is supplied by an overhead conductor and trolley.

No boiler will give good results unless the circulation is free and rapid. To overcome the difficulty experienced with some kinds, where there is no circulation in some parts of them, ejectors have been used to take the water out of the dead spaces and discharge it into other parts where the water is always in motion so long as there is any fire in the furnace.

Loose crank pins, and how to make them tight, is an interesting theme, and frequently comes up for discussion among engineers. One of the best remedies that I have heard of is to bore holes partly in the pin and partly in the boss of the crank, the holes being parallel to the axis of the pin, then driving in iron bolts that are a perfect fit and rivetting them solidly in place.

IMPROVEMENTS IN THE ARC LAMP.

By Robert A Ross, E. E.

The prominent place which the arc lamp took in the earlier years of electric lighting, involving as it did the designing and operation of the complicated series arc machine, has always excited comment, and the permanency of the types of apparatus then designed is astonishing. From the commercial beginning of arc lighting in the year 1879 up till the present, the direct current series lamp has undergone comparatively little change except in the smaller details. It is true that during the earlier years the questions of open and closed circuit types, of clockwork, clutch and rack feeds were fiercely discussed, but the lamps which have stood the test of time and which are now considered good commercial articles are much as they were when originally designed.

During the first eleven years of its existence the series arc lamp stood alone, in spite of the fact that the need was apparent for other types which would operate on the constant potential lines of direct and alternating systems. The result of the attempts to develop these types has been to produce in 1890 the constant potential direct current arc lamp to operate two in series on the 110 volt incandescent service lines, to give us, about 1892, the alternating current constant potential type, and in 1894 the enclosed type of the direct current arc.

At the present time all of these types are in successful operation, and in addition during the past year the enclosed alternating lamp has attained a thoroughly commercial form. The development of the several arc lighting systems by series, parallel, direct, and alternating current distribution has depended upon the development of suitable lamps alone, and gave us the series direct current system first, because of the simplicity of operation of the series lamp. The reason of this simplicity of operation is not far to seek, if we remember that after the arc is struck the regulating mechanism performs but one function, namely, to regulate the arc voltage, the current regulation being done at the machine regulator. On the other hand, the lamp mechanism for operation between constant potential lines regulates the arc voltage as well as the current, and as a consequence there is going on at all times a struggle between the forces by which these two factors are governed. It is this chiefly which necessitates the placing of a resistance in series with these lamps to prevent pumping. This trouble is not so apparent in the alternating type with which a choke or economy coil is used, as in addition to the resistance of the coil the inductance is of effect to dam back excessive current rushes. Another feature which long held the lamp for parallel operation in the background was the fact that the art of carbon-making had not advanced sufficiently to admit of the commercial manufacture of the high grades necessary for its successful operation. On the other hand, the force which has been of greatest effect in developing the constant potential type was the necessity which existed for the use of arc lamps on the incandescent service lines and the consequent uniformity and simplicity of the line and station equipment. The advantages attendant upon the use of the constant potential lamp have at the present practically banished the series arc from the field of interior lighting, and in many new plants are leaving no place for it even in what has been considered its own peculiar field, that of street lighting.

The question whether the series arc will retain its supremacy for outside illumination will depend largely upon whether machines capable of being direct connected or at least belted direct to fair sized engines can be built and operated. There seems to be a fair prospect of this, if we are to judge by the results of the past four or five years, within which time the limit of size has passed from about sixty to three times that number of lamps per machine. It is evident, however, that the limitations of safety will prevent the grouping of any such large number as might be desirable for other reasons on a simple series loop, and will force the adoption of systems of return loops as in the Brush machine, where several circuits are run from the same machine, and the line to line potential on each circuit correspondingly reduced, or by some other series parallel grouping of circuits which will give the effect of keeping down excessive line voltages while admitting of the use of large units in the station.

The advantages which the series system possesses for the distribution and control of light over large areas when coupled with the equally evident advantage of the use of alternating current generators, which are the standard type for most stations, have long been recognized, and some fairly successful attempts have been made to use alternating current lamps on series alternating circuits taken either from the constant potential bus bars of the station which feed the incandescent service primaries, or from the same bus bars through a self regulating transformer, which gives a constant current through the lamps placed in series on the circuit. As to the operation of these circuits there appears to be no great difficulty, and were it not for the fact that the light distribution from the alternating lamp is poor, and the cost of the superior carbons, which are necessarily so high, there is no apparent reason why this system should not displace the direct current series system with its separate and special generating units, thus permitting the distribution of incandescent and arc lighting from the same generators and the separate control of the arc lights as on the direct current series system at present in use. There appears to be a large field for this system in spite of the disadvantages mentioned above.

The development of the enclosed arc lamp has been a curious example of the effect of preconceived ideas in holding back much needed inventions. As early as 1846, Staite, recognizing the need for the enclosed arc with its long burning advantages, undertook its development, but without success, as were the efforts of others up till about 1894, when the lamp became a commercial success. The chief reason for the failures up to that time was that the endeavor had been to produce an arc similar to that in the open series lamp, which in the light of later knowledge was a mistake.

The open lamp has a normal arc of 45 volts, while the enclosed works to best advantage at about 80, the arc at the higher potential being much more stable and giving a better distribution of the light than at the lower voltage at which most of the experiments up till 1894 had been made. In addition to this misconception of the value of the long arc which enclosure made possible, the difficulty of obtaining enclosing globes which would withstand the heat, and the commercial impossibility of obtaining pure carbons which would not darken the globe, delayed seriously the appearance of the enclosed arc. These difficulties overcome, the increased voltage of the arc which in the series system is a disadvantage, were seen to be of decided advantage, as it enabled the lamp to be operated and controlled singly from the constant potential 110 volt lines from which the incandescent lighting was wired instead of two in series across the lines as the practice was with the open arc.

In comparing the relative advantages of open and enclosed arc lamps we find as follows:

1. That the enclosed type will burn for from 100 to 150 hours with one recarboning, as compared with 8 hours for single open lamps; the cost of the carboning and trimming being reduced in proportion.

2. For operation on constant potential circuits the ability to operate one enclosed as compared with two open lamps across the mains is a very evident advantage.

3. No dust, sparks or hissing from the enclosed lamp.

4. Simpler mechanism, and better regulation due to the longer arc, and less flickering in the enclosed type, as it feeds but one-fifteenth to one-twentieth as often as the open arc.

5. As compared with the series circuit open arc, the enclosed constant potential lamp operates on a low and very safe voltage, and may be handled and operated precisely as an incandescent lamp, thus making it especially suitable for interior illumination.

These are all advantages on the side of the enclosed type, but against this we must balance the decreased light giving power per watt of consumption due to the use of the opaline or ground enclosing globes which are necessary for the proper diffusion of the light, and the loss of light due to the smutting of the globes with carbon dust, which becomes a serious matter after about 100 hours of running; also there is the extra cleaning of the enclosing globe and the maintenance of same.

For interior illumination, however, where a ground globe is a necessity for proper diffusion in both cases, the open and closed types are on an equality so far as light giving efficiency is concerned.

It appears, therefore, that for all purposes of interior illumination and in many cases of outside lighting, the enclosed arc has decidedly the advantage, and the records in the larger cities of the United States show that these advantages have been recognized, and for most of the new installations of arc lamps the enclosed has been selected as the most suitable.

For the purpose of showing the different light giving efficiencies of the various types of lamps, as well as to place in accessible form the usual voltages and amperes in use in their respective arcs, the following table has been figured on the basis of 450 watts consumption at the arc in each case, that being the standard usually adopted. To complete the combinations all of the probable systems are considered, although several are not much used as yet, but the figures indicate what may be expected when they are adopted as the lamps are developed for all of them.

LIGHT GIVING EFFICIENCIES OF DIFFERENT ARC LIGHT SYSTEMS.

	Amperes	Volts in		Watts in		Candle power.		Watts per C.P.		C.P. per H.P.	
		Arc.	Line.	Arc.	Line.	Outside.	Inside.	Outside.	Inside.	Outside.	Inside.
	1	2	3	4	5	6	7	8	9	10	12
DIRECT CURRENT.											
Series Open	10	45	50	450	500	650	450	.7	1.0	750	520
Series Enclosed	6.5	70	75	450	500	375	450	1.2	1.0	440	520
Constant Potential Open.	10	45	55	450	550	650	450	.7	1.0	750	520
Constant Potential Enclosed	5.6	80	104	450	580	375	450	1.2	1.0	440	520
ALTERNATING CURRENT.											
Series Open	15	30	33	450	500	375	300	1.2	1.5	470	370
Series Enclosed	6.5	70	75	450	500	225	300	2.0	1.5	285	370
Constant Potential Open.	15	30	33	450	500	375	300	1.2	1.5	470	370
Constant Potential Enclosed.	6.5	70	75	450	500	225	300	2.0	1.5	285	370

Columns 1 and 2 give the volts and amperes at the arc; column 3 the voltage in the line or at the terminals of the transforming device,

which is necessary for their commercial operation. Column 5 gives the consumption in watts at the terminals of the lamp. Column 6 gives the mean illumination of horizontal surfaces or the useful illumination from the lower hemisphere of the lamp, allowing for the absorption of light of 10% in the clear globes of the open lamp, and 40% in the opaline globes which are necessary for the enclosed type. If opaline or ground globes be used for all types as should be done in the illumination of interiors, the useful candle power is given in column 7, in which due allowance has been made for the effect of the upper hemisphere of light, of which it has been considered that 50% of that passing above the horizontal lines is reflected from walls and ceilings and becomes useful. These figures have been obtained from a consideration of a number of tests which vary widely, and can be considered as being as nearly as possible an approximation to average conditions. Columns 8 and 9 give the average watts at the arc per useful candle power figured from columns 6, 7 and 4, and indicate the probable consumption of energy in the arc per useful candle power for inside, and for outside lighting with the several systems. Columns 10 and 11 are figured from columns 8 and 9 and indicate the useful candle powers which may be expected per belt horse power in the station, allowing for fair average commercial efficiencies of generators, lines, transformers, choke coils, etc. The figures in column 10 indicate that for out-door illumination, where clear globes are used on the open lamps, and opaline on the enclosed types to give a proper distribution the useful light giving efficiency of the direct current enclosed type is 60 per cent., of the alternating current open type 70 per cent., and of the alternating current enclosed type 40 per cent., of the direct current series arc per unit of energy in the station at the dynamo pulley. Column 11 indicates that for interior illumination where opaline globes are used on all types to get proper dispersion, the direct current lamps on all systems are on a par, and the alternating lamp efficiency in all cases about 70 per cent. of the direct. In considering these results it must be remembered that the series machine is much less efficient than the constant potential machine, which makes up for the smaller efficiency of the lamps on that system, and that the alternating arcs have a large light giving area above the horizontal which is considered as partially useful in columns 7 and 11 for inside lighting, but is considered as wasted for out-door illumination in columns 6 and 10. The direct current type, owing to the shape of the positive carbon, throws its light mainly downwards, and the upper hemisphere of light plays little part in interior illumination.

From the above considerations it appears that for outside illumination the series open arc will hold its own where the question of the simplification of the plant by doing away with the arc machines is not given first place. For interior lighting on the other hand, the enclosed direct current, or the alternating lamp of either open or closed types, will certainly displace the series arc, and will broaden that field largely and displace many incandescent lamps in large interiors. For this purpose arc lamps of small candle powers which are now offering will find a place. It must be remembered, however, that the candle power per watt of consumption for these smaller lamps decreases quite rapidly as the current consumption is lowered.

SPECIMEN OF MUNICIPAL TACTICS.

To the Editor of the CANADIAN ELECTRICAL NEWS:

SIR,—Knowing that you are a great admirer of nerve, I send you the enclosed, received from the clerk of the Water and Light Department of a city in the maritime province where there is apparently a municipal plant. For a concentrated essence of the above commodity this breaks the record. It is not enough that the municipalities want to confiscate our business without compensation, but expect us to find them with brains enough to run the thing to boot.

If the town has not a man in its employ who knows enough to give this information, it ought to have, and should get one right away. If they cannot afford to pay for one (which seems likely), they have no right to be in the business at all. Such information can only be had by years of costly experience, and is worth money. If the municipality is determined to have such a luxury as a civic electric plant, they should be willing to pay the piper for the music they want to dance to.

Yours truly,

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[COPY.]

CITY OF MONCTON, N. B.,
Water and Light Department, OCTOBER 20, 1898.

TO THE MANAGER

DEAR SIR,—We have been considering the advisability of making some changes in our electric light plant, and wish to get the opinion of competent men on the following points:

Which do you consider, high or slow speed engines, the most economical for steam plant? What are you using in your station? Name maker and style of engine used.

What is your average consumption of coal per horse power hour? What is your consumption of oil in proportion to horse power?

What do you consider the best and most modern arc dynamo on the market? Also the best incandescent alternating dynamo?

What do you figure the net cost per incandescent lamp per night (all night)? Also to 12 o'clock?

What type transformer do you consider the best?

What type of transformer do you use?

What does your coal cost? What kind do you use?

What does your oil cost per gallon—cylinder, engine and dynamo?

What do you charge per incandescent light per night?

What are your meter rates per 1,000 watts?

What do you charge per commercial arc light per night?

What do you charge per street arc light per night?

We are at present supplying about 1,000 incandescent lights, 53 street arc lights, and 40 commercial arc lights.

Average run summer months 10 hours, winter 16 hours.

Our incandescent circuit is about 10 miles, our arc circuit about 14 miles.

We would like your opinion as to the number of men required, including electrician, to operate a plant of this capacity. The latter question would not include our engineer and manager, or accountant.

You will understand that we have the water and gas as well under our management.

The above staff to make all extensions to circuits, all repairs, installations, etc.

We would thank you if you can answer the above at an early date; trusting it may come in our way some day to return the compliment.

Yours sincerely,

CITY OF MONCTON,
Per M. L.

ENGINEERING NOTES.

INSPECTING BELT LACING.—A good practice is to draw in extra pieces of lacing over the regular strips, and then have a board in close proximity to the belt as it runs. The result is that the outside pieces, which are not intended to hold any of the stress, catch all of the wear, and as soon as a piece is worn in two the centrifugal force due to its motion causes it to strike the board and attract attention. It is not at all necessary to shut down when this warning note is heard, for no one will know it to be but the outer part, but it should be attended to the next time that the engine is shut down. The adoption of this plan will save delays in many places where they are now considered a necessary evil.

OLIVE OIL.—There is no question but olive is the best oil to be used for many purposes in both mill and shop; its advantages over other kinds are that it softens, and even after a year or more does not become stiff and hard, and the oil remains fresh and sweet in it. It is very difficult to detect adulteration in oil, and as olive oil is mixed to a large extent with cotton seed oil, it behooves the purchaser to be very careful what he is doing, or some smart "drummer" will sell him a few barrels of cottonseed oil with a little olive mixed in for the best pure olive oil. The following is a good test for oil: Take a portion of the oil and stir it up with forty parts of a solution of carbonate of soda of three degrees of Baume. If the oil forms a milky emulsion, without any oil drops on the surface, it is a guarantee for a good greasing of the object to which it is applied.

BOILER CLEANERS.—A correspondent of the Scientific Machinist, on the advice of a brother engineer, took a good sized stick of cordwood (oak), put it in the boiler and screwed it to the brace so that it could not get fast between the flue and the shell when the water was low. After a week's run he found a great deal of scale had come off the sides, and a lot more was loose that was easily knocked off. At the end of the third week the scale was loose on the flues and easily knocked off. By continuing to use oak wood and to clean out once a week, in a remarkably short time he had the boiler free from scale. The difference in firing alone was no small matter. It is best, he says, to clean every week when using the wood, as it does not reduce the scale to a mud. Blowing off causes it to gather around the blow-off, which, if left too long, is apt to burn the shell, owing to its keeping the water from the shell.

BUSINESS IS BUSINESS.

"The man who whispers down a well
About the goods he has to sell,
Won't reap the gleaming golden dollars
Like one who climbs a tree and hollers."

W. Miller, of Glen Miller, Ont., is installing a new electric plant for his paper mills, and has purchased a 150 light machine from the Canadian General Electric Company.

The Robb Engineering Co., of Amherst, N.S., have established an agency at Winnipeg, Man. Their representative, Mr. John Carroll, recently made a trip through British Columbia and the west.

SPARKS.

Madill Bros., of Lakefield, are offering their electric plant for sale.

The city of Victoria, B.C., will likely appoint an inspector of electric wiring.

During the coming winter the Ottawa Electric Railway Company will build a large number of open street cars.

The directors of the St. Thomas Street Railway Company are considering the extension of their road to Port Stanley.

The town of Owen Sound, Ont., invites tenders up to 15th inst. for the construction of a fire alarm telegraph system.

Negotiations are under way for the construction of a telephone line from Hickson to Tavistock, Ont., a distance of six miles.

Messrs. Munderloh & Co., of Montreal, recently ordered from the Canadian General Electric Company a 6 kilowatt incandescent dynamo.

Messrs. Barber Bros., of Georgetown, recently ordered from the Canadian General Electric Company a six kilowatt 500 volt motor.

Some of the citizens of Ste Genevieve and Point Claire, Que., are considering the advisability of constructing an electric railway connecting the two places.

Mr. Roderick J. Parke, E.E., of Toronto, is preparing an estimate of the cost of installing a municipal electric light plant for the town of Pembroke, Ont.

A by-law to provide the sum of $6,000 by the issue of debentures for the purchase of an electric light plant has been sanctioned by the ratepayers of Acton, Ont.

Messrs. Geo. White & Sons Co., Limited, of London, Ont., are at present engaged in erecting a new boiler shop, 70 x 70 feet, to meet the increased demands of their business.

The corporation of the city of New Westminster have ordered from the Canadian General Electric Company a 100 light incandescent dynamo and a six h.p. 500 volt motor.

The London Electric Company have just placed an order with the Canadian General Electric Company for two of their standard No. 12 125 light multi-circuit Brush arc dynamos.

James Richardson & Son have ordered from the Electrical Construction Company of London, Limited, a forty horse power multipolar motor, to operate G. T. R. elevator No. 2.

Mr. J. H. Head, of Hagarsville, Ont, has recently ordered from the Canadian General Electric Company a very compact lighting plant. The generator will have a capacity of 50 lights.

The Bells Asbestos Company, of Thedford Mines, P. Q., have ordered from the Canadian General Electric Company a 100 light dynamo, to be installed at their premises, Thedford Mines.

The British Columbia Sugar Refinery Company, of Vancouver, have recently ordered from the Canadian General Electric Company a 25 kilowatt generator of the well-known multipolar type.

The Peterboro and Ashburnham street railway was sold recently to Mr. Arthur Stevenson, for $20,000. It is understood that Mr. Stevenson acted for some of the stockholders of the existing company.

The provincial asylum at Fairville, N.B., have placed an order with the Canadian General Electric Company for a six kilowatt motor and one 8½ kilowatt motor, of the well-known Edison bipolar type.

Messrs. Krug Brothers, of Chesley, Ont., have recently given an order to the Electrical Construction Co. of London, Limited, for a lighting plant, including a 150 light multipolar dynamo for incandescent lighting.

Mr. W. J. Camp, electrician for the C. P. R., is at present in Winnipeg, supervising the installation of the plant in the new offices of the company in that city. This plant, when completed, will be modern in every respect.

Mr. John Galt, C.E. and M.E., of Toronto, is designing an electric light plant for the town of Prescott, Ont. Commissioners will be appointed at the forthcoming January elections to arrange for the installation of the plant.

The Dundas Electric Company, Limited, of Dundas, Ont., have obtained a provincial charter, to supply light and power. The capital is $40,000, and among the promoters are Messrs. John Bertram, G. H. Harper and E B. Harper, all of Dundas.

The Fire, Water and Light Committee of the city council of Winnipeg, Man., are considering the question of submitting a by-law to the ratepayers to provide funds for the purchase of an electric light plant for lighting the streets and municipal buildings.

The directors of the Victoria Industrial School, Mimico, Ont., have decided to install an electric plant for the lighting of the various buildings, and to carry out this work have purchased a 300 light plant from the Canadian General Electric Company.

The Iron Mask Gold Mining Co., of Rossland, B. C., have decided to operate their hoisting, drilling and carrying apparatus by electricity, and for this purpose have placed with the Royal Electric Company at Montreal, an order for 100 k.w. S.K.C. synchronous motor.

The Linde British Refrigeration Company, of Montreal, have recently ordered from the Canadian General Electric Company a 15 h.p. three phase induction motor. The power will be supplied to this induction motor from the circuits of the Lachine Rapids Hydraulic and Land Company.

Montreal shippers have complained to the Department of Agriculture at Ottawa respecting damage occasioned to perishable articles of export, owing to lack of proper ventilation on some of the steamships. It is understood that about fifteen of the ocean-going steamers sailing from Montreal will be fitted this fall with electric apparatus for ventilation.

The employees of electrical companies in Toronto have organized a union, under the name of the Brotherhood of Electric Workers of Canada, in affiliation with the Trades and Labor Council. Mr. Thomas Eaton is president and Mr. F. Marson secretary.

Messrs. Wm. Jensen and Lawrence Goodacre, of Victoria, B.C., are endeavoring to form the Hardy Bay Tramway Company, Limited, to build a tramway from Hardy Bay to Coal Bay, Quatsino Sound. Should the scheme be carried out it is probable that electricity will be the motive power.

The City Council of St. Thomas, Ont., has instructed Mr. James A. Bell, city engineer, to make an estimate of the cost of a civic lighting plant of 100 arc lights for street purposes, and 3,000 incandescent lights for commercial purposes, the plant to be erected separate from the water works.

The War Eagle Consolidated Gold Mining Company, of Rossland, B.C., have ordered from the Canadian General Electric Company two 2 h.p. induction motors and one 10 h.p. induction motor. The power to operate these induction motors is to be furnished by the West Kootenay Power & Light Company.

The Stouffville Electric Light Co., of Stouffville, Ont., are making changes in their electric lighting station, among them being a new dynamo, with a capacity of about 500 lights. They are putting in an S.K.C. two phase machine from the works of the Royal Electric Company, so that they can supply power as well as light.

The People's Electric Company, of Windsor, Ont., owing to the very large and satisfactory increase in their lighting business, have recently placed an order with the Canadian General Electric Company to supply them with one of their 2,000 light iron-clad ventilated armature type single phase alternators.

The town of Campbellton, N.B., are installing a civic electric lighting plant. They are putting in Robb-Armstrong high-speed engines, with Monarch boilers, and one 60 kilowatt S.K.C. two phase dynamo, with the full capacity of the machine in transformers. They intend to use this S.K.C. machine for the supplying of arc lamps for the streets and incandescent lights for interior lighting, as well as for power in the daytime.

Mr. H. D. Symmes, of St. Catharines, has secured the contract from the corporation of Merritton for the lighting of their streets with 20 arc lamps. Mr. Symmes has also decided to undertake the operation of a commercial lighting plant, and for his requirements for this purpose has purchased from the Canadian General Electric Company one of their 1000 light, standard single-phase alternators. He proposes operating a street lighting service from the alternating system, using 2,000 c.p. enclosed alternating arc lamps. These lamps he has also purchased from the Canadian General Electric Company.

The British Columbia Gazette announces the incorporation of the Rossland Air Supply Company, with a capital of $200,000, the object being to develop water powers under what is known as the Taylor hydraulic system of air compression. The company will first develop its power on Beaver Creek, it being proposed to transmit 2,000 horse power to the Le Roi mine, a distance of ten miles. The initial pressure will be 135 pounds, and the air will be transmitted through a 14" wrought iron pipe. The cost of the plant is estimated at $150,000. Mr. A. J. McMillan, of Rossland, and Mr. D. J. Fitzgerald, of Trail, B.C., are interested.

An important change has been made in the course of lectures on "Steam and the Steam Engine" at the Toronto Technical School. This consists of dividing the subject into two parts, so that as well as the lectures on "the theory of heat engines or thermodynamics" others will be given of a practical nature, dealing with "the indicator, valves and valve motions, efficiency of engines and boilers, gas engines, etc." Mr. Harris P. Elliott, B.A.S.C., who has charge of this course, has had considerable experience in the actual design and construction of engines, and it is hoped that in this way it can be made interesting to mechanics and others who are not qualified to take the theoretical work.

Steam users throughout Canada and the United States now recognize the fact that the steam boiler is the source of energy of their factory, and its proper care is their aim. Not only do they give attention to external fixtures, but thoroughly investigate the interior, as experience has shown that corrosion, pitting and scaling cause expensive repairs, large fuel bills, and sometimes loss of life and property. It is not surprising, therefore, that the Wm. Sutton Compound Co., of Toronto, report many enquiries for their boiler compound. They state that they have been compelled to increase their staff and plant on different occasions, and that the compound is meeting with success from the Atlantic to the Pacific. It is a reliable preventive for scale and corrosion, and is claimed to be the only pure vegetable compound free from acid, caustic soda or zinc.

The Lunenburg Gas Co., of Lunenburg, N. S., are changing their electrical plant from steam to water power. They have a sixteen foot dam nearly completed on the Mush-Mush river at Mahone, eight miles from Lunenburg. This river, though small, has over ten square miles. These the company control, and can thus regulate the flow of the river as their needs may require. The Canadian General Electric Company are supplying the wire, transformers, switchboard and a 100 k.w. three phase generator. The pole line is completed, and is said to be the finest in that part of Nova Scotia. The water wheel is from the works of the S. Morgan Smith Co., York, Pa., and is one of their well-known "New Success" turbines. The company will light the village of Mahone, in addition to supplying light and power in Lunenburg

SPARKS.

An electric light plant has been installed in Fould & Shaw's flour mill at Thorold, Ont.

Some of the ratepayers of Bradford, Ont., are in favor of taking steps to secure electric lighting.

The Hamilton Radial Railway Company have let contracts for the extension of their road to Port Nelson.

The directors of the Hull Electric Railway Co. are considering the extension of their road to Gatineau Point.

The town of Bothwell, Ont., will vote on a by-law to raise the sum of $4,000 to install an electric light plant.

The Cornwall Electric Street Railway Company are said to contemplate considerable improvements to their system.

The Citizens Electric Light Co., of Smith's Falls, Ont., have added to their equipment a new dynamo of 1500 lights capacity.

The Goldie & McCulloch Co., of Galt, Ont., are supplying three large boilers for the C.P.R. elevator at St. John, N.B.

The Bell Telephone Company are fitting up a new exchange at Perth, Ont., under the direction of the district superintendent, Mr. Gilmour.

A proposal to expend the sum of $5,000 in improving the electric light plant was voted down by the ratepayers of Mitchell, Ont., on October 18th.

The town council of Thorold, Ont., has postponed until January next the submission of a by-law to provide $7,000 for the extension of the electric light plant.

O'Rilley & Murphy, of Ottawa, have put in the necessary fittings and wiring for lighting the Rideau street convent in that city. In all, about 150 incandescent lights are wired up.

The Bell Telephone Company have been given a renewal of their telephone franchise in the city of St. Thomas, Ont., having reduced the price of telephones in residences to $20 per year.

Jas. Parcell, second engineer of the steamer Chicora, plying between Toronto and Niagara, was presented with a handsome cruet stand by the mechanical and engineering staff on the last trip of the steamer for this season.

Mr. John Shields, well-known in Eastern Canada, has recently completed the installation of electric lighting and waterworks plants at Ashcroft, B.C. The plants are said to be among the most complete in the province.

The Dominion Public Works Department reports that excellent progress is being made in deep water telegraphs. A line has been laid along the north shore of the St. Lawrence, and the cable will soon be completed to Belle Isle.

The Lake Ontario Navigation Company are building a new steamer, to be equipped with an electric light plant, the contract for which has not yet been awarded. Mr. A. W. Hepburn, of Picton, Ont., is the principal member of the company.

The Montreal Street Railway Company discovered that car tickets were being stolen by certain conductors, and have taken steps to punish the offenders. The method of the conductors was to pull the tickets out of the box, either by means of the finger or a small wire.

The village of Grenville, Que., offers a good opening for the installation of an electric plant for lighting the village and both sides of the river, as well as the canals. There is an almost unlimited water power, and favorable terms could, it is thought, be made with the municipality.

A. G. Best, agent for the Massey-Harris Company at Cobden, Ont., was injured in an acetylene gas explosion recently. Mr. Best was installing a generator, when he held a lighted candle near the carbide chamber, thus causing the explosion. His injuries are not regarded as serious.

The town council of Orillia, Ont., at a recent meeting, discussed the question of engaging a consulting electrical engineer. The Fire and Light Committee recommended the engagement of Mr. Roderick J. Parke, of Toronto, which recommendation was finally concurred in by the council.

The telegraph operators employed on the Canada Atlantic Railway waited upon Mr. J. R. Booth and presented a demand for shorter hours and higher wages. The men work 12 hours a day, and receive an average salary of about $35 per month. As yet their demands have not been complied with.

The Canadian General Electric Company have just received an order from William Cook, of St. Catharines, for one of their standard 60 kilowatt single phase alternators. It is Mr. Cook's intention to undertake the furnishing of light to private consumers in connection with his present power plant.

A special committee was recently appointed by the city council of Halifax, N.S., to report as to the advisability of the city undertaking its own street lighting. As a result thereof, the city engineer and electrician have been instructed to prepare plans and specifications, and invite tenders for an electric light plant.

A proposal is under consideration to build an electric railway from Rondeau Park to Thamesville, via Ridgetown, Selton and Morpeth. At a recent meeting held at Ridgetown, at which Mr. Robert Ferguson, M.P.P., was president, and Mr. W. E. Gundy secretary, it was decided to form a directorate and apply for a charter.

The Dominion government is asking for tenders up to November 21st for the erection of a power house and the installation therein of the necessary electrical apparatus for operating the locks, bridges, etc., and for lighting the Soulanges Canal. Plans may be seen at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa.

Justice Walkem has given judgment for the plaintiff in the case of Arthur vs. the city of Nelson, a motion to quash the electric light by-law authorizing the council of Nelson, B.C., to borrow money to purchase an electric light plant from a private company. Mayor Houston was a director of the company, and on that ground the by-law was quashed.

The Metis Telephone Company, at a meeting held at St. Octave de Metis, Que., elected the following officers: Honorary president, Dr. J. A. Ross, M.P.; honorary vice-president, Mr. L. F. Pinault, M.P.; directors, Rev. Mr. Chouinard and Messrs. L. M. Desrosiers, Jule Gendron, A. C. Landry, L. M. Langlais, Dr. J. C. Demers and Donati Caron.

The St. Malo, Que., municipal council has granted the Jacques Cartie Water Power Co. exemption from taxation for 15 years, on condition tha they furnish electric light gratis to the municipality.

The Rogers Electric Co., of London, Ont., have removed their head office to Toronto, but will retain a branch in London. They purpose giving close attention to the electrical supply trade.

Arrangements are in progress for the construction of a local telephone line from Cannington to Hartley, Victoria road, Kirkfield and other points. The line will give a circuit of about 60 miles.

Early in October the annual meeting of the Exeter Electric Light Co. was held at Exeter, Ont., at which a dividend of 5 per cent. was declared. Since the meeting the plant has been sold to Messrs. Snell & Tremaine.

S. Paquette was instantly killed in Montreal by coming in contact with a live wire. He was swinging a derrick when it touched the wire, the insulation of which was worn off, and a current of 2000 volts came down the derrick wire rope and killed him.

Mr. J. A. Jamieson, superintendent C.P.R. elevators, St. John, N.B. has given an order to the Canadian General Electric Company for one 30 kilowatt generator of their well-known type, together with all the wiring material required to complete the installation.

Mr. Jas. Patterson, engineer for the Hamilton, Grimsby & Beamsville Electric Railway Company, estimates the cost of extending the road from Beamsville to St. Catharines at $107,000, there being a grade of 3 per cent. It is improbable that the extension will be carried out.

The annual meeting of the Merchants' Telephone Company was held in Montreal early in October. It was decided to increase the capital stock by $100,000. Officers were elected as follows: President, A. S. Hamelin; vice-president, J. E. Beaudoin; treasurer, L. E. Beauchamp; directors, A. S. Delisle, L. H. Henault, S. L'Archeveque, J. B. Thibodeau, J. N. Ducharme and R. Beauchamp.

A special meeting of the shareholders of the Royal Electric Co. took place in Montreal on October 18th, to consider the proposed issue of $500,000 of preferred stock and the proposal for the Royal Electric Co. to increase its holdings in the Chambly Mfg. Co. from $200,000 to $300,000. The shareholders voted against the issue of preferred stock, but the increased holding in the Chambly Mfg. Co. was carried unanimously.

The corporation of the town of Campbellford, Ont., has recently passed a by-law for the purpose of remodelling and increasing their electric plant, and to carry out the work have purchased from the Canadian General Electric Company one of their standard 120 kilowatt single phase alternators complete, together with the necessary transformers and wiring material. It is expected that, when completed, this will be one of the most modern plants in Canada.

A rumor was current in Toronto a fortnight ago that a scheme was under consideration for the consolidation of all the street railway systems in Canada. It is learned, however, that there were no grounds for the report, which evidently originated from the fact that a number of well-known capitalists interested in street railway ventures convened in Toronto on the 20th inst. It is now stated that a scheme for the extension of radial railways from Toronto throughout the province was under consideration.

A meeting of the shareholders of the Grand Falls Water Power and Boom Company was held at Fredericton, N.B., on October 21st. It was reported that the capital stock of the company, which is $1,000,000, had been subscribed. Plans of the proposed works have been approved of by the Governor General-in-council, and operations are to be commenced forthwith. Hon. R. A. Alger, Sir William Van Horne, R. B. Angus, Hon. Rodden Proctor, William Mackenzie and Hugh McLean were elected directors.

Messrs. Howes & Leighton, of Harriston, Ont., have decided to comply with the request of the merchants of that place to provide incandescent lighting for commercial and residential purposes, as well as arc lighting, which they are now furnishing, and for this purpose have placed an order with the Canadian General Electric Company for one of their new type 30 kilowatt single phase alternators, with marble panels, instruments and all the transformers and wiring required for the installation.

The Ontario government will likely ask the courts to determine whether or not the Niagara Power Company has forfeited the charter which it obtained from the provincial authorities. The agreement between the government and the company called for the development of 10,000 horse power by the 1st November last, and of 25,000 horse power by a later period. The government takes the view that the company has not fulfilled the first of these conditions, and that it has therefore no further right to the charter. The company, on the other hand, points out that under another section of the agreement the charter was only to be forfeited in the event of a failure to transmit electricity. It claims that it has been impossible to comply with the latter condition, as up to a very recent period the problem of long distance transmission had not been solved. Furthermore, the company says it cannot fulfill the contract to supply electrical energy because there is no demand for it.

BANQUET OF STATIONARY ENGINEERS.

THE Toronto branch of the Canadian Association of Stationary Engineers will hold their annual banquet on Thanksgiving eve, November 23rd. The event will take place at the Walker House, where the accommodation will be of the best, and an evening of profit and social re-union is assured. The dinner committee is as follows: John Marr, chairman; Chas. Moseley, Wm. Tait, Geo. Thomson, Geo. Mooring, John Bain, John Bannon.

ELECTRIC RAILWAY DEPARTMENT.

THE ST. THOMAS STREET RAILWAY.

THE St. Thomas street railway, which for so many years gave to the city the name of the horse-car town, has passed away, and in its place a real live, up-to-date electric street railway service is in full blast. The work of constructing the new road was undertaken by local capitalists entirely, with one exception, and June 15th, 1898, saw the road complete and in full operation.

Mr. Chas. McBeth, a graduate of the School of Practical Science, was engaged as electrical engineer, and is said to have handled the work with the assurance of a veteran. Mr. McBeth superintended the electrical equipment, while Mr. Thos. Kerr, of the London Street Railway, gave him valuable assistance with the track laying. The work of laying the track was proceeded with rapidly, no trouble between the city and the railway company arising to hinder the work, as is too often the case.

The company, instead of building a power house for themselves, engaged room in the spacious power house of the Gas & Electric Light Company, and purchased two 150 h.p. generators from the Canadian General Electric Company, and two engines from the Robb Engineering Company, of Amherst, Nova Scotia, the manager of the Gas & Electric Light Company looking after the working of them, and the railway paying for the power generated. The road is equipped with eight motor cars and two trailers of the most improved type, supplied by the Ottawa Car Company, the trucks being obtained from the Canada Switch & Spring Company, of Montreal. The cars are equipped with Canadian General equipment, 25 h.p. motors and double controllers. The cars at present in use have been found insufficient, and next spring it is the intention of the directors to place several more on the road.

The length of track is seven miles, five miles of a belt and two branch lines, one to the stations of the L. E. & D. R. and Grand Trunk Railways, and the other to the company's park, which is one of the features of the road. The park comprises about 100 acres, and is partly wooded by a beautiful bush. It is situated on the banks of Lake Pinafore, a very picturesque spot. Baseball, golf, cricket, lawn tennis, and bowling clubs are accommodated there with suitable grounds, bathing, boating and fishing appliances being furnished for these pastimes. Buildings are being erected for the accommodation of pic-nic and dancing parties. The directors are sparing no pains to make this one of the most beautiful parks in western Ontario, the natural facilities of the location assisting them very materially. This park is a boon to the city, being just what has been required for a number of years, and the electric railway has made it easy of access.

Mr. J. H. Still is president, and Col. Stacey, who held the horse car franchise, secretary-treasurer of the company. Mr. A. Bingham, who for fourteen years was local manager for the Bell Telephone Company in some of their largest exchanges, gave up that position and assumed the management of the street railway, preferring a larger field than the telephone offered for his labors. The road has every prospect of being a success financially, and should the company decide to go to Port Stanley with an extension of their line, which is a possibility, there is no question but that the road will prove a bonanza to the shareholders.

LONDON STREET RAILWAY STRIKE.

As we go to press, a strike of the employees of the London, Ont., Street Railway Company is assuming a serious aspect, and much speculation is rife as to the outcome of same. On October 24th the men formed a division of the Street Railway Employees' Union, and submitted to the management of the road a petition asking for an increase in wages and a more regular division of work. They also asked that only union men be employed. A committee waited upon Mr. C. E. A. Carr, the manager, but he refused to recognize the union. It was then decided to inaugurate a strike, which was done, and since that time several unsuccessful attempts have been made by parties concerned to effect a settlement.

The company has offered to increase the scale of wages, but the men insist that the union shall be recognized. The strikers have, in some instances, resorted to despicable tactics in their efforts to accomplish their purposes, and for the past week no attempt has been made to run the cars. The company has refused a proposal made by the men to refer the matter to the arbitration of the Mayor, Judge William Elliott and Crown Attorney Magee, and thus negotiations with the men would seem to be at an end. The conditions under which the street railway franchise in London was granted provide that the company must employ residents of the city exclusively. This provision, to which the company should never have agreed, has greatly assisted the strikers, as in bringing in outside workmen the company are in danger of losing their franchise.

SPARKS.

The Yarmouth electric railway will probably be extended to Port Maitland next spring, says the Yarmouth News.

It is believed that the Ottawa Electric Company still have in view the extension of their line to Britannia. No steps will be taken, however, before next spring.

Mr. J. W. Leonard, general superintendent of the Ontario and Quebec division of the Canadian Pacific Railway, has been appointed a director of the Galt, Preston and Hespeler Street Railway Company.

The strained relations between the Weston village council and the Toronto City & Suburban Railway are at an end, an agreement satisfactory to both parties having been reached. By the agreement the railway company get back their franchise, and in return will extend their line 1,200 feet from its present terminus.

On October 31st the Ottawa Electric Railway Company made a test of a new fender on one of their cars. It is manufactured by the Consolidated Car Fender Co., of Providence, R.I., and is composed of two distinct parts, a cradle and a cushion. A steel bar projecting to the rear, under the platform, holds the cradle at any desired height. By means of a latch or trigger to be pressed by the foot of the motorman, the cradle is released so that its front edge drops to the ground, making it impossible for anything to get under the car. The cushion is a Resiliant shield made of carefully tempered steel bands. This covers the iron bumpers and all other projecting parts of the platform, so as to effectually cushion the plough in case of a person being struck by a fast moving car. The Ottawa Car Company have taken the agency for Canada, and will manufacture the fender in Ottawa. The railway company will, it is said, apply this fender to 50 cars at once.

SPARKS.

Mr. Alex. Brule, of Billings Bridge, Ont., was killed by being struck by a car on the Hull electric railway.

Messrs. Ahearn & Soper, of Ottawa, have secured the contract for twelve open cars and five closed cars for the Quebec Street Railway.

Mr. Harry Dennis, engineer in charge of the electric light plant at Bracebridge, Ont., was found dead in bed recently. Heart failure was given as the cause of death.

The city council of Hull, Que., will probably call for tenders at once for an electric light plant for lighting the city. It is estimated that 50 arc lamps will be required.

Messrs. Dawson & Symmes, of St. Catharines, Ont., intend applying to the City Council for an extension of time in which to commence the construction of an electric railway to Port Dalhousie.

Messrs. J. C. Wilson & Co., of Lachute, Que., have purchased from the Canadian General Electric Company, for the lighting of their premises, one of their standard 17½ kilowatt multipolar generators.

The Metropolitan Railway Company are not likely to extend their railway beyond Bond Lake this fall. The committee appointed by the Aurora council to locate the line in the village has not selected a route satisfactory to the railway company.

Messrs. Bindon & McVicty, of Ottawa, have lately commenced operations on a mica mine at Templeton. It is claimed that a market has been secured for large quantities of mica, and that experts have pronounced the production of the mine of exceptionally good quality.

Negotiations are still in progress between the city council of Hamilton, Ont., and the promoters of the Hamilton, Chedoke and Ancaster electric railway regarding the building of the road. It is hoped that, at an early date, a decision will be reached which will permit of the work being proceeded with.

The Canadian Oiled Clothing Company, of Toronto, have recently found it necessary to increase their factory premises, and have removed from Port Hope to Toronto. They have given an order to the Canadian General Electric Company for the installation of a 100 light incandescent lighting dynamo.

The city of London, Ont., has signed a contract with the London Electric Company for street lighting for ten years, at the price of 23 cents per night per lamp of 2,000 c.p., from sunset to sunrise, for 317 nights in the year, and whenever the city engineer orders for the other 48 nights. From 300 to 350 lights will be used.

Mr. A. Piers, superintendent of the C.P.R. Company's steamship lines, has placed an order with the Canadian General Electric Company for a direct driven unit, to be installed on the steamer Alberta. This consists of a 25 kilowatt generator, direct connected to a 9 x 10 Ideal engine. The order includes a marble panel, with standard instruments and wiring.

The Bell Telephone Company of Winnipeg are making improvements to their system, including the placing of safety cut-outs on each line just after it enters a building and the using of porcelain conduits at the point of entrance. Fuse blocks are also being placed above each telephone to protect the apparatus. These changes are claimed to be the result of the appointment of a city electrician.

The Hull Electric Company, of Hull, Que., are increasing their generating plant, and have purchased from the Canadian General Electric Company one of their well known standard monocyclic generators, having a capacity of 150 kilowatts, with marble panel switchboard and instruments complete. This makes the third machine of this size and type which this company have purchased.

The ratepayers of Galt, Ont., recently passed a by-law to expropriate the gas and electric light works. The authorities of the town have since discovered that there is no law on the Ontario Statues sanctioning the expropriation of electric plants by municipalities, and it is probable that another by-law will have to be submitted before the council can even take over the gas plant. As to electric lighting, it is understood that an offer will be made to the Galt Electric Light Company for the purchase of their plant.

The Department of Electrical Engineering, McGill University, Montreal, are adding to their electrical equipment a number of special generators, motors, transformers and testing instruments, to be used in connection with their experimental work. They have placed an order for all their requirements in this respect with the Canadian General Electric Company.

L. Becigneul et Cie, Lake Megantic, Que., are installing an incandescent electric system for the town, and for that purpose have purchased from the Canadian General Electric Company one of their standard 30 kilowatt single phase generators, with marble panel switchboard complete. They have also placed an order with the same company for all transformers and wiring supplies required to carry out the work.

Mr. Edward S. Jenison, who is interested in the development of the water power of the Kakabeka Falls, on the Kaministiquia river, proposes to build a canal from above the Ecarte Falls, on the above river, to the boundary of Port Arthur, where he will build an immense storage reservoir. It is claimed that the water will be delivered under a head of 300 feet. The intention is that the towns of Port Arthur and Fort William shall get their water supply from this source, which will likewise give them a fire pressure by gravitation. Both towns are to be supplied with water sufficient to generate electricity to supply the Port Arthur electric railway and both lighting plants upon payment of a rate of one cent per thousand gallons, which will furnish power at a less rate than either municipality is now paying for their steam power. The cost of the canal is estimated at one million dollars.

PERSONAL.

Mr. Jas. Ross, vice-president of the Montreal Street Railway Company, arrived in Montreal during the past week from Liverpool, Eng.

It is understood that Mr. W. T. Goulding will be appointed manager of the G. N. W. Telegraph Co.'s office just opened at Vancouver, B.C.

Mr. W. H. Smith, of Goderich, Ont., has been appointed superintendent of the electric light and waterworks plants at Fort William, Ont. The electric light plant was installed by the town last spring.

Mr. Raoul D. B. Corriveau, son of Mr. A. J. Corriveau, late manager of the Montreal Park and Island Railway, Montreal, has returned to that city, and is now proceeding with his courses at McGill University. Mr. Corriveau was a member of the engineering party sent by the Dominion government on exploration to Magdalen Islands.

Mr. F. H. Badger, general manager of the Montmorency Power Co. of Quebec, has resigned his position, and Mr. Ed. A. Evans has been appointed manager of the amalgamated Montmorency Power Co., Quebec District Railway Co., and Quebec, Montmorency & Charleboix Railway Co. Extensive improvements are now being made at the power house at Montmorency Falls, in view of this amalgamation.

PUBLICATIONS.

The Pelton Water Wheel Company, of San Francisco, Cal., and New York, N.Y., have sent us a catalogue, in which special attention is called to the high standard which has been attained by the Pelton water wheels, used so largely in the United States. The numerous illustrations of the various applications of Pelton wheels are very interesting. Various tables are also printed.

"A Brief Synopsis of Our Course in Telephony" is the title of a little booklet received from the International Correspondence School, of Scranton, Pa. The instruction papers for this course were prepared, we are told, by Mr. Kempster B. Miller, one of the best known telephone experts, who is instructor in this subject. Every branch of telephony is taken up in a thoroughly practical manner.

TRADE NOTES.

The C.P.R., Montreal, have purchased a two-phase induction motor from the Canadian General Electric Company.

The Lachine Rapids Company have placed another order with the Canadian General Electric Company for three-phase induction motors.

The T. Eaton Company, Toronto, has ordered a 50 h.p. automatic engine, for direct connection to dynamo, from the Robb Engineering Company.

Messrs. J. Robinson & Co., of Winnipeg, Man., have purchased a 10 h.p. slow speed 500 volt multipolar motor from the Canadian General Electric Company.

Messrs. Brigham & Ingram, of Stratford, Ont., have placed an order with the Electrical Construction Co. of London, Limited, for an 8 horse power motor to operate their wood yard.

The British Columbia Sugar Refinery Company, of Vancouver, B.C., have purchased from the Canadian General Electric Company one of their new type 25 kilowatt multipolar generators.

The Salvation Army Printing House, Toronto, have given an order to the Electrical Construction Co. of London, Limited, for a motor equipment, consisting of three direct-belted, slow speed (300 r.p.m.), multipolar, 7 h.p. motors and two 2 h.p. motors.

The Canadian General Electric Company have received an order from the T. Eaton Company, of Toronto, for one of their 25 kilowatt direct-connected generators, with marble switchboard. This makes the fifth unit which the T. Eaton Company have purchased from the Canadian General Electric Company, their entire establishment being lighted and operated from these installations.

The Economy Manufacturing Company, of 613 Washington Life Building, 141 Broadway, New York, have just completed the installation of their hydro-carbon gas fuel system at the plant of the B. Greening Wire Company, Limited, Hamilton. This plant was equipped under the superintendence of Mr. H. Etches, Mem. Inst. Mech. Eng., of 83 Front street west, Toronto, the local representative of the company in Canada.

Messrs. H. Cargill & Son, of Cargill, Ont., have decided to install an up-to-date electric plant for their requirements, to furnish light and power to their residences, mills, barns and warehouses, and have purchased a 500-light plant from the Canadian General Electric Company, together with several motors for operating machinery and elevators. Mr. Cargill, M.P., is thoroughly up-to-date in all his undertakings, and his electrical plant will be most complete.

The Robb Engineering Company, Amherst, N. S., have received an order from New York parties for two 300 h.p. engines for an electric railway in Australia. They are to be tandem compound, side crank pattern, and the dynamos will be direct connected. This company is working up a considerable export trade, having shipped during the past few months one 300 h.p. engine to England, three 250 h.p. to the Isle of Man, three 125 h.p. to Spain, and one 125 h.p. to Newfoundland.

The Goldie & McCulloch Company, of Galt, Ont., are supplying a steam plant to the Metropolitan Railway Company, for their new power house at Bond Lake. It consists of two cross compound condensing Wheelock engines of 350 h.p. each, with high pressure cylinder 17½" x 42" stroke, and low pressure cylinder 32" x 42" stroke. The pulley fly-wheels are to be 18' diameter by 35" face. There will be four boilers, each 16' long by 73" in diameter, and each containing 90 tubes 3½" in diameter by 16' long, to be run at 125 lbs. pressure. There will also be two independent condensers, 10" x 15" x 15", two duplex pumps, 6" x 4" x 7", two 30" heaters, steam and exhaust pipes, etc.

LEGAL DECISIONS.

A JUDGMENT of importance to electric light companies has just been delivered in Montreal by Mr. Justice Charland. In October, 1897, Alfred Segum, an employee of the Citizens' Light and Power Company, met his death while working on a high pole of the company. In her plea, the plaintiff, the widow, alleged that there was a force of 1,000 volts being carried by the wire, which was not properly insulated, and that the death of her husband was due to the negligence of the company. The defendants denied responsibility, pleading that the accident was due to Segum's imprudence. The judge found that the death of Segum was due to the negligence of the Citizens' Light & Power Company, which had not furnished him with gloves, with which he might have handled the wires safely; and he condemned the defendants to pay Mrs. Segum the sum of $1,500 with costs as compensation for her loss.

THE AMERICAN STOKER CO. VS. THE GENERAL ENGINEERING CO. OF ONTARIO, LIMITED.—The case came up in the Superior Court, Montreal, on an inscription in law by the defendant. The plaintiff, in its answer to defendant's plea, said that the letters patent were null and void, and did not disclose any new or useful invention susceptible of being the subject of a patent in Canada. The plaintiff, in his declaration, did not attack the validity of the letters patent held by defendant and referred to in the declaration, but simply alleged in paragraph 6 that the stokers manufactured and sold by plaintiff were not an infringement of any patent held or owned by the defendant, and in no way infringed any rights of defendant. The court held that the plaintiff could not in an action like the present, and by answer to defendant's plea, attack the validity of the patents held by defendant and referred to in its plea. Under the Patent Act, section 33, such right is only allowed to defendant when pleading to an action for the infringement of the patent, and such exceptional provision did not apply to the present case. The plaintiff, in its answer, did not allege any fact or default which, by the Patent Act or by law, rendered the patent held by defendant void. The plaintiff did not by its answer say that the patents of defendant referred to in the pleadings be declared void. The defendant's inscription in law was well founded, and it was maintained with costs.

JUDGE Tellier has recently rendered judgment in the case of Mrs. Dominica Delvero against the Montreal Park and Island Railway Company. The plaintiff, who resides in Italy, claimed, in her name, and in the name of her five children, $5,000 damages on account of the death of her husband, who was killed while working in the service of the defendant company. Delvero was employed with a gang of other men in the construction of one of the company's lines. A platform car was used to carry rails from one point to another, and the men were in the habit, although against the rules, of getting on this car and allowing it to slide down the grade, when going for rails. On the day when the accident occurred, a big branch had been cut down from a tree, and was lying across the track, and as the men coming down on the platform car could not prevent a collision, having no break, they jumped off. In doing so, Delvero sustained injuries from which he died two days after. His widow then took out the present action. In rendering judgment, the Court held that it had not been proved that the deceased had been made aware of the rule forbidding the men to get on the platform car. Moreover, this order seemed to be pretty much a dead letter, and the use of the car for the convenience of the men themselves seemed to have been tolerated. Under these circumstances the company must be held responsible for the accident. In the absence of sufficient proof, the Court assessed the damage at $1,000, and rendered judgment in favor of the plaintiff for that amount.