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CANADIAN
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AND
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CANADIAN

ELECTRICAL NEWS

AND

STEAM ENGINEERING JOURNAL.

VOL. IV. NOVEMBER, 1894 NO. 11.

ELECTRIC PERCUSSION AND ROTARY DRILLS.

THE accompanying illustration shows in operation at the Windsor Gypsum Quarries, Windsor, Nova Scotia, portable electric percussion and rotary drills which have lately been introduced and are being manufactured by the Canadian General Electric Co.

The percussion drill in general external appearance conforms very closely to the regular type of steam and air drill; in fact the tripod and shelf are of the standard steam drill form. Electrically, it is arranged in the form of a solid piston reciprocating in a magnetic field and controlled thereby. The piston is provided with a standard air drill rotating rifle-bar and the usual form of springs to protect the front head of the drill from blows. The drill has a piston diameter of 3¼", a length of stroke from 6½" to 8½", length of feed 24", number of blows per minute, 360 to 380.

ELECTRIC PERCUSSION AND ROTARY DRILLS.
IN OPERATION AT THE WINDSOR GYPSUM CO.'S QUARRIES, WINDSOR, N. S.

The first of these drills was installed on the Canadian "Soo" Canal last winter, when the contractors, Messrs. Hugh Ryan & Co., were greatly pleased with its performance. On these works the performance was equal to that of a 3" steam drill, and the facility with which the drill could be moved, owing to the complete flexibility of the connections, was especially remarked. As far as economy goes, it far surpassed any other drills on the works. The cost of operating, including power for operating the generator and labor of the attendant at the power house, was somewhat under the average operating expenses of the steam drills. Bearing in mind that the attendance at the power house is the same whether one drill or fifty are in operation, and that the increase of power is by no means in proportion to the number of drills, it will be readily seen that a very great saving will be effected over steam drills where the number in operation is the same.

In the Windsor Gypsum Quarries, Windsor, N. S., where one of these drills is in operation, every satisaction is being given by it. The best day's work of one drill on record is ten 10 ft. holes in 9 hours and 20 minutes. This was in glow lime stone.

The rotary drill is designed especially for use in coal mining, but has also been used with great success in the Gypsum Quarries of the Windsor Gypsum Co., where the clayey nature of the material tends to clog the drill and imposes the severest test on the capability of the machine. The drill is similar to the well-known Howell's drill with an electric motor geared to it in such a way as to form a light and efficient tool. The control of the motor is effected by a small plug switch. No rheotsat being used, power may be taken from the same wire supplying current for lighting, pumping or haulage.

Feed screws of different pitch are furnished for varying the speed of boring and a friction clutch protects the motor should any particularly hard obstacles be struck suddenly.

The columns are made in different lengths and each is adjustable for about two feet variation. The construction of the drill and its method of mounting enable the operator to drill close to the roof, floors or walls as well as in any direction.

The drill weighs with post complete only about 160 lbs., the drill itself weighing 100 lbs. In bituminous coal this drill shows a speed of drilling of 7 to 10 feet per minute.

WHAT ZERO MEANS.

The word zero is from the Spanish and means empty, hence nothing. It was first used on a thermometer in 1707 by a young Prussian named Gabrie Fahrenheit, then but 19 years of age. From a very small boy he had been a close observer of nature, and in the years mentioned above, while experimenting by putting snow and salt together, found that it produced a degree of cold equal to the coldest day in the year. The young discoverer was struck with the coincidence of his little scientific discovery, and hastily concluded that he had found the lowest degree of temperature known in the world, either natural or artificial.

The Carriage World adds that he called the degree "zero," and constructed a thermometer, or rude weather glass, with a scale graduated up from zero to boiling point, which he numbered 212, and the freezing point 32, because as he thought, the mercury contracted the 32nd of its volume on being cooled down from temperature of freezing water to zero, and expanded to the one hundred and eightieth part on being heated from the freezing to the boiling point.

Time showed that this arrangement, instead of being truly scientific, was as arbitrary as the division of the Bible into verses and chapters. Fahrenheit's thermometer became widely adopted before any one adopted a better scale, and those who now use it cling to it as Englishmen cling to their difficult and cumbersome fractional money. The three countries which use Fahrenheit's scale are England, Holland and America. Russia and Germany use Baumer's, in which the boiling point is counted 80 above freezing, zero. France uses the centigrade, so called because it makes the boiling point 100 degrees from the freezing point.

The town council of Lachine, Que., will ask Mr. R. Bickerdike to renounce his right to construct an electric road from Montreal to that place, in order that the council may be in a position to accept the offer of the Montreal Park & Island Railway Co., to begin at once the construction of such a road.

A Toronto syndicate, at the head of which is said to be Mr. Alex. Manning, announces that it has purchased the Drummondville street railway, which it is proposed to transform into an electric road, with terminals at Niagara and Chippewa. The promoters of the company have made application to the town council of Niagara Falls for a bonus of $75,000 to aid in the transformation and extension of the line.

REPORT ON DUTY AND CAPACITY TRIAL OF WORTHINGTON PUMPING ENGINE AT LOW LEVEL PUMPING STATION, MONTREAL WATER WORKS.

By Professor J. T. Nicolson, B.Sc., and J. Emile Vanier, C.E.

THE following report was recently presented by Messrs. Nicolson and Vanier to the Water Committee of the City of Montreal.—

Acting under your instructions, we have conducted duty and capacity trials of the new ten million gallon high duty Worthington Pumping Engine, recently installed at the Low Level Pumping Station, and have the honor to report as follows

According to the contract, the engine must be capable of pumping at the rate of ten millions of Imperial gallons of water in 24 hours, against a difference of pressure in suction and force mains of not exceeding 80 lbs. per square inch, and it must be able to perform a duty of one hundred and five million foot pounds of work for every hundred pounds of coal burnt.

In lieu of the latter stipulation, your experts agreed to accept a performance of *one hundred and five million foot pounds of work for every thousand* pounds of feed water supplied by the boilers, it being understood that the steam used by the feed pump should be counted against the manufacturers.

The engine is of the latest type of horizontal Worthington High Duty Pumping Engine, having cylinders arranged on the double tandem compound direct acting principle. The general features of construction are shown in the accompanying cuts.

The steam cylinders *are all* jacketed, both on sides and ends, with steam of boiler pressure, and reheaters are provided through which the steam passes on its way from the high to the low cylinders, which are likewise steam jacketed. The steam which is used in the jackets is that derived from the drain pipe of the separator, which belongs to the engine, and the steam from this point passes in succession through the reheaters, which are at the highest elevation, and thence through the jackets of the four cylinders, finally being delivered into a common drain pipe, which proceeds to a tank in which the water of condensation is collected. The jacket tank is drained by a small duplex steam pump, working automatically, the throttle valve being under the control of a float in the tank, and this water is pumped into the boilers. The size of the pump is 3 x 2 x 3 inches. The pipe leading from the pump to the boilers is independent of any other feed pipe. The exhaust steam discharged *from this pump* is carried to the hot well in the basement of the engine house, which serves for the supply of water to the boilers, being itself supplied by the overflow water discharged from the air pumps of the engine. The hot well tank is one which has formerly served the same purpose for the old engines in the pumping station. Its diameter is 24 inches, and its length 13 feet.

In addition to the jacket pump, there is a second steam pump connected with the engine, *which, by means* of a set of pistons, furnishes air to the top of the accumulator cylinder, and, by means of a set of plungers, furnishes water to the under side of the accumulator ram. The size of the pump, which is of the duplex type, is 4½ x 3 x 4 inches. The exhaust steam from this pump, like that from the jacket pump, is carried to the hot-well tank just referred to. This is an auxiliary piece of apparatus, as the pressure on the ram is usually kept up by a pipe supplied from the force main. The air pumps of the condensing apparatus are operated by direct connection with the main engine, the only accessories about the engine itself which consume steam, are the jackets and the two direct-acting steam pumps referred to.

The feed pump, for supplying the boilers with water, is one which has already been in use for the old plant. It is located in the cellar, under the engine room, near by the hot well tank. The exhaust steam from this pump is carried into the tank. Its size is 6 x 4 x 6 inches duplex.

The cylinders are protected from radiation by a covering of asbestos, out side of which is a layer of hair felting, and the whole is encased in black walnut lagging. The steam pipe, extending the whole distance from the boilers to the engine, is covered with magnesia, and that part within the engine-room is finished with black walnut lagging.

DIMENSIONS OF ENGINE.

Diameter of each of two high-pressure cylinders	25 inches.
Diameter of piston rods of same	5¼ inches.
Net area of high-pressure cylinders	469.11 sq. inches.
Diameter of each of two low-pressure cylinders	50 inches.
Diameter of piston rods of same	5 inches.
Net area of low-pressure cylinders	1953 68 sq.inches.
Maximum stroke of steam pistons	38 inches.
Diameter of each of two plungers	27½ inches.
Diameter of plunger rods	5¼ and 3½ ins.
Net area of plungers	583.74 sq. inches.
Average length of stroke during trial	3 157 feet.
Diameter of two double-acting air pumps	12 inches.
Stroke of same	3 157 feet.
Diameter and stroke of feed pump piston	6 inches.
Diameter of plunger of same	4 inches.
Diameter and stroke of jacket pump	3 inches.
Diameter of plunger of same	2 inches.
Vertical distance between centres of suction and force main gauges	10.66 feet.

TRIALS.

The engine was run for 55 33 hours at its full power without intermission It worked smoothly and well, without undue heating of any part, or leakage of any kind. This run began at 10.40 a.m. on Friday, July 27th On that day the temperature test was made, all the conditions of operation being retained in the proper normal state for the purpose of observing the temperatures of the various supplies of feed water to the boilers On the 28th, the duty and capacity trial lasting 10 hours was made, the feed water being supplied through suitable tanks and weighed the jackets reheaters and separator drain being also caught and weighed. At 7.22 p.m. on Saturday the trial ended, and the engine was stopped at 6 p.m. on Sunday, the 29th.

During the temperature test, the feed pump (made by Snow) exhaust was led into the hot well, the jacket pump was not worked, but the jacket tank drained into measuring tanks, its temperature being obtained before the pressure fell, the temperature of the main feed was observed close to the boilers. Readings were made every fifteen minutes of the steam pressure and vacuum gauges of the gauge on the force main, of the mercury column on the suction main, of the number and length of the strokes of each engine, in order that the engines might be kept working in exactly the state in which they would perform their rated duty and capacity.

The duty and capacity trial began by a signal given when the height of water in the three boilers and in the feed tank had been simultaneously noted, the readings of the two counters in the engine being then read. At the same time the jacket tank drain was diverted, being caught and weighed throughout the trial. The main feed pump received steam from the same boilers as supplied the main engine, and was reckoned as part of the steam used by it. It exhausted to waste. The amount of steam used by feed pump was ascertained by condensing its exhaust on a subsequent day. Twelve indicators were used on the trial eight Crosby indicators on the four steam cylinders, and two Tabors, and two Thompson's on the two pump chambers

Indicator cards were taken every hour, of which average specimens are presented below The readings made every fifteen minutes included — Temperatures of engine room, jacket drain, pressure of steam, vacuum and water gauges, mercury column, engine registers and boiler gauges, and the lengths of ten successive strokes of each pump. The dryness of the steam was tested for one hour at a time, by three independent tests. The instrument used was a Peabody Throttling Calorimeter, which was attached to *the main steam pipe just before the separator. The separator drain* was estimated by means of the Calorimeter, the assumption being that all the wetness in the steam was left in the separator.

This trial ended nine hours and 46 minutes after its commencement, by a signal given in the engine room, when the boilers had been filled up to the same heights as at the beginning of the test, when the engine registers were again read. The feed tank was then filled to the hook gauge used at the commencement, and *the feed and jacket drain sheets closed. A counter on* the feed pump enabled the number of strokes made by it during the trial to be recorded. The exhaust from it was subsequently condensed and weighed, when working at the same rate of speed. The pressure against which the plungers worked being 4 57 lbs. in excess of the stipulated 80 lbs, it was mutually agreed to by your experts and Messrs. Worthingtons' representative, that the steam pressure on the boilers would be 105 lbs, instead of 100 lbs. *Acting upon instructions, the stokers accordingly kept the pressure be*tween 104 and 106 lbs, on the boiler gauges during the whole trial

All gauges, indicator springs and weigh scales were tested and calibrated by the standards at McGill College, before and after the trial.

The assistants employed on the part of your experts upon the trials were Mr. G. Sinclair Smith, B.A., Sc., Demonstrator of Thermodynamics, McGill College, Mr. J. S Cosgan, B.A., Sc., Mr. Leonard Dyer, B.A., Sc.; *Mr. Archd. Dall, B.A., Sc., Mr. Robins, Mr. Hutchinson, and Mr. Laurin,* C.E., Chief Assistant in Mr. Vanier's office.

DATA CALCULATIONS.

The following are the principal data obtained from the trials, and the calculations based thereupon

Duration of test	9 hrs. 46 mins 9 77 hrs.
Average pressure by boiler gauges (corrected)	104 8 lbs.
" " " " absolute	119 6 "
" " engine gauges (corrected)	103 35 "
" " " " absolute	118 15 "
Average pressure in steam pipe at the throttle valve (abs.)	119 0 "
" " barometer	14 8 "
" temperature of *main feed*	155 62 F
" " of jacket tank drain	330 4 F.
Total weight of water measured into boilers	740 79 lbs.
Weight of water drained from separator jackets and reheaters	8228 5 "
Weight of steam lost by Calorimeter tests	360 0 "
" " supplied to engine and feed pumps	737 19 "
" water drained from separator (73719 x .006)	442.3 "
Dryness fraction of steam supplied	99 4%
Absolute pressure in steam pipe	119 lbs.
Heat of water at temperature, 340 42 F	311.4 T. U.
Latent heat of steam at 119 lbs., abs	874 4 T. U.
Absolute pressure in Calorimeter	30 0 lbs
Temperature corresponding to same	252 .0 F
Actual temperature in Calor meter	298° 0 F
Total heat of steam at pressure 30.0 lbs.	1158 4 T. U.

$$\text{Dryness fraction} \cdot x = \frac{1158.4 - 311.0 + .48\,(298 - 252)}{874.4} = 0.994$$

MEAN EFFECTIVE PRESSURES.

North Engine —		
	High pressure, east end	41.10 lbs
	" " west end	42 18 "
	Low pressure, east end	16 52 "
	" " west end	16 88 "
	Pump, east end	85 43 "
	" west end	85.75 "
South Engine :—		
	High pressure, east end	45 45 lbs.
	" " west end	43 30 "
	Low pressure, east end	15.45 "
	" " west end	17.44 "
	Pump, east end	85.28 "
	" west end	85.68 "

HORSE POWER.

North Engine	229.05 H.P.
South Engine	233 45 "
Total	462.50 H.P.
Horse power of pump (obtained from cards)	438 97
Mechanical efficiency	94.9
Number of strokes in 9 hrs., 46 mins	53 840
Average length of stroke	3 157 ft.
Piston speed during trial (feet per minute)	145 02

PRESSURES IN PUMP

Average pressure per sq. in. on force main gauge	76 75 lbs.
" " " in suction main (mercury column)	3 21 "
Pressure due to difference of height of gauges	4 61 "
Total mean average effective pressure against plungers	84 57

WORK OF PUMP.

Work done by plungers in 9.77 hours,

$$84.57 \times 583.74 \times 53840 \times 3.157 = 8,332,600,000 \text{ ft. lbs.}$$

Steam used in performing this work	73,277 lbs.
Duty per 1000 lbs. of feed supplied	114,532,000 ft lbs

CAPACITY IN 24 HOURS.

At 145 ft. piston speed,

$$\frac{3.157 \times 583.74 \times 53840 \times 24 \times 6\,2322}{144 \times 9.77} = 10,524,300 \text{ Imp. gals.}$$

At 142 ft. per min. piston speed as per contract 10,306,500 Imp. gals.

DUTY PER 1,000,000 THERMAL UNITS.

Total heat above 32° F. of steam at 119 lbs., abs.	1185.8	B. T. U.
Heat of water at 155°, 62 F.	123.8	"
Heat received by engine per lb. of main steam.. .	1062 0	"
Heat in water at 330°, 4 F.	301.0	"
Heat received by engine per lb of jacket steam.. ..	884.8	"
Heat in water at temp. of 119 lbs steam.....	311.4	"
" " " 330°, 4 F.	301.0	"
Heat received by engine, per lb. of separator drain. ...	10.4	"

HEAT RECEIVED DURING 9.77 HOURS BY ENGINE.

From main steam, 65490 5 x 1 020 = 69.550 000 T. W		
" jacket and reheater steam .....7786 2 x 884 8 =	6.889.250	T. U.
" separator steam	4.600	"
Total	6,443,850	"
Duty per 1,000,000 Thermal units...	109.785,000 ft. lbs.	

FEED PUMP.

Feed water used by feed pump in 9.77 hrs....	1,099 lbs.
Horse power of feed pump,.....	0.938 H. P.
Steam used by feed pump per horse power hour,... .. .	119.8 lbs.

CONCLUSION.

It appears from the results of the trial made by your experts that the engine performed a duty of more than one hundred and fourteen million foot pounds for every one thousand pounds of feed water supplied to it. If it be assumed that one thousand pounds of steam at a pressure of one hundred pounds per square inch are equivalent to one hundred pounds of coal (an estimate your experts were willing to accede to, although Messrs. Worthington were thereby relieved from making good the performance of the boilers, which by the letter of the contract they were bound to do) then the engine has exceeded its contract duty by 9 million foot pounds. If only nine hundred and fifty pounds of steam be allowed per hundred pounds of coal (an evaporation which is easily obtainable with ordinary boilers) then the engine shows a duty of 108 million foot pounds per 100 lbs. of coal.

On the score of duty the manufacturers in the operation of this engine have therefore abundantly fulfilled the stipulation of the contract.

The engine showed a capacity, when on trial and working at 2% over the piston speed allowed by the contract, of 10,524,000 Imperial gallons. Its capacity at the limited piston speed allowed by the contract is therefore 10,306 500 Imperial gallons in twenty-four hours, a quantity about 3% in excess of that which is required by contract, so that in this respect also the contractors have exceeded their guaranteed performance.

The materials and workmanship throughout of the engine have been examined by your experts and are found to be of a high quality, the design being of a substantial character and the bearing surfaces ample.

Throughout the trial the engine ran smoothly and well, even although working somewhat beyond its normal duty and capacity, and the consumption of oil did not appear to exceed a warrantable amount.

Your experts have therefore decided to recommend the engine for acceptance by the Water Committee of the Council of the City of Montreal, and they hereby recommend the same for acceptance.

Your experts have the honor to be,

Your obedient servants,

(Signed) JOHN T. NICOLSON,
(Signed) J. EMILE VANIER.

A CORRECTION.

THE following letter has been received from Mr. Chas. F. Medbury, of Ottawa, with reference to the equation presented by him at the Montreal convention of the Canadian Electrical Association for determining the distance at which the cost of transmitting any given power electrically by high or low voltage is equal, and which was printed in the convention proceedings in the ELECTRICAL NEWS for October:—

"Owing to my absence from town I was not able to go over the type written copy of data which was sent to you from this office and therefore did not have the opportunity to make any corrections. I notice that through a typographical error in the last equation giving the weight of copper, it reads, 'c is equal to $3950.5 \frac{a\ d}{\text{volts lost.}}$' This should be d' instead of d, which, as you will see, makes quite a difference in the value of the equation. Moreover, following this equation, it should read: 'where a is the amperes on the line and d is the distance under consideration.' Otherwise, I believe it is correct.

Yours truly,
CHAS. F. MEDBURY."

QUESTIONS AND ANSWERS.

W. S. D., *Halifax, Nova Scotia*, writes: I would very much like to have your opinion on the following if you care to give it. We have a Knowles jet condenser for using salt water. Water cylinder is 14"×14". Do you think it is large enough to condense for 300 H. P.? The exhaust opening is 8", injection 5".

ANS.—Assuming that 30 lbs. of water per H. P. per hour are required, 300 × 30 equals 9000 lbs. per hour; and as there are 10 lbs. of water contained in each gallon, then 9,000 divided by 10, equals 900 gallons per hour. It is usually conceded that for every gallon of water used by the engine, 30 gallons of injection water are required for the condenser, so that 900 × 30 equals 27,000 gallons required per hour. Your water cylinder is 14" diameter, and has an area of 153.9 square inches; and for every foot of its travel it will displace 6.6 gallons of water. If this pump be run at 100 feet of piston speed per minute,—a very moderate speed,—it would displace 39,600 gallons per hour, without taking into account the slip, so that your pump is large enough for the engine mentioned.

The Toronto Electric Light Co. announce that they are completing arrangements for the distribution of current on their system for the purpose of operating clocks on standard time.

CANADIAN ASSOCIATION OF STATIONARY ENGINEERS.

Note. Secretaries of the various Associations are requested to forward to us matter for publication in this Department not later than the 20th of each month.

WINNIPEG ASSOCIATION, NO. 11.

Mr. C. E. Robertson, Dominion Government Steamboat Inspector, delivered a few evenings ago the first of a series of lectures on engineering subjects, to the members of the above Association. He called attention to what it was necessary that a competent engineer should know before taking charge of a steam engine. An explanation of the technical terms used by steel plate manufacturers followed, after which Mr. Robertson went into an explanation of the various causes leading to boiler explosions, and pointed out the dangers most to be guarded against. An explanation followed of the different strengths of the various manufactures of iron and steel. His next lecture will deal with the calculations pertaining to, and the construction of, a boiler of sixty inches diameter and twelve feet long. The lecture was illustrated throughout with samples and blackboard diagrams.

KINCARDINE ASSOCIATION, NO. 12.

Editor ELECTRICAL NEWS.

SIR, We have to report progress. We are holding our meetings regularly and the attendance is good. We have good and instructive discussions. We are also making arrangements to secure a teacher for a mathematical class.

ANDREW SCOTT, Sec.

139 BORDEN STREET, TORONTO, Oct. 15th, 1894.

Editor CANADIAN ELECTRICAL NEWS.

SIR,—Before you go to press (or at the latest shortly thereafter) I hope to be able to report the organization of new associations in Brockville and Carleton Place. I have visited Brockville a number of times, and often tried to interest some of the engineers in forming a branch of the C. A. S. E. there. I was there on business about the latter part of August, and met Mr. W. F. Chapman, Chief Engineer for the Brockville Carriage Co. (whose kindness to the writer will never be forgotten), and I took the responsibility of inviting him up to Toronto, to attend the Convention, which he did. On returning home again, he at once commenced work in earnest, and after a few communications with him, in reference to organization, I was most pleased to receive an application for a Charter. I am just in receipt of a full list of officers and members from Mr. James Aikens, the Secretary-elect of the new Association.

The Association will start with sixteen charter members, composed as follows:—W. F. Chapman, President; Geo. Whitney, Vice-President; James Aikens, Rec. Secretary; Chas. Bertrand, Financial Secretary; A. H. Franklin, Treasurer; Edward Devine, Conductor; Albert E. Henry, Doorkeeper; M. Turkington, J. Grundy, E. Carr, Trustees; Jas. Runnings, R. Turkington, W. Robinson, Jas. Window, W. Stanley Beaverstock, and D. G. Donovan. Several other engineers in the vicinity have signified their intention of joining the Association when it is organized.

Brockville Association No. 15 will be a valuable addition to the order, and under the direction of their worthy President, Bro. W. F. Chapman, its success is fully assured. I am pleased to see the name of A. H. Franklin among the officers as Treasurer. Bro. Franklin is a veteran engineer of over forty years' standing, and at the present time is chief engineer in the Brockville water works.

I shall be glad to hear from engineers in other towns where there there is any prospect of starting associations, and will give them the necessary information with pleasure.

ALBERT E. EDKINS,
Prov. Deputy for Ontario.

TORONTO, Oct. 27th, 1894.

Editor ELECTRICAL NEWS.

SIR,—As a result of considerable correspondence which I have had during the past four months with engineers in Carleton Place, a meeting was held there on Oct. 20th, to consider the advisability of forming an Association.

After the matter had been fully discussed, a committee was appointed to visit all engineers in the town, and ask them to attend a meeting on Oct. 27th at 8 P.M., for the purpose of organizing.

I am expecting to receive the charter members' names in a few days, when I shall forward them to the Executive Secretary.

I think it very likely that the Associations in Carleton Place and Brockville will be instituted about the same time.

If any of the readers of the NEWS in the towns of Ontario would like to help start new Associations, and will write me, I shall be most happy to give them the necessary information, &c.

ALBERT E. EDKINS,
Prov. Dep., C.A.S.E.

A number of members of St. Laurent Branch, No 2, of the C. A. S. E., Montreal, have recently withdrawn from membership in that body, and have formed themselves into a new organization, styled the "Mutual Society of Mechanical Engineers of the Province of Quebec."

THE MONTMORENCY POWER COMPANY'S TWO PHASE PLANT.

THE Montmorency Electric Power Co., of Quebec, intend to furnish several thousand horse power in the city of Quebec for incandescent and arc lighting and power purposes. This power will be obtained from the Montmorency Falls, a distance of nine miles from Quebec. For the original installation the Montmorency Electric Power Company will install three 675 H. P. two-phase A. C. generators of the S. K. C. type, built by the Stanley Electric Mfg. Co., Pittsfield, Mass. These generators are wound for 5,500 volts, and the loss in the line conveying the power to Quebec is so arranged that when the line is working at its full capacity, the generators will deliver 5000 volts at the sub-station in Quebec. In the sub-station will be arranged a switch-board for incandescent lighting, a switch board for arc lighting and a switch-board for power work, all of which will be connected to the main line running from the power station at Montmorency Falls. The Falls altogether have a fall of about 300 feet, there being one perpendicular fall of 268 feet. The total amount of this fall, however, will not be utilized, as ample power can be obtained for all purposes for several years to come by utilizing only a small part of the total fall available.

These generators will be connected to water wheels which are already installed in the power station. The current will be delivered at 5000 volts pressure at the sub station and here converted to 100 volts for incandescent lighting, 30 volts for arc lighting, and 500 volts for power work, by means of transformers of large size. These will be placed in the sub station built specially for their reception, and a very complete arrangement will be provided for keeping the transformers cool by air blasts. The three 675 H. P. single phase generators are to be delivered at Quebec on or before May 1st, 1895, but in order to enable the company to take care of their work during the coming season, the Stanley Electric Mfg. Co. have loaned them two 320 H. P. generators which will be used temporarily.

PUBLICATIONS.

The Arena for November gives the place of honor to Kuma Oishi, A. M., Ph. D., a famous Japanese scholar, who considers "The Causes which Led to the War in the East, from the standpoint of his nationality.

Announcement is made of the publication at an early date, by the Electrician Publishing Co., Salisbury Court, Fleet street, London, E. C., of the thirteenth edition of the Electrical Trades Directory and Hand-book—corrected to January, 1895.

TRADE NOTES.

Messrs. F. E. Dixon & Co., of Toronto, the well known manufacturers of leather belting, have removed to No. 39 Front street east, where they will have increased facilities for their extending business.

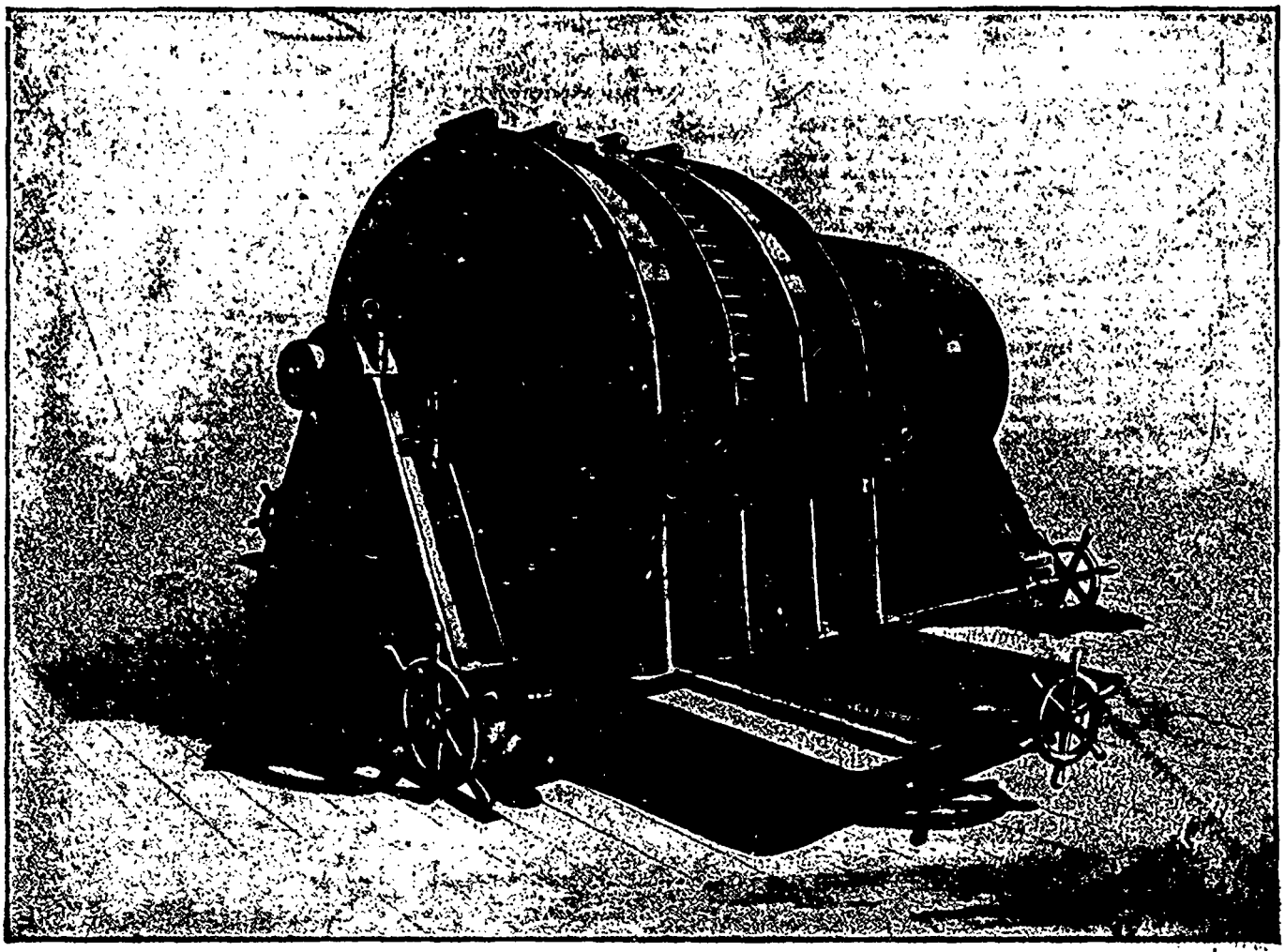
The insolvent estate of Messrs. T. W. Ness & Co., manufacturers and dealers in electrical supplies, of Montreal, has been purchased by Mr. Rankin, a member of the late firm, at 30 cents on the dollar.

The Thompson Electric Co., of Waterford, have sold to the Light, Heat & Power Company, of Newmarket, Ont., an 800 light alternating plant, 600 light capacity in (Diamond) transformers, 400 lights installed, plant to be in operation this month.

The well-known belting manufacturers, Messrs. Robin & Sadler, Montreal, and the Haworth Belting Co., of Toronto, have merged into one concern, and will carry on business in future under the firm name of Robin, Sadler & Haworth, with offices at Montreal and Toronto.

Mr. C. R. Garnoch, of Ottawa, who for several years was agent for the Pioneer Electric Light & Power Co., and Mr. Godard, formerly of the firm of Godard & Anderson, of the same city, have entered into partnership under the firm name of Garnoch, Godard & Co., for the purpose of doing all kinds of electrical work.

The Halifax Chronicle of Sept. 27th gives a description of the interesting electrical exhibit made by Messrs. John Starr, Son & Co., of Halifax, at the recent exhibition in the maritime provinces. The exhibit embraced "Starr"



THE STANLEY ELECTRIC CO.'S 240 KW. TWO-PHASE ALTERNATING GENERATOR.

incandescent lamps, Lahmeyer dynamos, unique telephones, switchboards, measuring and testing instruments, &c., the dynamos being run by a Robb engine.

The Thompson Electric Co., of Waterford, Ont., have recently sold the following arc dynamos. Bowman & Zinkan, Southampton, 35 light; Hanover Electric Light Co., 25 light, Jos. Williams, Glen Williams, 45 light.

The Royal Electric Co. have made recent sales as follows 800 light alternating plant to Conroy Bros., Deschene Mills, 60 light arc plant to Ottawa Electric Co., 1500 light generator Wingham Electric Co., 1800 light generator to Victoria Electric Light Co., Lindsay, 1400 light generator to Ratz Bros., Elmira, 2000 light generators to Hamilton Electric Light and Power Co., and Charlottetown, P. E. I. Light Co.

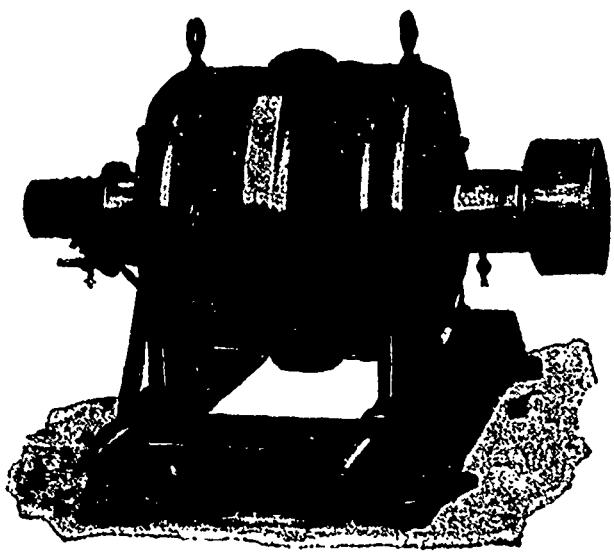
The Kay Electric Works, of Hamilton, Ont., were recently obliged, owing to dullness of trade, to call a meeting of their creditors. At the meeting the company's offer to pay 33⅓ cents on the dollar in settlement of their liabilities, was accepted by the creditors. In consequence, the company's works have not ceased operations, and it is probable that with the relief granted by their creditors and more active business conditions, they will meet with no further difficulties.

The manufacturing plant, patents, franchises, etc., of the Reliance Electric Mfg. Co., of Waterford, Ont., have been purchased by the Thompson Electric Co., of which Mr. J. W. Thompson, formerly President and Manager of the Reliance Co., is the Manager. The Thompson Electric Co. have the works in operation again, and will continue the manufacture of all kinds of electrical apparatus. Attention is directed to the company's announcement on front cover page of this Journal.

RIVALS OF THE STEAM ENGINE.*

THE title of this paper might lead one to believe we were on the point of a new era in engineering. By "Rivals of the Steam Engine," I simply mean, however, small powers of from one to sixty H.P. Some builders go so far as to say from 1 to 100 H.P. The economy of large plants where all the best appliances for generating and developing power are used, may be seen from the duty test of the S. S. Campania's engines, which developed 30,000 H.P. (same as boiler capacity of World's Fair), with the low rate of 1.16 lbs. of coal per I.H.P. per hour. This plant has made a saving of .25 or ¼ lbs. of coal over the last large marine engine built. The great saving that may be attained by cutting the coal per I.H.P. per hour, down ¼ of a lb., will be seen to be great. In a plant of the above named capacity, the saving would be 3¼ tons in 1 hour, and 90 tons in 24 hours. But in small powers this saving is far from being attained. Some engines from 1 to 60 H.P. use from 6 to 10 lbs. of coal per I.H.P. per hour. These engines are mostly in the hands of incompetent persons, and the plant fitted with the poorest appliances. I think that in such cases the steam engine has a rival.

Its rivals are comprised in three classes 1st, the gas or explosive engine, and, compressed air motor, 3rd, electric motor. I will first try to give a description of the gas engine and its mode of working. They are generally of the straight line, self-contained type, with very heavy frame. They are single acting. The connecting rod is directly attached to the piston, and is the length of the stroke, so as to give good bearing, having to act as the cross-head as well as piston. Their method of working is as follows: The gas is exploded once in every two revolutions—some having one explosion in three revolutions. The engine having just passed the centre, the charge of gas is exploded. The rapid expansion of the exploded gas drives the piston to the end of the stroke, when the exhaust valve opens and the returning piston drives the exhaust gas out. It then returns again this time acting as an air pump, drawing in the next charge of gas and air. The piston then starts on the return, the exhaust valve remaining closed during this stroke. The gas is now compressed, and when the engine again passes the centre the explosion takes place, the piston being thus driven forward again, the same action taking place as before, the governor admitting the necessary amount of air and gas for the load. There are three different



THE STANLEY ELECTRIC CO.'S TWO PHASE ALTERNATING MOTOR.

ways of exploding the gas—1st, by an electric spark in the combustion chamber; 2nd, by a gas jet in combustion chamber, and 3rd, by a tube heated red-hot, with which the gas comes in contact at time of explosion.

It will be readily seen that the heat of the explosions would be likely to heat the cylinder to a very high degree, thereby rendering lubrication difficult. This is remedied by the cylinder being jacketed and the jacket surrounded by cold water. In places where a running stream may not be had a tank is used. The water passes through the jacket and returns to the tank, thus keeping up a constant circulation. Some engines in France, with one explosion in three revolutions have no water jacket. The cylinder is supposed to be cooled by drawing in air at the second revolution and exhausting it and then drawing in the air and gas at the third revolution. This necessitates a very high speed to be steady, but would be all right for carriages, avoiding the necessity of carrying a water tank. These engines are now being used on carriages with great success, attaining a speed of from 8 to 10 miles an hour at a very nominal cost; and if improvements go on at the same rate as latterly, they bid fair to prove a strong competitor to the horse.

There are six different kinds of gases used in these engines, viz: Illuminating gas, gasoline gas, naptha, coal-oil, producer gas and natural gas. The illuminating gas at one dollar per thousand costs 2 cts. per I.H.P. per hour. Gasoline gas is mostly made by passing the gasoline through an atomizer, the current of air converting it into a gas. There is no danger from the gasoline. A tank is placed on the outside of the building, allowing only one quart inside, the connection being by a very small pipe, thus preventing any serious explosion in case of accident. Naptha and coal oil are protected in the same manner. The cost of gasoline per I.H.P. per hour is one cent, gasoline costing 10 cts. per gallon. Naptha gas is formed by the air being drawn through a tank in which there is a material which absorbs the naptha, thus forming a gas. The cost per I.H.P. per hour is 8-10 of a cent., naptha costing 7 cts. per gallon. Coal oil gas is formed in the same way as naptha and gives an I.H.P. per hour at a cost of one cent, coal oil costing 8 cts. per gal. Producer gas, or gas made from anthracite coal, takes about 1¼ lbs. of coal per I.H.P. per hour, equalling .35 of a cent—coal costing $6.00 a ton. The cost of natural gas where available is nominal.

There is one place in this city using light that I think could make a saving by introducing a gasoline engine and dynamo. The cost of light is one cent per ampere per hour. They are using three hundred and fifty (350) lights at one ampere per hour an average of four hours per day, which equals 1400 amperes, at a cost of $14 less 15 per cent. discount, equalling $11 90 cents. Now let us see what saving would be derived from using a gasoline engine, one H.P. giving 10 lights of 16 C.P.—350 lights requiring 35 H.P.—allowing 15 H.P. for loss in belt and machinery, equalling 50 H.P. This would cost 1 cent per H.P., 50 cts. in 1 hour, or $2 for every four hours. Allowing 50 cts for repairs, there would be a saving of $9 40. The lights are not generally on all together, but I took them in that way for the purpose of the comparison, to show the saving that might be attained.

I know of another place where a man pays 25 cts. a day for one H.P., using it for about 6 hours a day. The same service performed by a gasoline engine would cost about 10 cts. a day. Another place where they would do good service is in small yachts, saving the room of a boiler and being more economical. A small boat here in the bay, developing about 8 H.P., if driven steadily for 12 hours, would consume ½ of a ton of soft coal, costing $3 00, while using a gasoline engine the cost would be 8 cts. an hour, equal 96 cts., and the boat would have made better speed, owing to the absence of displacement caused by the boiler.

The reason these engines are so economical is we receive power only in one way, that is by heat. In the steam engine we transmit this heat to water, which forms steam, losing, as you all know, 967 heat units out of every lb. of coal, but in gas engines the products of combustion do their work directly on the piston, there being no loss through transmission, therefore, I think you will agree with me that now that gas can be produced from coal at the rate of 1¼ lbs. per I.H.P. per hour—which can and will be improved upon—the gas engine has a brilliant future. The largest gas engine so far built is 100 H.P., and one of its great advantages is that there is no getting up steam in the morning.

We will next take up the compressed air system, which is extensively adopted in Paris—which has at the present time a plant with a capacity of 25,000 H.P. In the first place, we must have a large plant with a large unit of power and all the latest appliances, so that the plant will give the utmost economy, built where cheap water could be had for condensing purposes, using triple expansion engines and the very best compressers. The next thing to decide is whether the pressure shall be 200 or 500 lbs. per sq. in. The saving of high over low pressure is small the pipes being much smaller for high pressure thereby making high pressure favorable using reducing valves at the point of distribution. It is a well known fact that in the best air compressers we only get 50 per cent. of the efficiency of the engine used to drive them, so that to make a profitable power we must in some way regain the power lost in compression. This is done by passing the air through hot water kept hot by a coal oil lamp or small fire. In this way damp, hot air is made, to which is given the properties of steam. The cost of heating the air is only 1 cent per H.P. When this heated air is used expansively, it gives the expansion curve on indicator diagram, just the same as the steam engine. In heating this air we regain the 50 per cent. we lost in compression. Deducting 5 per cent. for friction and other losses we get 95 per cent. at points of distribution. In selling steam for power, we have no means of registering properly the amount of steam used, a man with an automatic engine paying as much as a man with a slide valve engine, and using less steam. But with the compressed air system the amount consumed may be registered. The air not being heated until just before entering the engine, a man pays for just what he consumes. I think also that compressed air would be advantageous in street railway work. In electric railways there is a great loss in transmission in the wire besides the danger to life and inconvenience in cases of large fires. In the winter time there is a great inconvenience by the trolley wires being coated by ice, which is an insulator, and must be broken through, and in wet weather great loss through leakage. If anything happens to stop the power at the station for one minute the whole system is paralyzed. With compressed air each car has its own motive power, thus slight stoppages at the station would not inconvenience them. Electric cars give only 45 per cent. of the power applied to them, while compressed air gives from 70 to 80 per cent., thus effecting quite a saving. This is from tests made by Mr. C. E. Haupt, C.E.M.E. Where compressed air is distributed to consumers, the air is generally received into a large tank in the building. No damage could be done by the explosion of this tank the air merely escaping with a hissing sound. Experiments made by some mechanical engineers in Paris showed this effect. A weight was allowed to fall on the tank, so as to rupture it, with the foregoing effect. We thereby make a saving in insurance over handling a steam plant.

In testing the saving, if any, by using 400 lbs. per sq. in., it was found that it took as many cubic ft. of air at 400 lbs. per sq. in. as at 200 lbs. per sq. in., and the theory advanced was that the increased friction on working parts overcame any advantage gained by very high pressure. Now that high pressure in steam engines is becoming universal, I think a little study in this direction would be profitable.

I will now conclude with the electric motor. The electric motor has been in use since it was found that a dynamo with conditions reversed would act as a motor, and it has kept on improving until it has become a much used motive power. In large plants, where a great deal of power is distributed by long lines of shafting, the electric motor shows a great saving by driving directly the machines or the shafting of a single room. The loss in long lines of shafting due to friction and slip of belts makes only about 50 or 60 per cent. of the engine power available while with electric motor we get 70 to 75 per cent. of the engine power. Where the dynamo is the actual fly wheel of the engine a little more saving is attained on account of the slip of the belt which is sure to follow by running from a large wheel to a small one necessary to give the generator the required speed. In direct connected generators the speed is attained by the large diameter of the armature thus giving it rim speed, and also by the increased number of poles. I think in a well equipped station, with direct-connected dynamos giving 70 per cent. at points of distribution, if the distance be not too great, it could be made a cheap power. Another way in which the electric power may be utilized is by means of transmission from a water fall. But as the great cost of copper conductors is one of the chief items of such a plant, we must first look at any saving to be made in this direction. As we well know the higher potential or pressure we use, the less the size of the conductor required. A line carrying a thousand volts would cost $80 00 per mile. By raising the voltage to ten thousand we reduce the cost to $10 00 a mile. Most motors are run by direct current, but no direct current machine can make a voltage of over 1,200 to 1,500 volts, the insulation of the commutator not being able to stand any higher voltage, so that we have to look for a new kind of current. This is found in the alternating or multiphase currents. With these currents, by means of transformers, we can raise the current to any potential we like, and lower it again to any potential required at points of distribution, but the difficulty with the alternating current is that the alternating motors have to be brought up to speed by some other power, before they will carry the load. This difficulty is remedied by the use of the multiphase current, which is merely a double alternating current. A machine using this current can be started up under full load. Another way in which this difficulty may be remedied is by having in a central station an alternating motor, driving direct current dynamos, thus giving direct current to the consumer. The commercial success of such a scheme depends upon the first outlay for conductors and plant, and the dividend to be derived on such capital. Edison is credited with saying that current could not be as cheaply sent to Toronto from Niagara as it could be made on the spot, with the best compound engines.

In summing up this paper, I think you will agree with me that in some conditions small steam engines have a rival. We ought therefore to look around us and observe these powers, for at some time they may fill some of our necessary requirements.

*Paper by Mr. Geo. Mackie, read before the members of Hamilton Association, No. 2, C.A.S.E.

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

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IT has been decided that the next meeting of the National Electric Light Association of the United States shall be held in Cleveland, Ohio, on the 19th, 20th and 21st of Feb., 1895.

THE Dominion Government has announced that the new Electric Light Inspection Act will go into operation on the first of April next. The Controller of Inland Revenue is purchasing the necessary electrical testing appliances, and the gas inspectors whose services it is proposed to utilize as inspectors under the act, will be instructed in their duties during the coming winter.

IT is very likely that the recent opening of the Hamilton, Grimsby and Beamsville Electric Railway, may be of greater significance than is now recognized in marking the opening of a new era in the industrial history of Canada. The Niagara Falls electric road has a special function as serving a tourist route, and the H. G. & B. road is therefore the first electric road in Canada of any considerable length which serves a purely local traffic. The question of light railways as feeders to trunk lines, and as drawing freight and business to railroad centres, is a very live one. In England the question has lately been the subject of much discussion, as a means of affording relief to the agricultural depression from which the English farmer is suffering, by cheapening the carriage of his produce from the farm to the large transportation lines. On the continent of Europe large sums have been spent, provided on interest guaranteed by the government, on light railways for the same purpose, notably in France and Italy, though on the whole these roads have not paid interest on the investments. The question of drawing trade to the larger towns by passenger traffic on such railways, seems to be more particularly a question affected by the conditions of life prevailing in Canada and the United States. The H. G. & B. road is designed to serve both passenger and farm produce traffic, and though the results of this road should not, and will not, be conclusive in settling the question, either one way or the other, they will give most valuable information as to what are the essential conditions to be met by such roads in order that they may be commercially successful.

It should be pointed out to those who contemplate becoming members of the Canadian Electrical Association, that there is financially no reason for deferring sending in their applications to the Secretary. The financial year begins in June, and those joining between now and next June are not assessed for the current year, their membership dues dating only from the year beginning with June, 1895. The Ottawa meeting already promises to be most successful, and apart from the interest of the picturesque capital city, Ottawa has more to show the convention in the commercial use of electricity than any other town of its size on this continent.

THE thirteenth annual convention of the American Street Railway Association took place in Atlanta, Ga., on Oct. 17th, 18th and 19th, and is declared to have been one of the most successful ever held. Mr. Granville C. Cunningham, manager of the Montreal Street Railway, and Mr. Griffith, manager of the Hamilton Street Railway, were present. The former was elected a member of the Executive Committee of the Association. The nominating committee recommended that the next meeting be held in Montreal, Que. This met with spirited opposition from a section of the membership who were desirous that the meeting should take place in Philadelphia. The question was submitted to vote, when by a large majority the decision was given in favor of Montreal. Mr. Cunningham expressed his pleasure at the decision. He assured the members that there would be no difficulty in having supplies brought to Montreal for the exhibition which forms such an interesting feature of the annual meetings of this Association. The date for the convention in Montreal has been fixed for October 15th. We bespeak for the American Street Railway Association a hearty welcome to Montreal and the Dominion on the occasion of this their first visit, and feel assured that while here they will find much that will prove interesting and perhaps instructive from the electrical standpoint.

IT is announced that the investigation before the county judge into the alleged recent attempt at boodling on the part of some of the aldermen, in connection with the Toronto street lighting contract, will be held in the early part of November. Whatever may be the outcome of the investigation, the bare fact that such an accusation should a priori obtain credence to the extent that judicial investigation is considered necessary by a majority of the aldermen themselves, is a commentary upon the present condition of municipal institutions in Canada, which should be pondered over by those who have been inclined to civic ownership of a street lighting plant. For the credit of Toronto we hope that the accusation will prove groundless in this case, but that it should so readily be thought possible is sufficient to make prudent men pause before increasing the industrial interests committed to the care of the municipality. A lighting contract is let once in five, ten or twenty years, but a lighting plant would require continual purchases of supplies and frequent employment of men, with continual opportunities for jobbery and corruption; which, being on a smaller scale in each instance, would be the more difficult to detect, whilst the instances being more wide-spread, the effect would be more demoralizing to the community at large, than any one big "boodle" confined to a few already corrupt individuals. With the business parallel of ratepayers as shareholders and aldermen as directors in the municipal concern, and the directors under suspicion of abusing their trust for their private gain, what sensible business man would vote for increasing the opportunities for the suspected dishonesty.

THE late convention of the Canadian Electrical Association at Montreal marked a distinct advance. The general quality of the papers read stood higher than at any previous meeting. Some of them would have done credit to the older and larger associations established in the United States and England, and were worthy of fuller discussion than they actually received. In this respect the meeting brought out the present need of the Association, and that is increased membership. Though some of the papers provoked lively discussion, the good in them was not threshed out as thoroughly as would be the case with a larger membership of all classes, insuring that a sufficient number of speakers familiar with the subject of any one paper, might be present to give it full discussion. It is much to be hoped that many new members will be added to the Association before the convention to be held at Ottawa next September. Any objection that the annual dues were too high for an association which at present only holds one meeting during the year, was met by the action taken at Montreal, reducing the annual subscription of active members to $3.00 and of associate members to $2.00 per annum. To those who have refrained from joining until the Association should have successfully passed the initial stage and become an established and representative body, it may now be said that it is both successful and established, and it lies with those who are not already members to make it thoroughly representative by joining it. At the cost of time, labour, and personal inconvenience to many of the members, the Association has been advanced to that point, that the tone of its meetings and the character of the papers presented, are in advance of its size, and it may fairly claim from those who have awaited results, that they fulfil their implied pledge by swelling the membership and attendance. The Association has fully justified its formation; it is doing good work in establishing solidarity of feeling amongst electrical men in Canada, and in promoting intercourse amongst them. By the efforts of its present members it has attained a good standing, and its further rapid progress must depend upon increased membership. The fees are little more than nominal and there is no reason why every electrical man in Canada should not be a member, and every reason why he should for his own personal benefit, both directly by attending the meetings and rubbing brains with his fellows, and indirectly by promoting the growth and increasing the weight of a representative Canadian electrical body, which may speak with the authority to command attention if need be in matters of common interest.

THE Canadian Law Times for September in an article on the law of "nuisances" and "furious driving" as illustrated by recent decisions, deals with the probable bearing on the noise and speed of electric street cars. The conclusions are decidedly adverse to trolley cars as at present operated. It is to be presumed that the article is a correct statement of the legal aspect of the case. But though laymen are not competent to discuss what the law is, they are entitled to form an opinion of what it ought to be, provided they can give reasons for the faith that is in them. The article indicates the probable application to electric street cars of the law governing the speed of steam railroad locomotives where they are permitted to use the highway, and also that governing ordinary vehicles. But it is well to remember that in the endeavor to adapt itself to new conditions law sometimes requires assistance from the legislature. To ignore this is to violate the wholesome principle that the law should be respected but not worshipped. Otherwise good law may sometimes be poor justice. And underlying the whole treatment of the subject from the point of view of precedent there seems to lurk a fallacy in the form of an assumption that the electric street car is an intruder on the highway either allowed only on sufferance, or constituting a tyranny to be tempered by legal injunctions. A steam railroad which may be allowed to run for some distance through the public streets is a real intruder. But the electric car is merely a new form of vehicle using the streets for the primary purpose for which they were originally expropriated, and for which they are maintained at the public cost. In that it is a vehicle for general use and so of greater benefit than private conveyances, it may be rightly given by contract certain privileges over the latter, such as the right of way; and within the limits of safety to other vehicles and foot passengers, be permitted to travel at a higher rate of speed than other vehicles. The fact that it moves only along the line of its rails, and that its course is therefore perfectly obvious to the other users of the streets, determines its safe speed at a considerably higher limit than, for instance, the erratic butcher's cart. As a noise producer the trolley car is certainly very effective a more melodious substitute for the clanging bell would be welcomed but it is not in it with the early morning ice cart, or with heavy trucking of any kind. It is to be expected that the best residences will seek streets that are near but not on a trolley line. In other words the tendency will be to drive residences off trolley streets and turn them into business streets, but this also is the tendency where there is much traffic of any kind

on a street, without it being necessarily a good reason for stopping the traffic. The article in the Canadian Law Times points out that an annoyance to daintiness, fastidiousness or delicacy does not constitute a legal nuisance, which must be such a physical annoyance as materially affects the ordinary comforts of life to people of all ranks, ages and states of health. The trolley car must keep its noise within this limit, and it should have no difficulty in doing so, whilst such a provision as that in the Toronto Railway Act that the street railway speed shall be "determined by the City Engineer and approved by the Council" seems to satisfactorily cover the question of speed, by placing its control in the hands of those most affected by it and best fitted to judge what best suit them, namely, the citizens of the town where the street railroad operates.

IN the case of the Toronto Street Railway Company v. the Queen judgment has been given in the Exchequer Court at Ottawa, against the plaintiff. The company took suit for $56,000, being the amount which they had paid as duty on rails imported in 1891, 1892 and 1893, and which weighed 69 lbs. per yard. They asked for a refund of this amount. The customs department had exacted a duty of $6.00 per ton, claiming that this was the correct reading of item 88 in the tariff, bearing on steel rails. The contention of the company was that the rails, imported by them, should have come under item 173 of the tariff, which provides that rails "for use in railway tracks," weighing over 25 lbs. per lineal yard should be admitted free of duty. The real question at issue is whether the term "railway" included tramways. The judgment of Justice Burbidge is one of peculiar interest to all concerned in the development of electric railroads. It is argued that in 1887 the government were endeavoring to promote two interests, which somewhat clashed, namely, the manufacture of iron and steel, and the building of lines of railways; so they put a duty on light rails and admitted the heavy ones free. They did not wish to promote the building of street railways, contended the Court, as that opened up no new country, and so in the term "railway" they did not intend to include street railways. In the new tariff of 1894, the government left no doubt as to their position on this matter, it being expressly stated that steel rails for tramways and street railways shall be made dutiable at 30 per cent., while the free item in the tariff reads very plainly, so as to exclude "rails for use in the tracks of street railways or tramways." In a word, according to the tariff in existence to-day, a steel rail weighing over 45 lbs. is free for a steam railway, but is taxed 30 per cent. when imported for a street railway. With the development that has taken place in the building of electric railways, not only as a most efficient method of propulsion in all our larger towns and cities, but also as a means of connecting various municipalities throughout the country one with the other, it is difficult to understand the considerations that influenced the government in fixing the tariff on this item as they did at the last session of parliament. It is worth remembering that out of fully 1,000 street car plants existing in the United States and Canada, at least 25 per cent. of these are operated by electricity. Or to put it another way, where in 1891, there were only seven electric railways in the United States, it is computed that to-day there are probably over 500 cities in that country equipped with electric roads, while progress in this line in Canada has been greater than in any other part of the British empire, excepting the mother country. Within the short period of twelve months, the development in the building of electric roads in Canada has been very remarkable. We may refer simply by way of suggestion and illustration to the lines recently completed, connecting the towns of Galt and Preston, and to the projects under way uniting important sections of country in the vicinity of Hamilton, Dundas and Guelph, as also the proposition now on foot to build an electric railway between Ottawa and Brockville In all parts of the Dominion projects of this kind are being planned and in many cases put into operation. To what extent electricity will, in the future, become a competing element with steam in the transportation of both passengers and freight along our great highways need not, perhaps, be discussed at this moment, but what has already been accomplished in the case of the Niagara Falls Park & River Railway, and what is projected by the Canadian Pacific in certain parts of British Columbia, is at least suggestive of large development in this direction, in the not distant future. A New York electrical journal points out, in this connection, that steam railway managers have "in more than one instance of late had to face the electric road as a competitor; and we believe the time is not far distant, when a serious struggle for supremacy between the two, at least for short haul traffic, will be in full progress." How far also the government should draw a distinction between the development of interior sections of the Dominion, and the growth of our towns and cities is a question that will come home to capitalists in all parts of the Dominion. Lines of electric railway are being built in every direction, and who will say that both city and country have not been benefited, as a result of this development? It is quite likely that an appeal will be made from the judgment of the Exchequer Court at Ottawa, and this case of the Toronto Street Railway go to the Supreme Court. To this extent, the case is yet, perhaps, sub judice, but despite the fact, capitalists will not hesitate to take contention with Justice Burbidge in his judgment as already given out from the Court, and see more clearly than before the unfairness of the tariff of 1894, as bearing on steel rails when used for street railways and electric purposes.

THE A. S. M. E. IN CANADA.

There is little doubt that there is a very general regret that the relatively few cities in Canada suitable for holding a meeting of the American Society of Mechanical Engineers makes it unlikely that meetings will often be held there, for a long time to come, at least. The recent experience of the society with Canadian hospitality and good fellowship is one that will be long and most pleasantly remembered. From the moment of arrival in Montreal to the moment of final departure nothing that the kindest hospitality could suggest or the most open-handed generosity provide was neglected or omitted, and no honor, social or otherwise, was by the Canadians considered too great to be bestowed upon their visitors.

It is to be hoped that the result of this interchange of courtesies by influential men will result in much good to both sides. Engineering and science recognize no political boundaries, nor should they; nor is it true, as Senator Frye recently declared, that "Canadians hate Americans," a declaration which, though referred to in some of the addresses of welcome, was contemptuously dismissed as unworthy of notice by sane men. But if it were true, and the recent visit to Montreal and Ottawa showed how Canadians treat those whom they hate, then we are curious to know how they treat those whom they love.—American Machinist.

LEGAL.

The Sherbrooke Mutual Fire Insurance Co. brought action against the Bell Telephone Co., to recover $1,900 insurance paid to a tenant of the building in which the company's exchange was located at Richmond, Que. The plaintiffs claimed that through negligence on the part of the defendants a cross had occurred between an electric light and telephone wire, which resulted in setting fire to the building. Mr. Justice Archibald held the defendants to be liable and gave judgment for the amount claimed.

PERSONAL.

Mr. Thos. Ahearn, the well-know electrician, of Ottawa, has recently returned, with his family from a visit to Europe.

Mr. Spencer, lately with the Ottawa Electric Railway Co., has removed to Albany, N. Y., having secured a position with an electrical company in that city.

Mr. E. R. Merrill, who was for several years instructor in electricity at the Toronto Technical School, has been elected principal of that flourishing institution.

Mr. D. H. Keeley, superintendent of Government Telegraphs, is at present in the Maritime Provinces, supervising repairs to the cables between Grand Manan, Campobello and Eastport.

Mr. Duncan McDonald, who has been connected with the company for a number of years, has been appointed superintendent of the Montreal Street Railway, to succeed Mr. Franklin.

Mr. I. B. Mackay, superintendant of construction of the Niagara Falls Park & River Railroad, was tendered a banquet at the Baltimore House, Chippewa, and presented with a handsome gold watch by the officers and employees of the company, on the eve of his departure for his home in Montreal.

THE ONLOOKER.

A RECENT news item bears the information that in connection with a certain proposed extension of the electric railway system in Hamilton, an attempt will be made to do away with trolley wires, and adopt in their stead, as a working conductor, a sectional rail laid between the tracks. The suggestion opens up a wide subject for discussion. Though the service from the trolley system generally in vogue to-day is not in every respect satisfactory, yet electricians have found it a difficult matter to furnish a substitute that can be made practicable. The Onlooker, in course of conversation the other day, mentioned this Hamilton proposal to Mr. James Milne, electrician at the main station of the Incandescent Light Company, Toronto. His judgment is, that it will be a long time, if ever, before this system of electric street car propulsion can be made workable. "There will always be the difficulty," said Mr. Milne, "of moisture affecting the electrical current. We experience a difficulty as it is, from the fact that in a measure the trolley system is underground. The trouble would be aggravated were a sectional rail adopted, or for that matter any of the proposed conduit systems."

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It is natural to expect, with the wonderful growth of electricity as a method of street car propulsion, and with the very wide developments in electrical science in all its different branches, that earnest and determined efforts should be made to improve on the much abused trolley. "The ideal system," said Mr. Milne, "is, of course, the storage battery, but it seems a hard matter to overcome a number of difficulties that beset every experiment made in that direction." At the same time the Onlooker is reminded that there are, at least, a few cases where the storage system seems to have worked well. Storage battery traction has been adopted at Birmingham, Eng., with sufficient success to show that the storage battery may become an efficient competitor with other methods of traction. These, however, are exceptional cases, and will hardly prove the rule. There have been many experiments made with the open slot conduit. At Buda Pesth, Hungary, such a system has proven a practical and commercial success for some time. The Onlooker has been interested in a paper of some length by Mr. Joseph Sachs, and published in a late issue of Cassier's Magazine, where the whole subject of conduit electric railways is discussed at considerable length. This writer remarks that all of the open slot conduit methods embody the slotted trough or conduit running parallel and adjacent to the tracks with the necessary contact wires supported inside upon proper insulators. The current is supplied from a central source and the wire is continuously charged along its entire length. Mr. Sachs says he is of the firm belief that an open slot continuous wire conduit can be devised that will be commercially practical and efficient at a cost which will certainly compare favorably with the cable. The main difficulty in conduits that have previously been experimented with has rested in the meagre dimensions and bad location of the contact wires, and lack of proper drainage facilities and protection of the wires from moisture. With the amount of study that is being given to this question by many of the best electricians of the country it is not unreasonable to expect that Mr. Sachs's expectations will yet be realized, just as Mr. Milne has remarked that the time will come when the storage system will be an actuality. The Onlooker must say, however, that this time yet seems a good way distant, and especially where climatic conditions are of the character that we experience in Canada.

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The system in which the current is supplied to the car by a continuous bare conductor laid upon the surface of the street received the consideration of Edison some time ago and was patented. It, however, has not come into the realm of practical everyday operations. Then there is what is known as the magnetic service contact railway, devised by the late C. J. Van Depoele, where the working conductor is composed of sectional bars or straps of magnetic metal supported upon the conduit so as to be flush with the surface of the street, and insulated from one another. A method somewhat similar to this is that in which contact boxes are located at intervals along the road. There has also been made recently an experiment at New Haven, Conn. In this the switch boxes are located in a slotted conduit of rather small dimensions and are separated from one another by a distance of several feet. The tops of these boxes form the contact conductor and are so arranged that they can be depressed by the current collecting plow projecting through the slot. More ideal, perhaps, than any of the conduit methods is the induction electric railway, in which all contacts, whether in a conduit, or on, or above, the surface of the street are eliminated. A Mr. M. Dewey is working on this induction system at the present time. It will thus be seen that the Hamilton people, should they experiment on the conduit system, will not be the only ones who are endeavoring to get somewhere along that line. That there are difficulties in the way is clear from what has been suggested in these comments.

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It is perhaps not generally known that the Incandescent Light Company furnish power to the Toronto street railway at from 500 to 650 volts, and this circumstance has caused Mr Milne, no doubt, to give considerable thought to the question of electric propulsion of street cars. He believes that the time will come when over-head wires will be so adjusted as to completely supplant the present trolley methods. A German engineer, Eugen Langen, of Cologne, has worked out plans for what he calls a suspension road. Mr. Langen proposes to carry the two lines of rail on only one line of poles by means of brackets. The floor of the suspended car is to be about 17 feet above the street surface and the posts therefore would have to be about 26 feet high. Electric motors are to be used for propulsion, the current being supplied through a contact strip carried along the girders. In the twin towns of Eberfield Barmen, in Germany, the building of a road of this kind is being seriously considered.

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In the case of the suit brought by Mrs. Agnes Hartford, in this city, against the Bell Telephone Company, the Toronto Electric Light Company, and the Holmes Protection Company for $25,000 damages on account of injury sustained by the falling of a live wire in King street west some time ago, the Onlooker has noticed that the methods of insulating and hanging wires in use here have been severely criticised by Mr. Fred. J. Cross, of New York, an electrician of Cooper's Institute, who appears to have been brought on as an expert witness for the plaintiff. Mr. Cross ventured the opinion in the witness box that the insulation here is by no means of a high grade, and that in New York, were no better methods adopted, it would be difficult to obtain insurance from any insurance company. The Onlooker asked the opinion of a local electrician on this question, and he admitted that there was room for improvement in our methods of insulating. "We are sometimes," he said, "too careless in the work of outside construction. But why an electrician has been brought all the way from New York to give evidence in a case of this kind I do not know. We have many capable men in Canada who could have spoken with just as much knowledge and authority on this matter. The best insulating work that I know of in Canada is to be found in Montreal in connection with the work done by the Royal Electric Light Company." In Mrs. Hartford's case a non-suit has been entered for the Bell Telephone Co. Damages have not yet been fixed against the other two defendants, but will probably represent about $8,000.

BOILER COMPOUNDS.

AT a recent meeting of Hamilton Association No. 2, C. A. S. E., a paper was read by Mr. McKinley on "Boiler Compounds," as follows :

IN considering the value of boiler compounds two things should always be known, first, the nature of the scale; second, the chemical and solvent action of the mixture on that scale The scale on the boiler represents the insoluble part of the total solid of the water used with the suspended mineral and vegetable matter. As these insoluble salts differ both in quality and quantity in various waters so must the quantity and amount of the scale formed vary. In some districts the amount of insoluble solids in a water will be represented by from 2 to 5 grains per gallon, others from 20 to 25 and even higher, thus showing that it is unprofitable to use the same amount of boiler compounds in all localities. It may be supposed that scale is formed only by precipitation from the evaporation of the water to such an extent that all the total solids are thrown out of solution, but the precipitate begins to form long before this. When a solution containing the insoluble salts of lime, carbonate hydrate and a sulphate is raised to the boiling point, approximately half of the salts are precipitated without any evaporation, because the lime salts are much less soluble in boiling than in cold water. Hydrate lime soluble in cold water, 750 parts hot, 1 650 parts; sulphate lime soluble in cold water, 400 parts hot, 500 parts; carbonate lime soluble in cold water, 23,000 parts hot, 40,000 parts. There is no doubt that most of the scale is formed during the night when the water is in a quiet state, as it then has a better chance to become firmly attached to the flues and sides of the boiler The chemical nature of the scale for the Hamilton district may be represented by. Carbonate of lime, 65 per cent., carbonate of magnesia, 20 per cent.; sand, 3 per cent.; sulphate of lime, 4 per cent.; oxide iron and alumina, 2 per cent.; invisture, 6 per cent., total, 100.

In a boiler or series of boilers using, say, 1,000 gallons of water per day the deposit would be for the Hamilton district 9,000 grains of one pound, or in one week, six pounds. There can be no doubt that in blowing off most of this is removed, but the layer in immediate contact with the metal is not disturbed. In a boiler with thick hard scale the cheapest way to remove it is with a chisel or instrument for the purpose, then follow with a good compound. In a clean boiler a good compound should prevent the precipitate from settling into a hard state and prevent it from growing. It must be remembered that it is easier to prevent a precipitate than to dissolve one when formed, and also in a hard slate-like scale only the surface is acted upon, while the precipitate is suspended, it is subjected to the full action of the solvent. A boiler compound may have a three-fold action, a slight chemical, a solvent and a mechanical action. This slight chemical action may change some of the salts and thereby retard the formation of the scale; but in the majority of cases the solvent and mechanical action are the two important factors. The best solvents are caustic soda, chloride, ammonia, hyposulphite soda, chloride soda and sulphate of ammonia. The best mechanical agents are bark extracts, molasses and glycerine. In all probability the most effectual work of a compound is to keep the precipitate from settling hard. Suppose you have a week's precipitate, of seven pounds, in the boiler, and you have used through the week four gallons of a compound, carrying eight pounds of caustic soda, chloride soda, etc. These salts having a strong affinity for water, keep the precipitate soft, so it is readily detached when blowing off. If the precipitate consists of clay and sand, with a small percentage of lime, salts, bark extracts and molasses are the most satisfactory things to use. When the water contains carbonate of lime I would not advise using carbonate of ammonia or soda in the compound, as carbonate of lime is very insoluble in water containing alkali carbonates, the solubility being about one in 65,000 parts.

I submit the following formulas for compounds No. 1—Caustic soda, 30 pounds; (salt) chloride soda, 30 pounds, oak bark extract 5 pounds, water, 15 gallons. Use 2 gallons twice a week.

No. 2—Chloride ammonia, 10 pounds; molasses, 50 pounds; water, 10 gallons. Use 2 gallons twice a week.

In the discussion that followed Mr. McKinley said that he thought there was no composition with which a boiler could be painted to prevent scale adhering; also that sal soda (washing soda) helped rather than prevented scale.

ELECTRIC RAILWAY DEPARTMENT.

THE NEW ELECTRIC STREET RAILWAY AT ST. JOHN, N. B.

THE city of St John has an entirely new system of electric street railway. The work from start to finish was carried on under the direction of most competent overseers and is thorough in every respect. There is not a better track in America, the cars are finished comfortably and almost elegantly; new engines, boilers and generators have been placed in the power station, the car sheds and offices of the company have been enlarged and extensive repairs made on each. The company has a thoroughly reliable and competent staff of conductors and motormen. It will thus be seen that St. John is abreast of the times in possessing a first class electric railway.

A. R. BLISS, Electrician.

The first electric street railway in the city was opened up in the spring of 1893, and took the place of the old horse-cars which had been in use four or five years prior to that date. The company that owned and operated the road at this time was known as the Consolidated Electric Co. It had its power station on Union street and did a large share of the city lighting. The company afterward became involved financially, and last April the railway was put up at auction and sold for $90,000 to a company composed of the following named gentlemen: Sir Wm. C. Van Horne, James Ross, H. P. Timmerman, H. H. McLean and Col. J. J. Tucker, directors; Sir Wm. C. Van Horne, President; James Ross, Vice-president; F. W. Warren, Secretary-treasurer.

The road had practically fallen into decay. The first thing therefore on the part of the new company, was to order new and suitable rails from England. This done, they immediately began operations and employed steadily between 350 and 500 men. Work was commenced on the streets which had not been before covered by the railway, but which were to form portions of the new circuit which the company proposed to make for the better accommodation of the citizens. Ground was broken on the second or third day after the arrival of the rails at the corner of Crown street and King street east. The men were divided up so that the work was going on all over the city at the same time. The work progressed at the rate of from 350 to 400 feet per day on each track.

The "T" rail was adopted instead of the old flat rail. The rail now in use is 6½ inches deep. It is placed on heavy cedar ties or sleepers firmly bedded in ballast. The rails are bolted together by means of six bolts having a fish plate on each side, thus making a true and substantial job. The special work, that is, the intersection, was made by the Canada Switch Co., of Montreal. This work was made from diagrams showing only the angles of the streets. The rails were bevelled and slotted in the shops and shipped straight to the streets where they were put together for the first time, showing at a glance the great care and accuracy with which the rails were handled in the shops. The streets that are double tracked are Prince William street as far as Indiantown wharf, where the river boats discharge, and Brussels street. The remainder of the streets have single tracks.

The old over head system was taken down and replaced by a better and more recent one. The wire is copper about ⅜ inch in diameter carried on a span wire reaching from pole to pole across the street, having all the necessary frogs, insulators, etc. The cars, which were built expressly for the St. John Railway Co. by the Ottawa Car Co., of Ottawa, have excited the admiration of all who have seen them. They are 24 feet in length and are provided with a vestibule at each end so that the driver and conductor will be completely protected from the weather. The interior finish of the car is of mahogany, upholstered in English Wilton, with bevelled plate glass mirrors, birds eye veneered ceiling, polished brass trimmings and automatic Pullman car curtains. Each car has a coal stove of the new Gurney style which rests upon the seat in the centre at one side of the car. The register of the fares is operated, not by means of a cord, as in the old cars, but by means of an iron rod to which short levers are attached. Each car is provided with a clock, and the whole aspect of them is most cheerful and comfortable. The new cars will not require to be turned, so that neither Y's nor turntables will be necessary, for the motor men can operate them from either end, both ends being alike. This arrangement will save much time and will be a great convenience in every way. The new cars will be provided with life saving fenders. The car bodies rest upon solid iron trucks and have powerful springs, and running on a perfect road bed they will be entirely free from all jolting and jarring which have made the other cars so uncomfortable. It may be said of these cars that they are equal in appearance and equipment to any cars on any street railway in the United States or Canada. They are handsomely lettered and the circuits to which they belong are shown by letter boards on their sides and in front.

CHAS. D. JONES, Superintendent.

POWER STATION.

The power station which is situated on Union street is used for lighting the town as well as to supply power for the railway. The railway engine which was built in Auburn, N. Y., is expressly designed for street railway work, and capable of withstanding the sudden variations of load incidental to the work. Belted to this engine are two Westinghouse railway generators of 250 horse power each.

As a result of additional plant in the engine room, the company has had to increase its boiler capacity, but owing to the very contracted space, it has had to build two additional stories. On the ground floor is the boiler, and above it the fan and economizer. Three boilers of the locomotive type have been added, and they are expected to do good work as they are very fast steamers and a class of boiler adapted to a station where sudden changes of load cause great fluctuations in demand for steam. The intention is to run the station on the induced draft principle, the first of the kind in the maritime provinces if not in Canada. It does away with a brick chimney altogether. The fan which is used was made in Boston and is capable of handling the gas from a 1200 h. p. boiler. The machine has been placed on the first story above the boiler. The gas will be drawn through a

Green economizer of 320 pipes. On the top of the economizer is an arrangement of gearing for scraping the soot off the pipes. The soot falls into a pit below. The water which enters the economizer at a 100° is heated to 250° before going into the boilers.

The car sheds, situated at Indiantown, are two in number, 150 feet by 65 ft. wide, and 132 by 62 ft. One of them is fitted up for storing cars at night. In this shed is a washing and drying department where the cars will be cleaned after their day's run The other shed is fitted up as a repair shop. A boiler will be placed in one of these buildings for heating purposes. As hinted in a foregoing paragraph the old railway in no sense served the

needs of the people of St. John, but the road that has just been placed in operation will serve the city so thoroughly that no house will be more than a block away from the line. There are twelve or fifteen new cars, then a number of the old electric cars were repaired and made nearly as good as new. All these have been placed on the track and have been arranged to give a six minute service.

A number of St. John capitalists are laying out a park around Lily Lake, a beautiful sheet of water only a few moments walk from the city. When the park is completed, the St. John railway Co. has promised to extend its track to the lake. With a car running to this lake every few minutes it would be one of the most popular resorts in the vicinity of the city. Then it is intended to extend their line to Fairville, a pretty little suburb a mile out of the city. There is also strong talk of running the cars to Rothesay, nine miles out of town, on the line of the I. C. R. Many prominent business men live at Rothesay during the summer.

The superintendent of the road is Chas. D. Jones, and the electrician, A. R. Bliss, whose photos appear in connection with this article.

SPARKS.

The Ottawa Electric Street Railway Co. have been petitioned to extend their Bank street line to the village of Billing's Bridge.

Collingwood capitalists are said to be considering the question of forming a company to build an electric street railway in that town.

Messrs. C. E. Harris, superintendent, and Briggs, chief electrician of the Nova Scotia Telephone Co., recently selected a route for a metallic circuit line between Truro and New Glasgow.

The suit brought by the Edison Electric Light Company against Westinghouse, Church, Kerr & Company, for infringement of the feeder and main patent, has been decided in favor of the defendant by Judge Acheson, of the United States Circuit Court of Appeals, at Philadelphia.

Mr. P. R. Randall is at the head of a company which propose to construct an electric railway in Port Hope, and to extend the same to Rice Lake, there making connection with a line of steamers making four trips a day to Peterboro'. The company propose also, to build a branch line to Cobourg.

American capitalists are said to be negotiating for a charter for an electric street railway, at Brockville, Ont. Mr. W. H. Comstock, a well-known citizen, holds a charter for a horse railway; but is said to be willing to dispose of it at a nominal figure, in order to induce the construction of an electric road. The promoters of the new enterprise ask a twenty years' franchise, exemption from taxation, and the privilege of operating their cars every day in the week.

The Quebec City & District Railway Co., is seeking a charter from the Quebec Legislature to construct and operate electric railways in the city of Quebec and adjoining counties. The promoters of the company are Hon. L. P. Peletier, advocate, of Quebec, M.P.P.; Hon. Phillippe Landry, of Villa Mastai, senator; J. J. T. Fremont, advocate, M.P., P. B. Eumoulin, banker; Bernard Leonard, painter; John T. Gregory and Earnest Paeaud, the five latter of the city of Quebec.

The syndicate which proposes to construct an electric railway from Hamilton to Guelph, is reported to have purchased the Niagara Central Railway, which operates between St. Catharines and Niagara Falls. It is said to be the intention of the purchasers to extend the road to Hamilton, and there make connection with their proposed radial electric lines. At a meeting recently held at Waterdown, of those interested in the Waterdown and Guelph Electric Railway, it was stated that a Boston syndicate are prepared to undertake the construction of the road, and that the only question now to be decided is, what route the line should take out of Hamilton It is said to be the intention of the promoters to build the road with rails of sufficient weight to carry a freight train of twenty-five cars. Sir W. P. Howland made the statement that the syndicate represented a capital of $50,000,000. A committee was appointed to negotiate a basis of agreement with the company, and to report to a future meeting of the ratepayers.

OPENING OF THE HAMILTON, GRIMSBY AND BEAMSVILLE ELECTRIC RAILWAY.

THE Hamilton, Grimsby and Beamsville Electric Railway, frequent mention of which has been made in the ELECTRICAL NEWS during the period of its construction, was formally opened for traffic on the 17th of October. A large number of invited guests participated in the opening ceremonies. The company and invited guests embarked at the Hamilton end of the line at two o'clock p.m., and were conveyed to Grimsby, stopping en route at Stoney Creek to inspect the power station and its equipment. At Grimsby a tempting luncheon was enjoyed, following which came a number of speeches in which well deserved praise was bestowed upon the enterprise of the company and the creditable manner in which they have carried out their undertaking. All were delighted with the beauty of the scenery through which the line passes. We present portraits of Mr. F. E. Handy, under whose superintendence the road was constructed, and Mr. Clyde K. Green, who has been appointed to succeed him as electrician for the Company. It should be mentioned that Mr. Handy is about to make a visit to Europe. Mr. Green is a young man, who, after finishing a college course, accepted a position with the Edison Co. at Peterboro'. He continued with the Canadian General Electric Co. after the amalgamation of the Edison and Thomson-Houston interests. On the opening of the Toronto Street Railway he transferred his services to them, and was in their employ until last September,

F. E. HANDY, Superintendent of Construction

when he received the appointment to his present position. The following particulars of the road, with the electrical supervision of which he has been entrusted, will doubtless prove interesting :—

POWER HOUSE.

The building is a substantial brick and stone structure, 40x95 feet in size, and standing back from the main street just east of the bridge at Stoney Creek. The boiler room, which is 30x40 feet, contains two 200 h. p. tubular boilers, with room for a third. The flues of these boilers are so constructed as to utilize all the heat possible from the coal consumed, and are bricked over, allowing room for the smoke after leaving the tubes to pass between the shell and brickwork back to the chimney flue. Mr. McFarlane, engineer of the Hamilton Water Works, by request of the Company, put in the steam plant. The first thing that meets the eye on coming to the engine room is the switchboard, which for the size of the plant, cannot be beaten in America. It has a full set of instruments for each generator, all mounted on marble slabs, and these placed on another large marble board 7x8 feet in size. The arrangement of this switchboard reflects credit on the electrician. Right here the line is divided and separate bus bars are put in for east and west. The following instruments adorn the switchboard. Two 3-jaw switches, four automatic circuit breakers (two of these for feeders instead of the old-time fuse), two generator ammeters and one main line ammeter; two voltmeters (one portable), two single jaw switches for feeders and trolley, two generator lightning arresters, and two Wurtz arresters. The whole of these instruments were supplied by Messrs. Ahearn & Soper, of Ottawa.

Two Westinghouse generators, capacity 150 h. p., 225 amp multipolar, supply the current, being belted to two 150 h. p. Corliss condensing engines, supplied by Messrs. John Inglis & Son, Toronto. One of these units is enough for the traffic during nine months of the year, but on account of the heavy Grimsby Park business during the remaining three months,

July, August and September, both engines and generators will have to be in operation.

Water for condensing is found in a pond 15 feet deep and 60 x120 feet in size, situated some 20 feet west of the power house. Two car wheels are grounded in the pond and connected to minus bus bars and station arresters. The leads, trolley feed and tracks are strung over rafters in the building and through a perforated block of stone in front of the building, then branch off east and west along the line. A substantial brick chimney, 100 feet high, towers up at the rear of the building.

CAR BARN.

This building is of brick, 50x130 ft. Being situated at Grimsby, it allows for an early car leaving the barn to bring passengers and milk to Hamilton by 6:30 a.m., insuring a much quicker delivery to the city than the present mode. There are three tracks in the barn, one with a pit nearly the entire length for cleaning and repairs to motors. At the west end of the building is a large store room and machine shop 15x40 ft., where a motor will be installed to operate lathe, drill, etc.

CARS.

Eleven cars constitute the first equipment of rolling stock. They comprise five trolley cars, four 32 ft. and one 28 ft. bodies, with double McGuire trucks, and one single McGuire truck—all

CLYDE K. GREEN, Electrician.

having Westinghouse motors of the latest design (30 h.p.) Controllers are the new series multiple type. There are four freight cars and two very fine open cars, probably the longest in Canada. All the cars were built by the Ottawa Car Co.

THE LINE

is 16½ miles long, with six turnouts or switches, and several stubs blind sidings for the freight cars. The trolley wire is No. 0 B. & S., with 14 miles of 0000 feeder. A metallic return of No. 10 copper, telephone system, is also installed. All bells and clips, strain holder insulators, etc., were made by Ahearn & Soper. The brackets, made in Hamilton, are on the iron pipe principle, screwed into ½ inch boiler plate, which is bolted to the pole. The poles are 28 feet long, and all well tamped into six feet of ground. One feature of this line is the number of slight curves, necessitating a large number of stubs and guy poles.

THE TRACKS.

are of the above length at present, but arrangements are in progress to run them to Grimsby Park and Beamsville in the spring, which will make the entire line 28 miles. Rails are mostly of the pattern weighing 50 lbs. to the yard, but in the centre of Stoney Creek and in Hamilton city limits, 86 lb. girder rails were called for. These rails are bonded with No. 0 copper, and cross bonded every fifth rail with same size copper. The ferrule cap style of bonding has been exclusively employed.

Messrs. Wm. Stewart & Son, architects, of Hamilton, designed the buildings; Messrs. Myles, the Civil Engineering; the whole of the electrical equipment of the road being in the hands of Mr. F. E. Handy, Electrical Engineer, late of the Vancouver, B. C., Westminster and Vancouver Tramway.

Trouble is very often experienced with Corliss valves pounding by the breakage of the springs that hold the valve to its seat, says the Boston Journal of Commerce. When this occurs a clicking noise is heard that is very disagreeable to the engineer who wants everything to run quietly. An engineer who was troubled with these springs breaking was induced to change the character of the spring. Instead of using brass spring wire, similar to that found in the engine, he tried a steel piano wire of good quality, and to prevent rusting had it nickled when it was cut to the right size. The spring was cut longer than needed, and put into a vice and compressed coil to coil to give it all the set it would ever have. The springs have given no trouble since.

SPARKS.

The increasing use of bicycles is said to be making serious inroads on the receipts of electric street railways in Montreal, Toronto and other cities.

The Montreal Street Railway Co. show a surplus for the year ending September 30th last, of $37,354.46. A half-yearly dividend of four per cent. has been declared, payable on the 8th inst.

The Galt and Preston electric railway has proved so successful that application is to be made to the legislature for authority to increase the capital stock of the company from $50,000 to $100,000, the object being to extend the road to Hespeler. The company is said to be now making a profit of about $50 per day.

An offer is said to have been made to the Winnipeg City Council by prominent officials of the Toronto and Montreal Street Railway Companies for the erection of extensive gas works in return for certain concessions. *The extension of the Winnipeg street railway system to Armstrong Point*, a residential suburb, is also said to be under consideration.

Ottawa and Brockville capitalists are said to have decided upon the construction of an electric railway to connect these cities. It is said that the headquarters of the company will be in Ottawa, and that water power from the Chaudiere and Rideau river will be employed for the operation of the road to a point twenty-five miles from Brockville, and that for the balance of the distance, steam power will be used.

It is reported that the Toronto & Scarboro Electric Railway Co. have transferred the control of their road to the Toronto Street Railway Co., accepting as payment shares in the latter company. The Scarboro road is said to have come short of paying expenses. Should the transfer take place it is said to be the intention of the Toronto Railway Co. to complete the line to Victoria Park and carry passengers to the park at single fare.

A charter has been granted to the Packard Electric Co., Ltd., with a capital of $300,000. The following is a list of the incorporators: W. D. Packard, J. W. Packard, Jno. H. Howry, H. K. Howry, Chas. C. Paige, A. Mackenzie and Chas. L. D. Sims. It is the intention of the company to go into the manufacture of electrical apparatus and machinery, as well as incandescent lamps. They have not yet decided upon a location for their works.

From the annual report of the Commissioners of Queen Victoria Park, Niagara Falls, for the year 1893, it is learned that the number of people who entered the park during that year, was 543,924 as compared with 233,495 in 1892. The great increase is attributed to the Niagara Falls Park and River Railway which carried in seven months of 1893 over 400,000 passengers. It is somewhat peculiar that the carriage traffic has also increased since the electric road went into operation.

The City Council of Hull, Que., has granted a charter to a local company represented by Mr. Theo. Viau for the construction of an electric railway and for the supply of electric light. The charter, which is an exclusive one, is for thirty years. The plant, buildings and revenue of the company is to be exempt from taxation for the period of fifteen years. The company is bound to commence the building of the railway in the city of Hull, and radiating to Ironsides, Aylmer and Gatineau Point, within three years; and it is understood that a regular service will be provided seven days in the week.

Four years ago the right to build and operate an electric railway in Ottawa was going a-begging. There were few who were daring enough to believe that it was an enterprise that gave a reasonable expectation of profitable investment. The result, however, is that it has paid a handsome dividend from the start, but not greater than the enterprising gentlemen who made the venture are fairly entitled to. The road is controlled by the firm of expert electricians, Messrs. Ahearn & Soper, who built and equipped it, and it is recognized wherever electric railways are mentioned as a model of its kind. It was the pioneer electric railway of any mention in Canada, and its management were the first to demonstrate the practicability of giving an uninterrupted service throughout the winter season. Since in the remote past, the building of the Rideau locks, there have been two distinct eras in the progress of Ottawa: one its selection for the seat of government, the other the construction of the electric railway.—Montreal Hetald.

MOONLIGHT SCHEDULE FOR NOVEMBER.

Day of Month.	Light.	Extinguish.	No. of Hours.
	H.M.	H.M.	
1.....	P. M. 6.10	A. M. 5.50	11.40
2.....	" 7.10	" 5.50	10.40
3.....	" 8.20	" 5.50	9.30
4.....	" 9 40	" 6.00	8.20
5.....	" 10.30	" 6.00	7.30
6.....	" 11.40	" 6.00	6.20
7.....	.....	" 6.00	}
8	A. M. 1.00	.....	} 5.00
9.....	" 1.40	" 6.00	4.20
10.....	" 2.10	" 6.00	3.50
11.....	" 3.10	" 6.00	2.50
12.....	" 4.00	" 6.00	2.00
13.....	No light.	No light.	....
14.....	No light.	No light.	....
15.....	No light.	No light.	....
16.....	P. M. 5.20	P. M. 8.50	3.30
17.....	" 5.20	" 9.50	4.30
18.....	" 5.20	" 11.10	5.50
19.....	" 5.20	A. M. 12.10	6.50
20	" 5.20	" 1.10	7.50
21.....	" 5.20	" 2.10	8.50
22.....	" 5.20	" 3.20	10.00
23.....	" 5.20	" 4.30	11.10
24.....	" 5.20	" 5.40	12.20
25	" 5.10	" 6.10	13.00
26.	" 5.10	" 6.10	13.00
27.....	" 5.10	" 6.10	13.00
28.....	" 5.10	" 6.20	13.10
29.....	" 5.10	" 6.20	13.10
30.....	" 6.30	" 6.20	11.50
		Total,	220.00

SPARKS.

The demand for mica has lately increased to such an extent that Canadian mica properties are changing hands at high figures.

The Petrolea Light, Heat & Power Co., has been incorporated with a capital stock of $25,000, and the London Electric Co., with a capital stock of $250,000.

Mr. Griffith, manager of the Hamilton Street Railway, who has just returned from the street railway convention at Atlanta, Ga., states that he saw nothing in the line of street railway fenders at the exhibition there, which was equal to those in use in Toronto.

Application for incorporation is being made by the Central Telephone Co., of Bridgewater, N. S. The object is to construct a telephone line between Bridgewater and adjacent towns. Mr. Nelson P. Freeman, of New Germany, is one of the promoters of the company.

The Ottawa Electric Light Co., which embraces the Standard Electric Co., and the Chaudiere Electric Co., owns four water power houses and one steam power house. The steam plant is seldom used. The dynamos in these several power stations have a combined capacity of 35,000 incandescent lights, and 500 arc lights.

$100,000 has been voted by the citizens of Vancouver, B. C., for the purchase of a municipal lighting plant. The Victoria Colonist, makes the following significant comment: "On the principle that 'misery loves company,' we should feel rather pleased that the corporation of Vancouver have obtained authority from the ratepayers to do the lighting of their city."

Mr. Frederick W. Mount, electrician with the St. John, N. B., Gas Light Co., committed suicide, by shooting himself through the heart with a revolver, on the 5th of October. Deceased was forty years of age, and a native of Montreal. Despondency, induced by some difficulty with machinery, is believed to have been the cause of the unfortunate occurrence.

Messrs. R. & W. Conroy, of Deschene Mills, Que., have had installed at their mills, an electric plant, by means of which power is to be transmitted for cutting corn and other farm purposes, to their farm buildings a mile distant. Their creamery plant is also to be operated by electricity, and is said to be the first plant of this description to be operated in this manner. The Messrs. Conroy control a water power of about 10,000 H. P.

Following the voting down of a by-law by the citizens of Summerside, P. E. I., to purchase a municipal lighting plant, has come the formation of the Summerside Electric Light, Heat & Power Co., Limited, with a capital stock of $10,000. The company has ordered from the Canadian General Electric Co., the necessary plant for 1,000 lights, and expects to have them in operation about the 15th of December. The officers of the company are as follows: T. B. Grady, president; R. T. Holman, Neil McQuarrie, Neil McKelvie, Neil McLeod, Leonard Nevin, H. W. B. Stewart.

Mr. George Johnson, Dominion Statistician, in a report on the subject of lighting in Canada, states: Electricity has been given a commanding position, and though gas works have increased from 36 in 1881 to 49 in 1891 and their continued value to the wage-earner is seen in the fact that 1,164 hands were employed in 1891 against 1,062 in 1881, yet against the two employed returned in 1881 as connected with electricity there were 1,190 wage earners in 1891. Electricity as a motive power has been adopted by thirty companies, having 256 miles of railway thus operated. This development has its influence upon other industries, such as street car building, and any industries in connection with iron and steel, etc.

SPARKS.

A Winnipeg motorman, named McLaren, recently fell heir to an estate worth $20,000.

Mr. O. N. Auge, has been elected President, Mr. Wm. Clendinneng, Vice-President, and Mr. A. Prieur, Secretary, of the Montreal Island Belt Line Railway Co.

Application will be made to the legislature of Quebec, for authority to increase the capital stock and enlarge the scope of operations of the Montmorency Power Co., Montmorency, Que.

The Montreal City Council will apply to the legislature for a number of amendments to the city charter, among others, for authority to regulate the tax on telegraph, telephone, electric poles and wires, and the apparatus pertaining thereto.

The Colonial Telegraph & Telephone Co. have been granted a charter to operate and maintain telegraph and telephone offices in Canada. The capital stock is $25,000, and the incorporators are all Americans, except two, who reside in Niagara, Ont.

Mr. A. V. White, of the Canadian General Electric Co., is delivering a series of lectures in the Mechanics' Institute, at Peterboro', on "Elementary Mechanics," "Mensuration," "Machine Design," and "Electricity." The lectures are being well attended.

The St. Thomas Street Railway Co., will ask the council for a franchise to light the city, and for commutation of taxes. The company state that it would be impossible to successfully operate an electric railway unless they are given the exclusive right to furnish all the electricity that may be required for any purpose.

On the morning of the 18th of October, the large dam, 250 feet long, and 35 feet high, at Cobden, Ont., gave way. The new electric power house and incandescent lighting plant which had just been got ready to go into operation, owned by Mr. Alexander McLaren, was swept away, resulting in a loss of about $9,000. The night watchman who was in the station at the time of the accident, was carried out into the lake, two miles distant, but miraculously escaped with his life.

Incorporation has been applied for by the Buckingham Electric Railway, Light & Power Co., to build a railway from the mouth of Du Lievre, to Buckingham village, in the Province of Quebec, and to carry on a general electrical business. The applicants are Albert McLaren, of the town of Buchingham, gentleman; Thomas Kennedy, of the city of Ottawa, agent; E. S. Leetham, of the city of Ottawa, agent; Thomas Wells, of the town of Buckingham, aforesaid, superintendent, and Henry Aylon, advocate, of the town of Aylmer in the district of Ottawa.

SPARKS.

The recent health congress at Montreal, recommended the thorough cleaning of floors and cushions of cars.

Under a by-law of the City Council, the Toronto Street Railway Co., are under obligation to vestibule their cars on lines of most traffic before the 1st of December next, and on the remaining lines before the 1st of February, 1895.

The South Shore Electric Co., is applying for incorporation with a capital of $25,000. The applicants are. Hon. Louis Tourville, of Montreal, lumberman; Andrew Hardie, of Longueuil, farmer; William B. Powell, of St. Lambert, manager; Henry Williams, of St. Lambert, secretary; Joseph Horsfall, of St. Lambert, merchant; Fred. Thomson, of Montreal, electrician, and George F. Burnett, of Montreal, insurance manager.

The Toronto Globe is responsible for the following: An instance of how the rural population receive information regarding our city was witnessed in the tower of the Parliament buildings the other day. A young man evidently a farmer, who had been in the city for a few days, was showing a young lady the sights. Pointing to the iron framework of the gas tanks, he asked her if she was aware of the use they were put to. She replied in the negative. "Well," he said, "in them iron scantlings is big tanks, full of electricity, and it lights the whole city." He had evidently been told that it was a city lighting plant, and imagined that the deadly fluid was contained in the giant reservoirs.

The Bell Telephone Company's Exchange, at Kingston, Ont., has been undergoing repairs for several months past. The exchange is located in the Hotel Frontenac Block, the entrance from Ontario street leading into a large and cheerful public office and waiting room. Adjoining is the office of the Manager, Mr. A. T. Smith, and next to this the distributing room, on one side of which is the switchboard composed of twelve sections. Each section is capable of serving fifty subscribers. A daily average of over 3,500 connections are made. Adjoining the operating room are dressing rooms, lavatories, and storerooms. The staff consists of six day and one night operator, one messenger and two repairers. Mr. Smith, the local manager, is entitled to credit for the completeness with which the improvements have have been carried out.

Incorporation has been granted to the Seaforth Electric Light, Heat & Power Co., with a capital stock of $25,000.

The right to use the immense water power of McCool's mill, at Mattawa, Ont., has been purchased by the Mattawa Electric Light, Heat & Power Co.

Application is being made for incorporation by the Electrical Chronometer Co., of Toronto, to manufacture time indicators, etc. The capital stock is $100,000.

The St. Thomas Street Railway has lately been purchased by the syndicate who control the Cleveland, Toronto and London systems. Mr. E. R. Cameron of London, has been elected president, and Mr. John Break, of Toronto, secretary-treasurer of the new company. If a satisfactory arrangement can be made with the Council, the system will be transformed to an electric one in the spring.

The Town Council of Kincardine recently bought from Messrs. Henry & Swan their Ball arc electric light plant for the sum of $2,350 the purchase to include the free use of seven sixteen candle power incandescent lamps for three years. At a special meeting of the Council recently, the committee which had charge of securing tenders for the incandescent electric light system reported. The Canadian General Electric Co.'s figures were $3,343.20, for the work complete, which includes dynamos for incandescent light, poles, wiring, etc. The company were given the contract. For the engine, Inglis & Son, of Toronto, tendered at $1,625 for a Corliss engine, everything complete. This was also accepted. The town council also recently purchased the waterworks for the sum of $40,000. The various plants will be put in one power house and run under the superintendence of Mr. Jos. H. Walker, who has been engaged at an annual salary of $1,100, he to find his own assistants.