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AND
STEAM ENGINEERING JOURNAL

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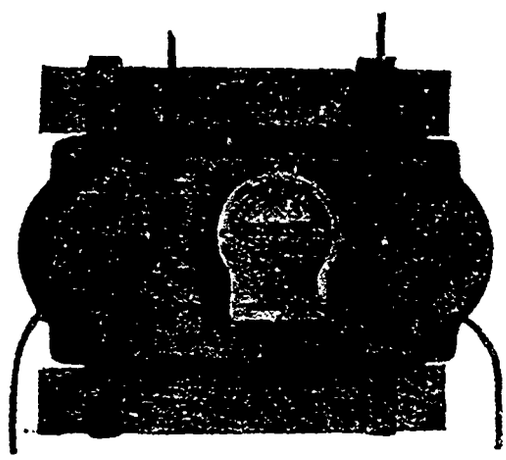

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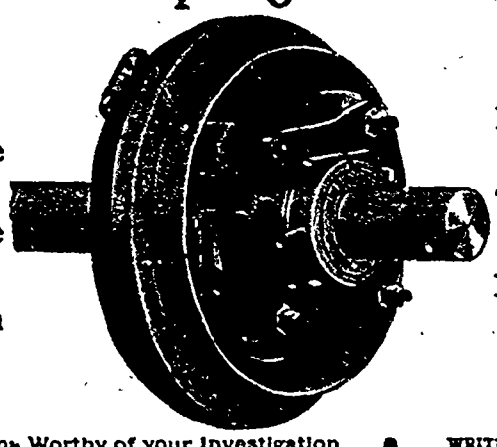
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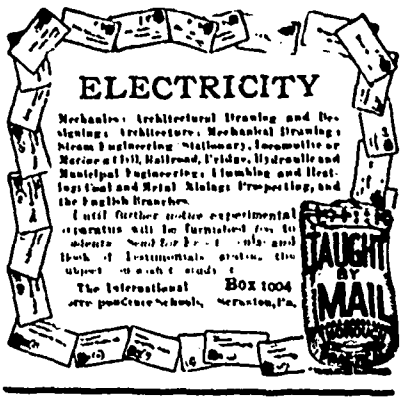

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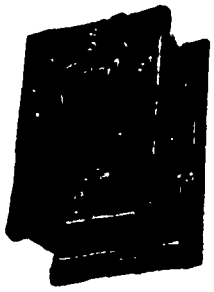

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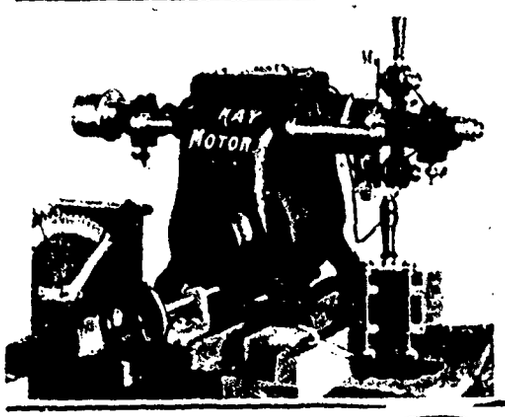

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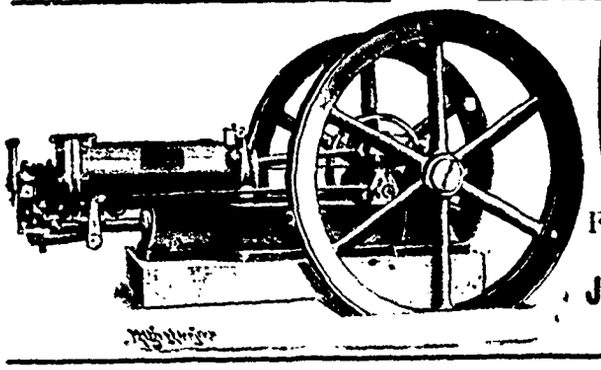

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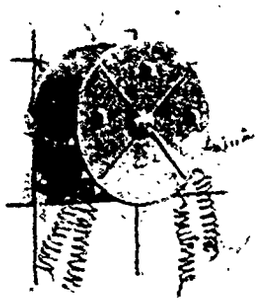

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CANADIAN

ELECTRICAL NEWS

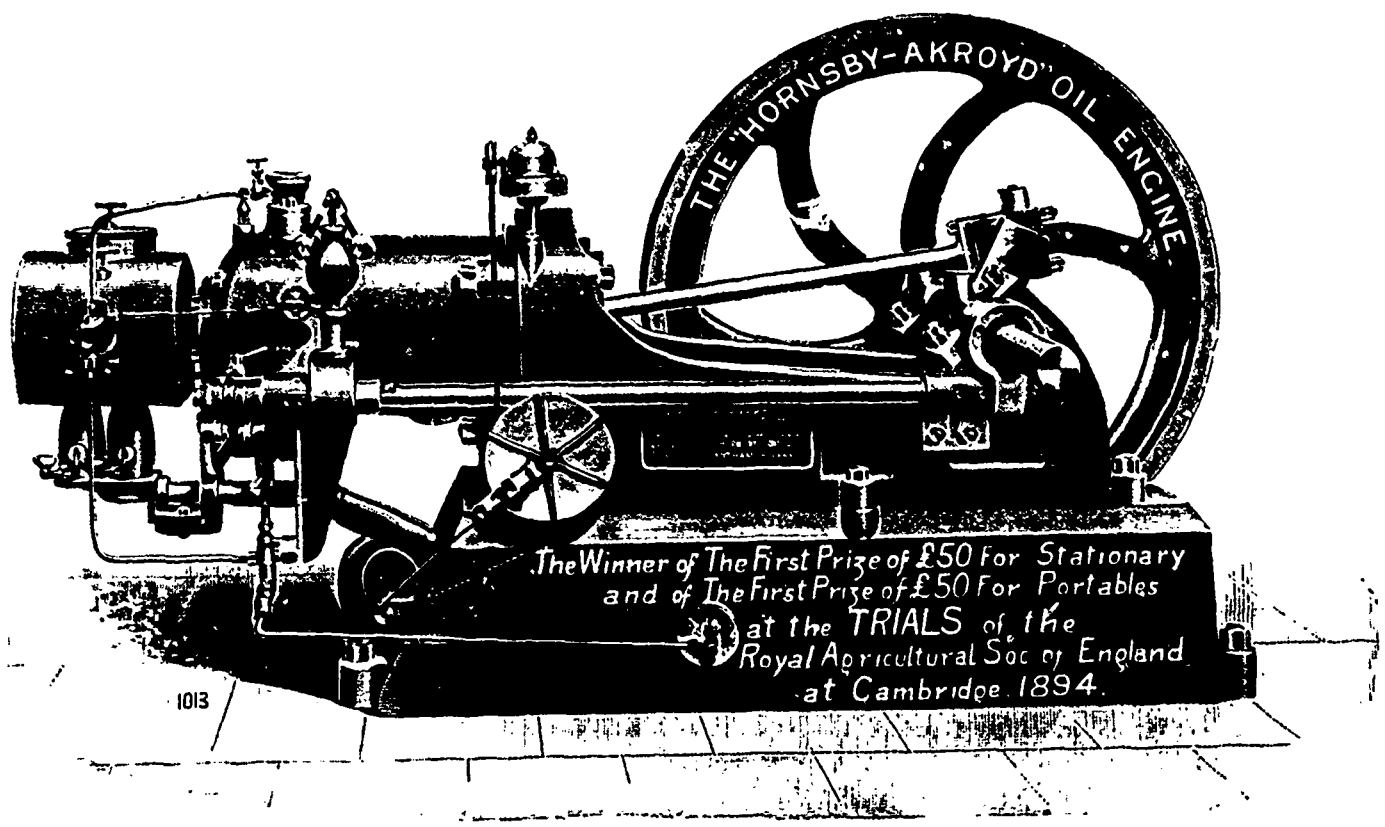
AND

STEAM ENGINEERING JOURNAL.

VOL. VI. OCTOBER, 1896 No. 10.

THE HORNSBY-AKROYD OIL ENGINE.

THE Northey Manufacturing Company, Ltd., well-known throughout the Dominion as builders of high class pumping machinery, have lately entered upon the manufacture of a most decided novelty in Canada, in the shape of the Hornsby-Akroyd oil engine. This engine, as will be seen from the accompanying cut, is a very compact and simple machine, and one which will prove most useful in a great many situations in which



the steam engine is neither so convenient or so economical.

In the oil engine the power is produced direct from a low grade of petroleum, by internal combustion, without the intervention of a boiler or steam in any form.

The oil engine which the Northey Mfg. Co. is about to place on the Canadian market, works on what is known as the "Otto cycle," which may be briefly explained as follows:—

1st. The admission of atmospheric air into the cylinder during the forward movement of the piston.

2nd. The compression of this air during the backward movement of the piston and its intimate intermixture with the oil vapor, previously introduced into the vaporiser.

3rd. The expansion by combustion of the mixture of gas and air in the cylinder.

4th. The expulsion of the spent gases by the piston.

In starting the oil engine, the small lamp, fed by the same oil as is used in the engine, is lighted and placed under the vaporiser, which is the part immediately behind the cylinder proper. In about ten minutes the vaporiser is hot and the engine ready to start. The fly-wheel is turned by hand a couple of revolutions, to draw air into the cylinder, and the engine then works automatically, giving out power in exact proportion to the work to be done, and running evenly and quietly without further attention, so long as the supply of oil is maintained. The consumption of oil is less than one pint per horse power per hour, and a cheap gas oil, first distillation, is used, costing 7½ cents per gallon.

It will be noticed that the power in the oil engine is obtained from the expansion by combustion of a mixture of gas and air, and special attention is directed to the special safety from explosion or fire which the oil engine affords. The only fire while the engine is running is inside the cylinder, and the supply of oil is contained in a cast-iron receptable in the bed, secure from all danger. There are no sparks, no smoke and no ashes.

Attention is also called to the ease and quickness of starting of this engine, and its great economy and safety from fire hazard. It may be used advantageously

wherever a steam engine can be used, and in many situations where a steam engine could not be used. For threshing it is specially useful, as no large supply of water is required, and the portable type is light and compact.

In combination with a pump it affords cheap and economical waterworks for towns and villages; and the engine may be used with excellent results for driving dynamos for lighting and other purposes. In fact, the special applications of the Northey Mfg. Co's. oil engine cannot be enumerated, but will readily suggest themselves to parties requiring power.

Prices and catalogues may be obtained from the makers, the Northey Manufacturing Company, Ltd., King street subway, Toronto, who will be glad to furnish estimates and information to all interested.

ROCKING GRATES.

In view of the rather adverse conclusion arrived at by the American Boiler Manufacturers' Association with regard to the advantage to be secured by the use of shaking furnace grates, the ELECTRICAL NEWS solicited the opinion of several well-known engineers on the subject. The opinions received are printed below. This subject, like any other which affects the fuel account, should have a particular interest for owners and operators of steam plant. We would therefore be pleased to see subjects of this character discussed from time to time in our columns.

Mr. A. E. Edkins, Toronto, on the eve of his departure for England, writes briefly as follows: "Re decision of American Boiler Makers' Association, and rocking grates, I have never yet seen a fireman use them to cause waste of fuel, but on the contrary, as a general rule, I find they do not operate them often enough. If the fuel is suitable, I believe the rocking grate to be a good thing and conducive to economy."

Mr. E. J. Philip, 11 Cumberland St., Toronto, writes:

"In reference to the advantages and disadvantages of shaking grates, many things may be said, from the fact that different people look at the same thing from different standpoints A shaking grate may save money if properly designed and managed, or it may waste coal and be a bill of expense in repairs.

"A good shaking grate will save coal, increase the capacity of the boiler, and will reduce the work of the fireman; but to do this it must be properly designed for the work it has to do, and put in a properly proportioned furnace, and it must be carefully managed. If any of these requirements are neglected it will very likely fail to meet the expectations of the purchaser. Coal may not be saved, and yet the grates may be satisfactory if they accomplish what they were put in to do. I know of an instance in which a firm put in a shaking grate and their fuel consumption was increased, yet they were satisfied, because they wanted to be able to burn more coal and increase their capacity. In this case the grate was badly proportioned - the air space was very wide. In other places, under other conditions, this grate would have been condemned.

"In another place a new make of shaking grate was put in and an old stationary grate taken out. The new grate was to save 15%. When a test was made a loss of from 1 to 3% was shown. The grates are still being used and are satisfactory, in that they increase the capacity of the boiler and the work of firing is less.

"Against these cases may be cited two sets of shaking grates put in and the furnaces rebuilt and entirely altered, by which a saving of 11% was effected with the same coal (large egg) and a change to pea coal showed a saving in cost of 24%. A large percentage of this should be credited to the new furnaces. The old furnace and ash-pit was very low, and had far too large a grate area. The height of ash-pit and furnace was doubled and the area reduced nearly one-half. This is an exceptional case; it was not a boiler furnace.

"There are a number of shaking grates in the city that are giving good satisfaction and have shown a good saving. Where there is only one boiler and it has ample capacity, a good stationary grate is the best under most conditions, but if a fireman has much steam to make and a number of boilers to fire, a shaking grate will be found of advantage.

"It must not be forgotten that there are shaking grates, and shaking and dumping grates, with all sorts of combinations on both. The dumping feature is as a rule dangerous to the coal pile, and is often expensive in repairs in the hands of many firemen. This type of grate, however, may be used with advantage and economy in large plants, or when in charge of an unusually careful fireman.

"Under all conditions a grate of any description, to be satisfactory, should have the air space properly proportioned for the particular fuel to be burned. If a shaking grate, it should be designed so that it will not be likely to get out of order, and that, if a part is broken, it can be easily replaced without disturbing the entire grate. It should be put in a properly proportioned furnace. Lastly, it must be carefully managed. The furnace should be proportioned to the grade of fuel used. If all these conditions are complied with, coal will be saved and the capacity of the boiler increased, and the work of the fireman made easier.

"There is not enough thought and care used in building in a boiler, designing the furnace and selecting the grate. Nearly every furnace has some arrangement to save coal, increase the capacity or reduce the work, and yet where is there to be found a furnace that is entirely satisfactory in every respect? Discussions on labor and coal saving devices would bring out much information and would be of benefit to us all."

Mr. G. C. Mooring, Toronto, writes: "To my mind the main and best feature of the shaking grate bar was not touched upon by the American Boiler Makers' convention, (or at least was not reported), and that is the possibility of being able to clean the fire without having to open the furnace doors. If the fireman has too much steam he sometimes opens the furnace doors and the steam drops very suddenly. It takes from two to five minutes to clean a fire. Any thoughtful engineer or boiler maker knows what a great loss in fuel this causes, not to speak of the injury to the boiler. Throughout the whole discussion the main point against shaker bars is that the fireman does too much shaking. Is that the fault of the bars? I have seen great waste of coal from the same cause and from the coal being too fine for the mesh of the bars as well as from trying to burn hard coal dust without mixing some soft screenings with it, which latter method cokes and prevents much loss. I do not agree with Mr. Leonard, who says that shaker bars work best with poor fuel. If Mr. Leonaad would try firing with the coal we get sometimes that melts and runs over the bars like iron—runs partly

through the bars until the cold air trying to get through chills it and it sticks there. Let him try to shake under these conditions, and he will wish those shaker bars in a still hotter place than they are. Shaker bars work best with good coal, either hard or soft. Ask locomotive engineers how they would get along these days without shaker bars. I think that the shaker bar has an advantage over the straight bar; still I would not recommend any firm to change unless the straight bars were burnt out. I do not recommend any particular shaker bar, but whatever the make, it should have as much air space as possible."

Mr. Geo. C. Robb, Chief Engineer of the Boiler Insurance and Inspection Co., Toronto, writes:

"The best method of burning coal in a steam boiler is still an unsettled question, and likely to remain so. One reason for this is, that it seems to be impossible to get the best results out of a given quantity of coal, and at the same time, get the greatest amount of work out of the boiler in which the coal is burned. To get the greatest amount of steam out of a boiler is often a far more important matter for the owner than to get steam with the least possible amount of coal. Another reason why the question is so difficult of settlement is that there are so many varieties of coal, each requiring to be used in some particular way in order to get best results. The amount of air which should pass into the furnace, how much of it should go up through the coal, and how much should enter above the fire, form points of detail upon which great differences of opinion are found to exist. It will repay any one interested in the subject to make a study of the theory of combustion and then try to carry the theory into practice, and carefully note the results.

"The argument used by the American Boiler Manufacturers' Association seems to be rather a poor one. Supposing it were true that sometimes some unburnt coal did fall through because the fireman shook the bars too vigorously; that is an evil which can be easily remedied, and it is an evil of much less magnitude than having the furnace doors kept wide open while the vigorous fireman is stirring up the fuel and the cold air is rushing in, cooling off the boiler, and developing rivet cracks at the seam over the bridge wall.

"Shaking or rocking grates enable a fireman to keep the whole surface in better condition for the proper passage of air than can be done by stirring with slice bar in the hand. The fire can be shaken up without the doors being opened, except for the actual admission of the fuel. Fuel is wasted and boilers are injured by sudden changes of temperature in the furnace, and as shaking bars diminish the time when the furnace doors must be kept open, it follows that they must if properly used, both save fuel and prevent injury to the boiler. It is quite possible by sufficient shaking to dump the whole fire into the ash pit, but that would not be a fair way to use them, and if a fault, it should be laid on the fireman rather than on the grates.

"It may be taken as proved, that economy in fuel in a steam boiler is promoted by burning the fuel at as high a temperature as possible, by keeping that high temperature as uniform as possible, and by having the rate of combustion as regular as possible. Mechanical stokers, rocking grate bars and other appliances help a fireman to keep a furnace in these conditions and hence, unless there be other objections to their use, it would seem that they should be more used than they are."

LONG BURNING ARC LAMPS.

A RECENT innovation in arc lighting practice which has already attracted considerable attention from central station managers as well as the manufacturing companies is the "long burning arc lamp." A recognized objection to the use of the arc lamp for general illumination has been the cost of the carbons and the daily expense involved in their renewal. An additional drawback has been the inadaptability of the existing arc lamp for candle powers lower than those which obtain for ordinary street lighting service.

A very simple, and it is claimed satisfactory arc lamp with enclosed arc for "long burning" service has been placed upon the market recently by the Canadian General Electric Company. Among the principal features of value claimed for a lamp of this type may be noted briefly the following: It requires very little attention, and therefore the expense of trimming is greatly reduced; it is independent of other lamps on the same circuit, and may be cut in or out without affecting them; it does not cast deep shadows; it is artistic in appearance and compact in design, having a self contained resistance.

Two classes are being made at present, burning with one trimming 100 hours and 150 hours respectively. The former is about 37" and the latter about 46". Both are made with three different styles of finish as follows: Plain back japan finish; ornamental dull black ebony finish, and ornamental polished brass finish.

The standard lamps are made for 5 amperes and can be adjusted to take from 4¼ to 4½ amperes if desired. Lamps of smaller amperage can be furnished if so ordered. Lamps for 3 to 3¼ amperes are not considered impracticable, but small carbons should be used. All lamps are carefully adjusted and tested at 110 volts before shipment.

The mechanism is extremely simple, consisting of a pair of magnet coils, the armature of which carries the clutch and controls the feeding device, the clutch being perfectly positive, and at the same time feeding with the utmost delicacy. In order to meet the varying conditions of line voltage, an adjustment for the voltage at the arc is provided in the resistance at the top of the lamp. Changing this resistance varies only the length and potential of the arc and not the current strength. The method of securing the inner globe and lower carbon is very simple and effective, rendering it convenient for trimming and cleaning. The inner globe completely encloses the arc. This is designed to increase the life of the carbons, by excluding the air and thereby preventing combustion. The outer globe holder is a new, patented, self-locking device which is very convenient and perfectly secure. The globe is supported at all times from below and when lowered for trimming the top of the globe is level with the bottom of the frame, rendering the lower carbon holder accessible.

The use of high grade, solid carbons is necessary to prevent undue coating of inner globe to give satisfactory service. As there is more or less variation in the size of ½" carbons, the opening of the cap of the inner globe is .525" diameter, and the carbons used should come within the following limits: .520" max. diam.; .505 min. diam. The opening or space between the cap and carbon should be only sufficient to allow the free passage of the carbon as it feeds downward. If air is allowed to enter the inner globe the life of the carbons is greatly shortened. Attention should be given to

polishing and cleaning the carbon rod at every trimming, to prevent its becoming sticky from atmospheric conditions. With solid "electra" carbons, which have been found to give the best results, a potential of 75 to 80 volts at the arc is required.

When these lamps are properly trimmed with correct lengths of carbons, more than the rated time of burning can be expected. They will not need further attention through an entire run, and will cut out properly when the carbons are consumed. In most cases the piece left in the upper holder is of correct length for the lower holder for the next full run.

A further desideratum is a lamp equally simple and effective adopted for use on alternating circuits. Such a lamp is promised and indeed assured by experimental work as a development of the immediate future.

CANADIAN ASSOCIATION OF STATIONARY ENGINEERS.

NOTE Secretaries of Associations are requested to forward matter for publication in this Department not later than the 25th of each month

KINGSTON ASSOCIATION NO. 10.

At the last regular meeting of the above association the officers for the ensuing year were installed as follows: Past President, S. Donnelly; President, F. Simmons; Vice-President, J. Tandvin; Treasurer, C. Selby; Secretary, A. Macdonald; Doorkeeper, R. McDonald; Conductor, R. Bajus; Trustees, John L. Orr and S. Donnelly. Letters were read from delegates to the recent annual convention of the C.A.S.E., expressing their appreciation of the hospitality extended to them.

BROCKVILLE ASSOCIATION NO. 15.

Mr. J. Aikens, Recording Secretary of this association, reports that since the Kingston convention some very interesting instruction meetings have been held, at which there has been a good attendance of earnest workers. At these meetings the blackboard has been in constant use for purposes of illustration. In the unavoidable absence on some occasions of the President, Bro. Franklin, the Past President, Bro. Chapman, gave the members the benefit of his assistance in solving the problems under discussion.

ONTARIO ASSOCIATION STATIONARY ENGINEERS.

TORONTO, Sept. 11, 1896.

To the Editor of the ELECTRICAL NEWS.

SIR,—The following engineers have recently passed their examinations: Third class Geo. H. Bull, Rosemeath; Chas. Kemp, Petrolea, A. Ritchie, Orillia; C. Labarge, Hull, P. Q.; J. Radmore, Buckingham, P.Q.; Fred. Nagle, Paris; J. Carol, Hamilton; Albert Martin, Toronto; F. C. Corrie, Stratford; D. Anderson, Mt. Forest; J. Wilson, Hamilton; Geo. E. Bower, Lucknow; Geo. H. Cooper, Oakville. Second class—D. H. Vincent, Belleville; B. Deo, St. Thomas; Thos. R. Seaton, Toronto. In all twenty engineers wrote for examination, four of whom failed, either through not having had the required experience or other cause.

Enquiries are coming in daily from all parts of the province concerning examinations, which goes to prove that the feeling is growing, viz., that all engineers should hold certificates.

The city council of Hamilton have decided that no engineer shall be employed by that corporation unless he hold an Ontario certificate. This is a move in the right direction and might well be followed by our city council in Toronto.

There are about forty certificate holders who have not paid their renewal fees so far this year, and I shall be glad if they will return old certificates, either with or without renewal fees, as the certificates are the Board's property and must be returned to this office when expired.

I shall be glad to send information regarding examinations to any engineer desiring same on receipt of post card giving name and address.

Yours truly,

A. E. EDKINS, Registrar.

Office, 88 Caroline St., Toronto.

BURSTING STEAM PIPES.

The explosion of steam pipes has been occurring lately with such frequency as leads one to ask, Why? As a general thing a steam pipe is stronger for the pressure it has to carry than is a steam boiler, and yet they explode, showing that some force is at work which produces a weakening effect on the pipe. A long line of steam pipe is difficult to keep tight unless some special arrangement is employed that will allow, not only for expansion and contractions but other strains to which the pipe is subjected.

There are few engines that run so steadily but what they cause vibration of the steam pipe and in some cases the vibration becomes so great that it is necessary to use extra braces or stays to prevent its going beyond limits. Constant vibration of metal under strain is known to have a tendency towards producing crystalization, and this is probably what results in some steam pipes.

KEEP AT IT.

If you expect to conquer
In the battle of to-day,
You will have to blow your trumpet
In a firm and steady way.
If you toot your little whistle
And then lay aside the horn,
There's not a soul will ever know
That such a man was born.

The man that owns his acres
Is the man that plows all day;
And the man that keeps a humping
Is the man that's here to stray.
But the man that advertises
With a sort of sudden jerk,
Is the man that blames the printer
Because it didn't work.

But the man that gets the business
Uses brainy printers' ink,
Not a clatter and a sputter,
But an ad. that makes you think;
And he plans his advertisements
As he plans his well-bought stock,
And the future of his business
Is as solid as a rock.

ERRATUM.

NEW YORK, Sept. 22, 1896.

To the Editor of the CANADIAN ELECTRICAL NEWS.

DEAR SIR,—I beg to call attention to an error (probably a misprint) which appears in your paper for September. In the column headed "Electrical Items worth Remembering," there appears: "The resistance of copper rises about 0.21 per cent. for each degree centigrade," which should read "0.21° F."

Respectfully yours,

V. M. BENEDIKT, E. E.,
27 Thames st., New York.

DEFINITIONS OF ELECTRICAL TERMS.

ACCUMULATOR. Storage or secondary battery, in which electricity has been carried and has been converted into chemical energy, being retransformed into electricity when the battery is put to use for the purpose of furnishing energy or light.

AMPERE. The unit of strength of the current per second. It represents, perhaps, the volume of electricity, and its value is the quantity of the fluid which flows per second through one ohm of resistance when impelled by one volt of electro-motive force.

ANODE. The positive pole of a battery.

ARC. The space between the points of the carbons in an electric light or lamp which is bridged by the current represented by the flame.

ARMATURE.—The revolving arm of an electric generator.

BATTERY. A primary battery is one in which electricity is obtained through the decomposition of metals in chemical solutions. Zinc and copper may be the metals and sulphuric acid the chemical. Gold, silver, platinum, iron or tin may also be used as the metals and sal-ammoniac, bi-chromate of potash, nitric acid and sulphate of copper may also be used as the chemicals. The storage battery is a cell of acidulated water, containing, for example, plates of lead. This arrangement has an electric current directed into it, which it will give back in almost an equal quantity when the energy is wanted. There are various methods and ways of making both primary and secondary or storage batteries, but the above are the general principles governing their construction.

BRUSH. The copper string which connects with the commutator of a dynamo and gathers the electricity for the conductors.

CANDLE. Our unit of illuminating power.

CARBONS. Rods of carbon are used in arc lights for first establishing the current, and then, when withdrawn, form the arc over which the electric flame leaps. They are made of powdered coke by a secret process.

CELL. The vessel in which chemical action produces electricity.

CIRCUIT. The path along which an electric current travels.

COMMUTATOR.—The collector of the electricity generated, and from which the fluid is taken by the brushes.

CONDENSER. An arrangement for collecting a large quantity of electricity on a small surface.

CONDUCTIVITY.—The comparative ability of a substance to convey a current of electricity.

CONDUCTOR. Conveyors of the electric current, silver being the best, and copper next, in conductivity.

CORE. The iron that becomes magnetized in an electro-magnet. In helix, this iron is of the softest kind.

COULOMB.—The unit of dynamic quantity represented by one ampere of current.

CURRENT. The flow of electricity along a conductor. Its strength in amperes is found by dividing the electro-motive force in volts by the resistance in ohms.

A WORD OF PRAISE.

MR. B. A. YORK, Secretary of Montreal Association of Stationary Engineers, writes the publisher of the ELECTRICAL NEWS as follows:—"At our regular meeting your paper received much praise for the way you had so ably and fully reported all that took place at our last convention, and I will take opportunity to thank you and wish your paper every success."

THE ADVANTAGES OF VERTICAL ENGINES.

The great increase in the use of power for the generation of electricity in large quantities has served to develop large stationary engines, and as such plants are usually in thickly populated districts, where land or floor space is expensive, the vertical engine has received the preference to a great extent; for a given power it occupies less floor space than any other type. For the same rotative speed and power the cost of building such engines is about equal, whether the vertical or horizontal type is used, but, as builders become used to designing the vertical engine, I think the first cost will be in favor of this type.

As to accessibility for repairs and care in running, there is little to choose between them, but with a properly rigged overhead travelling crane I think the matter of overhauling the vertical is the easier, whereas in running it is doubtless more convenient to have everything on one level.

In the matter of friction the vertical engine, too, has a great advantage, as the packing, besides its appropriate office of preventing steam leakage past the piston, has only to guide it also, whereas in the horizontal engine it must not only support the entire weight of the piston, but also the pressure of steam, as the "bull ring" generally fits the bottom half of the cylinder steam tight, but allows the steam to enter on top as far as the packing ring.

In the vertical design the weight of the cross-head does not increase the slide friction, which is not the case with the horizontal engine when running, with the crank passing the upper arc as the piston goes toward the shaft; and when the reverse direction is used, although the slide is relieved of the weight of the cross-head, a worse trouble is introduced, namely, the slapping up and down of the cross-head at each end of the stroke. Charles H. Manning in Cassier's for October.

SPECIALIZATION IN ENGINEERING.

THE civil engineer of past generations, who was supposed to command a comprehensive knowledge of every branch of engineering then practiced, from the design of a steam engine or machine tool to that of a bridge or city drain system or complete waterworks plant, has virtually ceased to exist, and in his stead, says a writer in Cassier's Magazine, we find the steam engineer, the sanitary engineer, the bridge engineer and the engineer of various other subdivisions of the great field of engineering, each an expert in his particular line. It has been found impossible for one man to combine within himself the detail knowledge necessary to practice all these branches with entire success. One branch alone is almost sufficient to make a life study, and the engineering specialist of to-day finds himself busily enough occupied in keeping abreast of the times.

Messrs. John Starr, Son & Co., Halifax, have just installed a 50 light plant for the St. Croix Paper Mills Co., of Hartsville, N. S.

F. Stancliffe, of Flat Lands, N. B., has had a 50 light plant installed in his shingle mill. This plant was supplied and installed by John Starr, Son & Co., of Halifax, N. S.

Messrs. John Starr, Son & Co., Halifax, have recently installed a 200 light plant for Kilgour Shives, of Campbellton, N. B. This is used for lighting Mr. Shives' extensive lumber mills and yards.

The "Unique" telephones as manufactured by John Starr, Son & Co., Halifax, are having a large sale. This firm have recently supplied a number of telephones and switchboards to Campbellton and Quebec, both of which orders were "repeats" which speaks well for the "Unique" telephones which have now been on the market for several years.

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Advertising rates sent promptly on application. *Orders* for advertising should reach the office of publication not later than the 25th day of the month immediately preceding date of issue. Changes in advertisements will be made whenever desired, without cost to the advertiser, but to insure proper compliance with the instructions of the advertiser, requests for change should reach the office as early as the 22nd day of the month.

SUBSCRIPTIONS.

The ELECTRICAL NEWS will be mailed to subscribers in the Dominion, or the United States, post free, for $1.00 per annum, 50 cents for six months. The price of subscription should be remitted by currency, registered letter, or postal order payable to C. H. Mortimer. Please do not send cheques on local banks unless 5 cents is added for cost of discount. Money sent in unregistered letters will be at senders risk. Subscriptions from foreign countries embraced in the General Postal Union $1.50 per annum. Subscriptions are payable in advance. The paper will be discontinued at expiration of term paid for if so stipulated by the subscriber, but where no such undestanding exists, will be continued until instructions to discontinue are received and all arrearages paid.

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

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

EDITOR'S ANNOUNCEMENTS.

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

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

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ONTARIO ASSOCIATION OF STATIONARY ENGINEERS.

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

The Geneva Congress.

THE electrical congress held at Geneva in August, was poorly attended. Notwithstanding that representatives were not present from many of the leading scientific societies of the world, including the British and American Institutes of Electrical Engineers, the Congress felt no hesitation in rejecting the magnetic units sanctioned by the American Institute, and adopting a system of photometric units.

Some Results of Municipal Lighting.

AT a convention of street lighting officials held recently at New Haven, a bad showing was made on behalf of municipal control of electric lighting plants. The statement was made that Wabash, Ind., purchased a plant for $18,000 and sold it for $30; Xenia, O., paid $35,000 for a plant and ten years later sold it for $10,000; Moline, Ill., bought a plant at $15,000 and four years after sold it for $8,000; Michigan City bought a $10,000 plant and sold it for $2,500.

The Telephone Situation.

THE agreement entered into five years ago between the Bell Telephone Company and the City Council of Toronto, is about to expire. Under this agreement five per cent. of the receipts of the Toronto exchange were to be paid into the city exchequer and the yearly rental was decreased from $50 to $45 per instrument for commercial use. The Telephone Company have notified the Council that they will decline to renew the agreement, and it is said to be their intention to increase the rental of their instruments when the period of the present arrangement shall terminate. The Council have invited tenders for the franchise, but are understood to have had no offers. Representatives of the Strowger automatic telephone have, however, set up several of their instruments in the business part of the city with

the purpose of demonstrating their utility. Appearances would seem to indicate that the Bell Telephone Co. are likely to remain in control of the situation in Toronto unless dislodged by the less expensive method which Prof. Bell is reported to have discovered of transmitting messages by means of a ray of light.

Those Alleged Portraits.

Messrs. A. M. Wickens, A. E. Edkins, and John Fox, have for many years been among the most intelligent and hard-working promoters of the prosperity of the Canadian Association of Stationary Engineers. Presumably in recognition of their self-sacrificing efforts, they find themselves depicted in the columns of the Canadian Engineer as "the villains in the play," or as a couple of cracksmen who have just finished a term in the strong institution at Kingston and are on the look-out for another job.

The Feed Water of Water Tube Boilers.

In the case of the recent explosion of a water tube boiler in England, the Board of Trade stated the cause to have been the closing of the down-take tubes by calcareous deposit. The stoppage of the circulation due to this deposit caused undue expansion of the horizontal tubes and placed such a severe strain on front and rear cast iron headers, as caused their fracture. Forged steel is now being substituted for cast iron in headers in some boilers of this description. Notwithstanding, there would still appear to be an element of danger where pure feed water cannot be obtained.

Three-Cent Fares.

The universal demand for cheapness has led to an agitation for a reduction of the street car fare to three cents. Mr. H. A. Everett, formerly of Toronto, now the principal owner of the new electric street railway at Detroit, Mich., was one of the few men in the business who believed that it would be to the advantage of the companies to offer a three-cent fare. He reduced the fare accordingly, but the results have not justified the wisdom of the step, and a return has been made to the former price. Especially in view of the serious inroads which the increasing use of the bicycle is making in the business of city roads, any reduction in the present fares is out of the question.

Insurance Against Accident to Electrical Machinery.

This is the day of electrical enterprise. Every day new concerns are started, new machinery introduced, new methods invented; machinery and apparatus are being continually improved and cheapened, and the man who neglects to read neglects his own interests. Enterprises are being organized in every direction, which have for their object the lowering of prices of supplies, machines, etc., and among the latest that we have heard of is one for the insuring of electrical machinery against loss by accident, and against repairs. This seems to be a most valuable business, for electrical men cannot tell when their engines, or armatures, transformers, or motors may break down and require expert attention. The fact is that there is a most unsatisfactory amount of old and out of date apparatus being operated in central stations, the repairs on which must amount annually to a considerable sum, and any arrangement which will permit of the owners being guaranteed against ruinous accidents ought to pay both the owners and the guarantors. Besides which, a company of experts who make it their business to keep plants in efficient working order will be a great boon to those whose acquaintance with electrical matters is limited.

Electricity in Photography.

We are constantly being astonished by the multitude and variety of the purposes to which electricity is being adapted. One of the latest and most wonderful is to be seen in connection with the cinematograph now on exhibition in Toronto. By means of this instrument, which is the production of a French inventor named Lemaire, pictures in which the activities of living creatures and of nature are reproduced with the utmost fidelity, are thrown upon the canvass. Electricity has made it possible to take a series of photographs of objects in motion with such lightning-like rapidity, that when the photographs are placed side by side together and passed through the cinematograph, there is presented to view a reproduction of the whole scene as it appeared to the eye of the original beholder.

Shaking Furnace Grates.

The American Boiler Manufacturers' Association, at its recent convention, discussed at some length the relative advantages and disadvantages of shaking grates. The conclusion arrived at was, that owing to the disposition of firemen to do too much shaking, an unduly large percentage of coal is dropped through the grate into the ash-pit. This would appear to be the fault of the fireman rather than of the grate. There are a great many costly fuel-saving devices on the market at the present day, for most of which large claims are made. It is highly desirable that those who have had practical experience in the use of any of these devices, should make known for the general welfare of owners and operators of steam plants, how far these claims are capable of being realized. We would take it as a favor if any of our readers who have had experience with shaking grates and suchlike modern devices, would write us their opinion of them.

Steam Turbines.

A class of steam plant is now forcing itself on the notice of the electrical operating interest that presents many most interesting points and is well worthy of careful investigation. We allude to the machines known as "steam turbines." There are two of these that are well, and we may say favorably known to those who keep a place on the advance guard of electrical progress. The first is the Parsons, and the second the DeLaval steam turbine. In both the principle is to take advantage of the tremendous impact force of steam escaping (under pressure) from the boiler, to turn what may be termed a wheel with little discs or fans placed on its periphery. In this aspect, steam turbines are analogous to the Pelton and other impact turbines that rely for their turning moment more on impact than on static pressure. The tests on these turbines shew a very high degree of efficiency, the comparison being somewhat as follows: A single cylinder non-cohdensing high pressure engine will require about 30 lbs. of steam to maintain a horse power. A compound (two expansion) engine of superior make will require about 21 lbs. condensing; but some most extensive and apparently

competent tests on a DeLaval steam turbine give a consumption of a little over 18 lbs. per horse power, which is an uncommonly good showing, and one worthy of attracting the attention of the electrical profession. These machines revolve at a very high rate, and of course require most careful construction. Hitherto they have been connected to special dynamos through gearing, but in the near future, no doubt, they will be equally well adapted to belt connections. We strongly advise all electrical men to watch their development.

Montreal vs. Toronto.

The city of Montreal has announced its purpose to hold an International Exhibition in 1897 or the year following. Toronto also gives notice of its intention to hold a Dominion Exhibition next year. Toronto claims it was first in the field, and says it doesn't want to undertake an International Exhibition, and asks Montreal to defer the larger enterprise for a year or two. Montreal replies that the holding of a Dominion Exhibition in Toronto next year would seriously impair the chances of an International Exhibition a year or two later. Both cities have applied to the Dominion and Provincial governments for aid. Both have admitted that without such aid they cannot hope to make their scheme a success. Therefore, the decision as to which of the enterprises shall go forward at the present time would appear to rest with the government, unless, as we trust will be the case, a satisfactory arrangement can be reached between the representatives of the two cities.

Efficiency of Transformers.

In his valuable paper on "Some Central Station Economies" presented to the Canadian Electrical Association, Mr. P. G. Gossler makes a very conclusive showing as to the amount of saving which it is possible to effect by substituting for old-style transformers modern high efficiency apparatus. He instances a case in which the saving thus effected was sufficient to pay the cost of the new transformers within a period of less than three years. Mr. Gossler is authority for the statement that the efficiency of transformers varies from 50 to 100 per cent. If this statement be correct, and we judge it to be so, then there is need of the exercise of greater knowledge and skill on the part of some of the manufacturers of transformers in order that their production may be brought nearer up to the standard of machines of the highest efficiency. In other classes of electrical apparatus such a wide variation in efficiency does not exist, nor should it be allowed to continue in an instrument with functions so important as those of the transformer.

Specifications.

We have had the advantage of seeing the specifications on which a number of electric lighting plants have recently been purchased, and have been struck by their laxity, and generally vague nature. In many cases—in most of them, in fact it seemed as though special stress was laid on comparatively unimportant matters, whereas those points on which should really depend the selection of machinery were either not alluded to at all, or received only the most cursory notice. We have particularly in mind an arc plant specification which called for "a plant of 50 light nominal 2000 c. p. capacity with lamps, etc.," and then it went on to state that the candle power would be tested, and must be as specified. Now, in the first place, what is the actual candle power of a nominal 2000 c. p. lamp? and is that actual candle power to be tested in the horizontal plane, or in any other plane making an angle with the horizontal? There was no efficiency requirements—no maximum temperature limit and the only really onerous condition was that the plant would have to operate to the satisfaction of the engineer, who, by the way, knew just enough about electrical apparatus to carbon the lamps. In another case a 60 k. w. alternator was called for. There was no specification as to voltage, maximum line loss, temperature limits, efficiencies, or any important feature of a machine, but it was clearly stated that the machine would be required to carry its full rated load for 24 consecutive hours, without undue heating (sic) in any part. What is "undue heating"? May the limit be placed at 200° F or 50° F, or where—and who is to fix it? Furthermore, what man in his senses is going to run a machine, in a small town, for 24 hours, in ordinary practice? If the machine is ever required to carry its full load for more than four hours at a time, that is all that it would ever be called on to do. And yet this same specification that left the alternator and transformer to the mercy of the contractors in every important point, imposed the most rigorous and minute conditions as to how the poles were to be placed—their size, and how many times they were to be painted, and the exact color, finishing up consistently by neglecting to say how many were required. Is this the way to buy machinery? Persons who throw themselves on the mercy of contractors by making specifications of the above description are laying themselves open to all kinds of deception and trickery, and only deserve to be taken in. The electrical market is full of machinery, good and bad and medium, and of course a purchaser is entitled to choose which he prefers, but carelessly or ignorantly prepared specifications impose rigorous conditions only on those manufacturing companies that will not condescend to sell poor apparatus, and leave every loop-hole of escape to those second-rate concerns that trade upon the inexperience of a credulous and penurious public.

EXPANSION OF BOILERS.

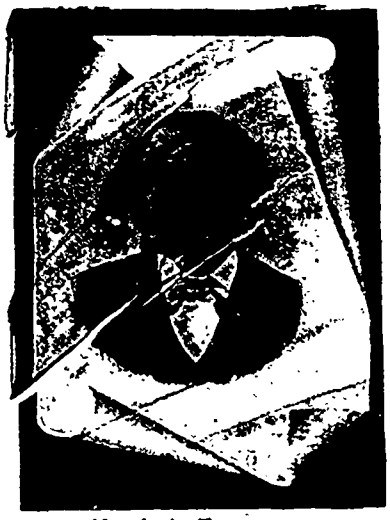
In a communication upon the above subject presented before the American Boiler Manufacturers' Association, by Mr. Fred Leonard, of London, Ont., the author said that during the last year an opportunity was offered to measure carefully the expansion of a stationary boiler bricked in and a small locomotive boiler mounted on skids, and it would appear that the expansion amounts to very little. The stationery boiler was 60 inches in diameter, 12 feet long, and stood three days, being cleaned and washed out. On the fourth day it was steamed up with a working pressure of 90 pounds, and a difference only of ¼ of an inch could be seen in length when standing cooled off and steam on. The locomotive boiler was 34 inches in diameter, 12 feet 9 inches long and carried 95 pounds steam, measured only ¼ inch less after having the water drawn off and standing 24 hours. From this it would appear that the plates and rollers under the brackets are unnecessary, as ¼ inch expansion in 12 feet amounts to practically nothing.

By request Mr. Leonard explained that the measurements were made on the return tubular boiler by means of a rod with a hook on the end which should be shoved through the tubes to the back connection.

PEMBROKE ELECTRIC LIGHT COMPANY.

The composition of the Pembroke Electric Light Company is as follows: President, Hon. P. White; Vice-President, A. Foster; Directors, Geo. Smith and Alex. Miller.

The building is an L shaped structure, 52 x 40 feet, in which the plant is situated, the boiler room being situated in the smaller part. The building is of brick, with a steep roof, and is situated on the banks of the Madawaska river, convenient for condensing purposes.



MR. J. A. THIBODEAU.
Manager Pembroke Electric Light Company.

The C. P. R. track passes within a few feet of it, and coal is easily handled.

In the dynamo room two Wheelock cut-off condensing engines operate the machinery; one of them is a tandem compound of 110 h. p., the other of 128 h. p. These engines are belted to 40 feet of 4 in. shafting, from which is run a Royal alternator of 1000 lights, two Edison three-wire system generators and two 25 light Western arcs, all of modern design. The switch board is 11 x 18 feet, and is fully equipped with all necessary instruments. On the shafting are two Goldie & McCulloch clutch couplings, which permit the engines to run separately or together.

The boiler room is 22 x 30 feet, and contains two Goldie & McCulloch boilers of 100 and 70 h. p. respectively, fired by wood. Two Northey condensers in the dynamo room supply them through two Austin heaters.

The company was organized in 1889, and three years ago erected the building, an illustration of which appears on this page.

Mr. Thibodeau, the manager, whose portrait appears herewith, is a shrewd business man and is connected with many other enterprises in the town.

The plant is in charge of Mr. A. Cone, electrician, and Mr. Thos. Mackie, engineer.

The Hull and Aylmer Electric Railway Co. have purchased a park a mile and a half further up Deschene Lake than the present park at Aylmer. The park has a frontage of nearly half a mile on the lake. It is said to be the intention of the company to double track the road from Hull, and to purchase another locomotive and ten 40-foot trailers for handling excursion parties. A Ruggle's rotary snow plough has also been ordered.

BY THE WAY.

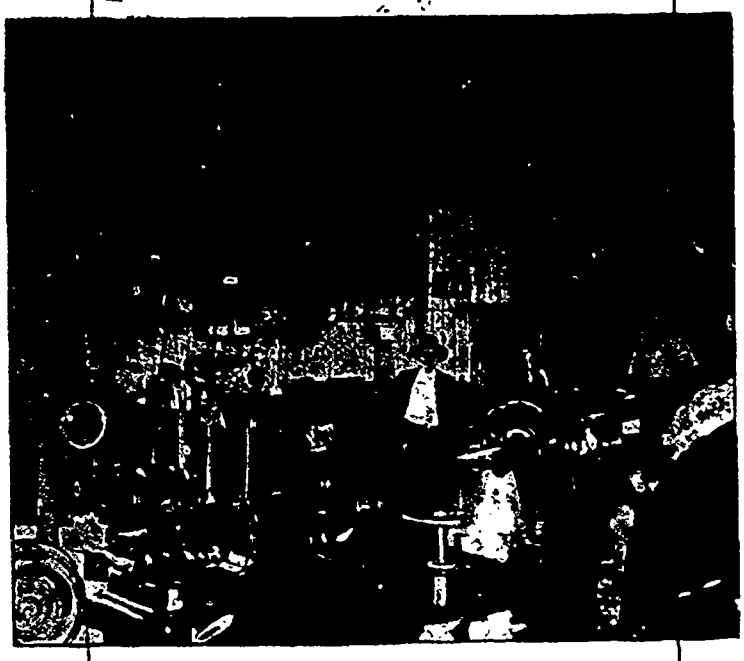
A NOVEL cause of dispute has arisen between the City Council of Toronto and the Toronto Railway Company Under its agreement the Company pay mileage fees to the city on the pavement between their tracks. The point in dispute is whether curves and intersections should be included in the mileage pavements. The city argues yes, and the Company, no. The latter quote the opinion of Mr. W. T. Jennings, late City Engineer, who drafted the engineering clauses of the agreement, in support of their contention. If the curves and intersections are to be counted in, the Company will be required to pay $4,000 per year additional mileage.

× × × ×

THE city of Detroit rejected the offer of the Detroit Electric Light & Power Co., to furnish light at $102.20 per lamp per year, and went into the business as a municipal enterprise. The sum of $630,141.92 was invested in the plant. A report of the first nine months' operations has just been published, by which it is shown that it has cost the city $68.52 per lamp, exclusive of any allowance for depreciation, interest on investment, water, rent and insurance. If these items are taken into account, as they certainly ought to be, and counting in also the amount which would have been received in taxes from a private lighting company, the actual cost per lamp is shown to be upwards of $130 per year, or more than $25 per lamp per year in excess of what a private concern offered to supply the light for.

× × × ×

THE State of Ohio, following in the wake of New York state, has recently placed upon its statute books a law which makes electricity the instrument by which in future the death penalty is to be inflicted. The prison official whose duty it was to purchase the required electrical apparatus for this purpose is said to have made the round of the electrical supply companies in Chicago and found that not one of them was willing to sell a dynamo to generate current to stop the current of human life. He had previously visited New York with the same result. The New York State authorities are said to have met with the same difficulty, and were finally obliged to buy their apparatus through a second

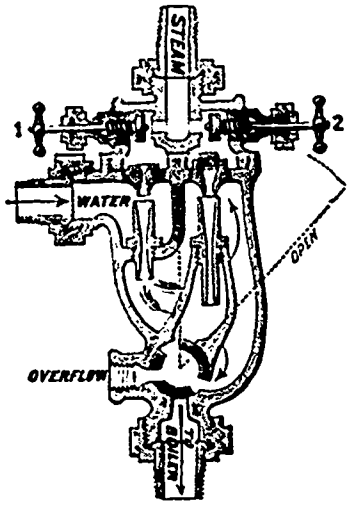


PEMBROKE ELECTRIC LIGHT COMPANY—DYNAMO AND ENGINE ROOM.

party. The above circumstance would appear to indicate that there is not yet a complete divorce between business and sentiment. The electrical fraternity have, no doubt, also felt it to be their duty not to assist to accentuate the idea which the daily press had succeeded in instilling into the minds of the people that the use of electricity was attended with the greatest possible danger to property and life.

THE "NIAGARA" INJECTOR.

Below is a sectional cut of the "Niagara Injector" an injector which is rapidly becoming popular among steam users. This boiler feeder is manufactured in St. John, N. B., by W. H. Stirling. The machine has only been on the market one year and is now in actual use in most of the cities and towns throughout Canada.



The Niagara Injector.

The machine is complete in itself requiring no valves as will be seen by the cut.

It can be throttled by means of valve No. 1 on suction side, so as to supply from full capacity down to required quantity, thus reducing the quantity of steam used, and delivering the water 90° hotter. The manufacturer states that this feature will save the price of the injector many times over in fuel alone, and that this fact has been demonstrated beyond doubt by the "Niagara" Injector being connected where other machines have been taken off.

Mr. Stirling has shipped these injectors to nearly every western city in Canada as far west as British Columbia.

The "Niagara" Injector is sold in Montreal by Samuel Fisher, 57 Sulpice street, and other dealers.

SPEED OF PULLEYS.

The diameter of the driven being given, to find its number of revolutions: Rule—Multiply the diameter of the driver by its number of revolutions, and divide the product by the diameter of the driven; the quotient will be the number of revolutions of the driven.

Ex. 24in. diameter of driver × 150, number of revolutions = 3,600 ÷ 12in. diameter of driven = 300.

The diameter and revolutions of the driver being given, to find the diameter of the driven, that shall make any given number of revolutions in the same time: Rule Multiply the diameter of the driver by its number of revolutions, and divide the product by the number of required revolutions of the driven; the quotient will be its diameter.

Ex. Diameter of driver (as before) 24in. × revolutions 150 = 3,600. Number of revolutions of driven required = 300. Then 3,600 ÷ 300 = 12in.

The rules following are but changes of the same, and will be readily understood from the foregoing examples.

To ascertain the size of the driver: Rule—Multiply the diameter of the driver by the number of revolutions you wish to make, and divide the product by the required revolutions of the driver; the quotient will be the size of the driver.

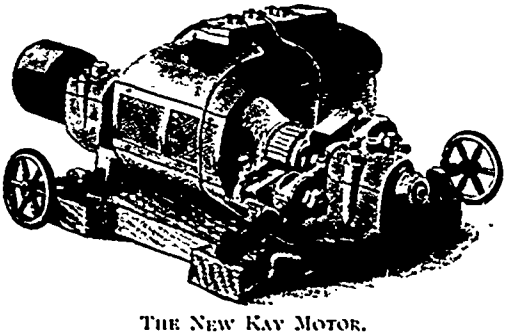
To ascertain the size of pulleys for given speed; Rule Multiply all the diameters of the drivers together and all the diameters of the driven together; divide the drivers by the driven; the answer multiply by the known revolutions of main shaft.

THE NEW KAY MOTOR.

This motor was designed to meet the increasing demand for small power, and they are made in sizes from ½ h.p. up to 10 h.p., the object being to produce an efficient, durable and cheap machine. There is only one joint in the magnetic field, therefore the loss in the magnetic circuit is scarcely perceptible. The bearings are self aligning and self oiling, having a metal ring at each end to carry the oil on to the shaft from the collar below. These bearings are made of the best phosphor bronze that can be had, in fact all the material used in the construction of the machines is of the best and the the workmanship unsurpassed.

These machines have been tested in different places by expert electricians and they claim that they are as high in efficiency as any others they have tested and higher than a good many. The simplicity of their construction enables the firm to put them on the market at a very reasonable price. Every machine that is turned out is tested up to its full capacity and guaranteed against all electrical and mechanical defects for two years from the time they are started. The demand for these machines is so great that the company's factory is taxed to its utmost.

In the last few years electricity as a motive power has



The New Kay Motor.

come so rapidly to the front that there is scarcely a village or factory where it is not employed extensively for lighting and power purposes. The Kay Electrical Mfg. Co. being among the pioneers in this line, have endeavoured to keep pace with the most advanced improvements and there is hardly a village, city or town from Quebec to Vancouver where there is not more or less of their machinery in operation. In the city of Toronto there are more than three hundred of their machines in use; in Hamilton nine-tenths of the electric power is used through Kay motors. Guelph, Brantford, St. Catharines and Montreal are all extensive users of these machines.

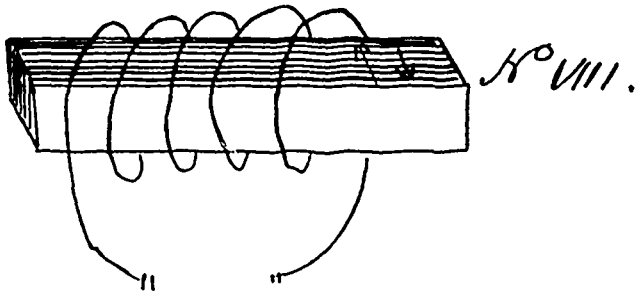
TRANSFORMERS.

By G. W. F.

(Concluded from September Number.)

A COMPARISON of tests made on a number of transformers shows that between the best and the worst there was the difference of about 100 watts per hour in the amount of energy consumed in the above friction—which is called *hysteresis*. Reducing this to a question of coal consumed, the better transformer consumed on no load more than one ton less than the other. This meant a saving of about $3.50 per year per transformer, by using the better and more expensive one. This saving capitalized shows that the better transformer was worth at least $100 more than the other in point of hysteresis saving alone, not considering losses to be investigated later.

A second source of wasted energy is the generation, within the core itself, of Eddy currents which heat up the iron, and so consume power. It will be evident from an inspection of the diagram 6 that the passage of a current through the primary wire P will set up currents, not only in the secondary wire S, but also in the bar A, which is actually a conductor placed in a varying field. These currents will circulate through the bar in directions at right angles to its length, and any means of checking them or reducing them will be an advantage as tending to reduce the losses. A current is stopped by breaking a circuit, and this method is employed in the construction of transformer cores, which are built up of thin sheets of iron placed side by side with some form of insulation between them. Thus, instead of the bar being solid, and so constituting a metallic circuit for Eddy currents, it may be represented by the accompanying diagram No. 8, which shows it made



of sheets separated by other sheets of insulation. The direction of the Eddy currents would be across the length, as indicated by the arrows; but they are evidently checked by the insulation, and so cannot flow in such great strength. The insulation does not interfere with the flow of the line of magnetic force, whose direction is along the bar. It is impossible to quite check or do away with Eddy currents altogether, because just as long as iron is subjected to a varying field, it must necessarily have currents set up in it. We can only minimize the evil by efficient design and construction. Lest it might be thought that these losses—from hysteresis and Eddy currents—are too insignificant to really take any account of, it may be here stated that results of a series of most carefully conducted tests, by persons whose competence was quite beyond question, showed that with transformers of superior make, the losses in very small sizes were sufficient to form about 10 per cent. of the capacity of the transformer, and in the larger sizes between 7 and 8 per cent. What the percentage would be in transformers of inferior make is impossible to estimate for all cases, but a test made on several different transformers by Prof. Jackson showed that, taking two for comparison, a central station using 100 transformers of the size considered would find a difference of $1,200 in operating expenses between the two makes—that is, the better type would cost less to operate than the other by $1,200 per year. Transformers are just like everything else—there are good ones and poor ones. A good transformer is the only one that a central station can afford to buy, and a good transformer costs money to build and is therefore expensive.

A third source of waste is the "magnetizing current," and this again can be minimized by careful design and good construction, but not entirely stopped.

This magnetizing current can be understood thus: P is a primary wire from the generator G. S is the secondary, and both are wound round a bar A. It is generally thought that if the secondary circuit is open—that is, when there are no lamps being lighted—that no current will be flowing in the primary circuit P. This is an error. There is a current flowing in P just as long as the generator is operating, whether the secondary is open or closed. The current, it is true, will be but small in the former case, and will increase as the load on the secondary becomes greater; but it is evident that no matter whether that secondary is open or not, the primary circuit is always connected right across the 1,000-volt mains, and must therefore carry some current. The reason it is so small at open secondary is because a counter electromotive force is set up in the primary by the alternating magnetism which it is itself the cause of in the core. This counter electromotive force is almost equal to the impressed E. M. F., and only the difference

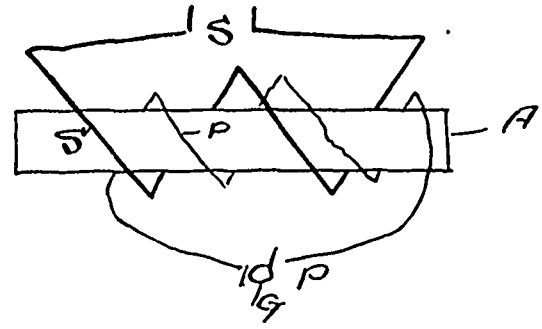


DIAGRAM IX.

between is available for setting up the flow of the small magnetizing current. Whenever the circuit through the secondary is closed, through a lamp or lamps, an E.M.F. will be set up in the secondary, which will indirectly assist the E.M.F. impressed on the primary. In this case the difference between the impressed and the counter electromotive forces acting to force a current through the primary will be greater than at open secondary, and will set up a primary current which will increase as the secondary resistance becomes less by throwing in more lamps. But it must be clearly borne in mind that a current is flowing in the primary whether the secondary is open or not, and further that the amount of this magnetizing current *depends on the construction* of the transformer, being capable of reduction to a very small amount, or of being made to assume very uneconomical proportions. Two high-class transformers on the market to-day are guaranteed to have the following magnetizing currents: A has ·125 of an ampere; B has ·0656 of an ampere in transformers of 6,000 watt capacities. Just as long as the generator is operating, A will consume ·125 of an ampere, and B ·0656 of an ampere, whether there are lamps burning or not. This is sometimes incorrectly called the leakage current. Take an installation of 1,000 lights, using ten of this size transformers. The magnetizing current of the lot will be, with A type 1¼ amperes, and with B type ·656 of an ampere. Reducing this to a matter of watts or horse power: A type *will cause a necessary waste of one and* seven-tenths of a horse power every hour the generator runs, while B will cause a necessary waste of only nine-tenths (9/10) of a horse power. Assuming that the plant operates for an average of eight hours for 365 nights during the year, and taking coal at $3.00 per short ton, and allowing 4 lbs. per h.p.h., the calculation is easy that the waste in magnetizing current only using A type transformers amounts to $30 worth of coal per year, and with B type to $15.75. This cost, being a constant yearly expenditure, should be capitalized, and at say 5% interest it shews that B type transformers of the above total capacity are worth $300 more than A type, or $30 each; and consequently that to use A type instead of B type is a very marked extravagance, unless they can be bought for $30 less. *It cannot be too strongly emphasized, that* it is by careful attention to, and consideration of such details that central stations must look to their profits. There have been numerous instances where central stations have turned a yearly deficit into a satisfactory profit by scrapping all their old transformers—with their wasteful magnetizing currents, and heavy hysteresis and Eddy losses—and using instead transformers of the most modern type. In the former case the generator current was lost in the transformer primaries; in the latter it was saved and available for sale. In the calculation made above, two really high class transformers were compared. What will be the results if transformers using half an ampere are taken as the basis? And yet it may easily be verified that plenty of those now hanging on poles *in provincial towns take all of that. From the above* considerations it will be plain that the efficiency of a transformer is a matter to be seriously taken into account, and that to buy such apparatus on the basis of lowest cost is a most imprudent policy. The facts that such apparatus cannot be watched during operation should make purchasers all the more careful in selecting it.

A point of considerable importance, although not entailing any loss on the central station, is that of the pressure regulation. A transformer, having no means of automatically raising its voltage

as the load becomes greater, necessarily allows a "drop" between no load and full load. A generator has some provision made, either by compounding its field or by hand regulation of the exciting current, for increasing its initial pressure as the current gets larger so that at all amperages the final pressure at the lamps will be constant. A transformer, however, cannot be compound wound; nor is it convenient to have a man up the pole to work a rheostat periodically, so that the pressure at its primary terminals is all that is available for causing the flow of current from no load to full load. It is plain, therefore, that at full load the pressure on the lamps will be somewhat lower than at light load, and the difference between these two pressures depends—as indeed does all the data—on construction and design. In the above transformers A has a regulation of 2½ per cent., B, of 1¼. This means that at no load, on one lamp, the pressure will be 2½ volts higher than it will at full load or 100 lamps, with A, and 1¼ volts higher with one lamp than with 100 lamps with B. Thus B will subject its lamps to ¼ of a volt less variation than A, and as the life of lamps decreases about 15 per cent. with every 1% of excessive voltage, it requires no great ability to see that for the consumers' interests B is the better transformer. All the foregoing considerations shew conclusively that transformers are in their way just as important as generators; that they are just as susceptible of careful and educated design and construction as any other apparatus; that to build a thoroughly good transformer requires very superior material and equally superior workmanship; that consequently a good transformer necessarily costs money, and a cheap one bears prima facie evidence of inferiority; that a cheap transformer is the most expensive piece of apparatus that can be bought; and a high priced one the truest economy and the best investment. It is to be hoped also that, in the near future, central station men will come to understand that the more sharply and intelligently that they study their plants and business, and the more they try to keep abreast of the times the better for themselves.

IMPROVED THERMO-ELECTRIC BATTERY.

By James Asher

The problem of how to transform heat economically into electricity is one of the most important that can be laid before the inventor. The electrical efficiency of the best thermo-electric battery is probably about one-twentieth only of that of a dynamo driven by a steam engine whose boiler uses an equal quantity of fuel.

We shall now consider where the great waste of heat occurs in the thermo-electric battery. In the first place there is an enormous waste of heat from the chimney. The quantity of heat which escapes from the chimney of a thermo-electric battery is perhaps about equal to that which escapes from the chimney of a stove consuming an equal quantity of fuel in an equal time. Nearly one-fourth of the total heat is radiated from a stove, and three-fourths passes up the chimney and does no useful work except the production of a draught of air for supplying the furnace.

The writer has invented several methods of securing better economy in those thermo-electric batteries which have chimneys and which use no water to cool the ends of the elements.

First Method.—All the air which feeds the furnace is caused to pass within a casing, along and in contact with the ends of the elements which need to be cooled, and then it enters the furnace at an elevated temperature. Thus the heat that would have otherwise been wasted is returned to the furnace, and part of the waste is thereby avoided. In fact, in this method I apply the regenerative principle to the thermo-electric battery. This method will not enable us to save all the heat which otherwise would have been wasted by radiation and convection from the exposed ends of the elements of the battery, because the products of combustion will leave the chimney at a higher temperature than they would otherwise.

Second Method.—An artificial draft is employed in the furnace. It is well known that an artificial draught can be maintained much more economically than can a natural draught in the furnaces of steam boilers. When we use a natural draught a high temperature in the escaping gases is necessary, otherwise the draught would be very feeble. But when we use a blower to force air into the furnace the products of combustion can be made to leave the chimney if required at a temperature but little higher than that of the atmosphere. Hence, the heat from the products of combustion may be used to elevate the temperature of the inner junctions of a thermo-electric battery, row after row, each row receiving heat from the gases at a lower temperature than the preceding row. The gases part with nearly all their heat before entering the chimney. The first row in this method would naturally receive heat at the inner junctions, but this temperature would be too high for the metals to endure without either fusion or rapid oxidation. In order to overcome this difficulty the writer proposes to force air into the thermo-electric battery beyond the furnace, and so as to mingle with the products of combustion of very high temperature which proceed from the furnace. By this plan we shall have a large volume of mixed gases, at a temperature which will not be too high for the inner junctions of the battery to endure. A great many elements will be needed to absorb the heat from the large volume of mixed gases. The temperature of the last set of elements at their outer ends should preferably not greatly exceed the temperature of the atmosphere.

Third Method.—It is said that the range of temperature in thermo batteries is only about ninety degrees. There is no advantage in maintaining the heated ends at a temperature of more than ninety degrees higher than their cooler ends. This being the case, I propose to utilize the outer ends of the first set of elements as a source of heat for the inner or hotter ends of the second set of elements, the ends of which are nearly in contact therewith, then the outer ends of the second set as a source of heat for the inner or hotter ends of another or third set, and so on until the inner ends of the last set have a temperature of about ninety degrees above that of the atmosphere. Thus I might have about ten sets of elements, the outer end of each set serving as a source of heat for the next set. A portion of the heat which enters each set of elements is transformed into electricity, and therefore, as heat, it disappears.

It is probable that in a thermo-electric battery, constructed according to my plans, the second law of thermodynamics would approximately hold. Supposing that we maintain the inner junctions of the inner set of elements at a temperature of 960° Fahrenheit, and the ends of the last set at a temperature of 150°, then if the second law of thermodynamics holds good here we should have a theoretical efficiency of

$$\frac{(960^\circ+460^\circ)-(150^\circ+460^\circ)}{960^\circ+460^\circ}$$

which is equal to fifty-seven per cent. This is a much greater efficiency than any which has ever been obtained from any steam or gas engine. It should be stated, however, that a deduction should be made for the power required to operate the blower when we use one.

Here, then, are several methods proposed for economizing heat in the thermo-electric battery. All these methods may be combined, then we shall obtain the highest efficiency.

SPARKS.

The failure is announced of the Holmes Electric Co., of Montreal. The assets of the company were recently sold by auction.

It is reported that the first building in Canada to be lighted with acetylene gas will be the new Presbyterian church, Palmerston, Ont.

An employee of the Royal Electric Co., named Sabaouth was killed in the Company's factory recently by coming in contact with a large belt.

Following the example of the ladies of London, the members of the King's Daughters Society, Cornwall, acted as conductors on the electric cars on September 16th, with the object of raising funds for the general hospital in that town.

Messrs. R. J. McGowan, Secretary Fire Dept., Toronto, and Z. Benoit, Chief of the Montreal Fire Department, were among the promoters of the National Association of Police and Fire Telegraph Superintendents organized in Brooklyn, N. Y., on September 15th.

Messrs. Fregeau & Lecroix have recently purchased the electric light plant at Three Rivers formerly owned by the corporation. The purchasers propose to obtain power from the falls at Price's Mills on the Batiscan river, 14 miles distant from the city. It is said to be their intention to also supply light to the neighboring villages.

When 350 watts make one horse-power, when copper wire sells for five cents a ton, when six inches make one foot, when two feet make one yard, when one watt equals a kilowatt—then 53 cents will make one dollar, and the people of the United States will stand as the largest aggregation of dishonest repudiators in the history of the world.—New York Electrical Review.

SPARKS.

Since the first of August the Montreal Street Railway Company have refused to accept payment of fares in American silver.

There was a collision on the Hamilton Radial Railway Co.'s line on Sept. 10th. Only two persons were injured, and these but slightly.

The Hamilton Street Railway Co. have notified their employees that a reduction of ten per cent. in salaries will be made commencing October 1st.

The Port Arthur Pulp Timber Co. is being incorporated to manufacture timber and to construct electric light and power works. The capital stock is $200,000.

Mr. John Patterson states that construction work will be commenced immediately on the plant of the Cataract Power Co., who propose to convey power from DeCew Falls to Hamilton.

The Armington & Sims' Engine Co., of Providence, Rhode Island, which suspended on the first of the month, had a contract to make a 600 horse-power engine for the London Street Railway Company.

The Telephone Company of St. Francois, Riviere du Sud, will seek for an amendment to its charter at the next session of the Provincial Legislature to enable it to prolong its line as far as Montmagny.

Negotiations are in progress between Toronto capitalists and the company who operate the horse car system at Niagara Falls, looking to the transfer of the line and its transformation into an electric road.

The management of the Toronto Technical School have added $100 to the salary of Mr. James Milne, Lecturer in Electricity, and have given him the supervision of the drafting room, mechanics, electricity, steam and the steam engine.

Application will shortly be made to Parliament for the incorporation of the Moto-Cycle Co., of Canada, Ltd., to manufacture and sell horseless vehicles. The headquarters of the company are to be at Montreal. The proposed capital is $150,000 in shares of $10.00 each.

At the annual meeting of the standard Light & Power Co., held in Montreal recently, the former Board of Directors was re-elected and the following officers appointed for the ensuing year: R. Wilson Smith, president; W. McLea Walbank, vice-president and managing director; E. Craig, secretary-treasurer.

The building and plant of the Palmerston Electric Light Co., was totally destroyed by fire last month, together with 100 cords of wood belonging to the company. The loss is a heavy one, the insurance being only $1,600. It is said to be the intention of the company to rebuild and instal a new plant immediately.

In order to get better service to points between Arnprior and Pembroke, the Bell Telephone Co. has constructed a new copper wire line from Ottawa to Arnprior. The Company have also a direct line from Ottawa to Brockville via Almonte and Carleton Place, and a new line is under construction from Ottawa to Morrisburg, via Metcalf and Winchester.

The courts of Montreal will decide in a day or two whether or not the Standard Light & Power Co. and the Bell Telephone Co. have power to open up the streets of the city and lay underground mains without the consent of the City Council, by virtue of the authority conferred upon them by the Quebec Legislature. Each company has commenced the construction of underground mains, but work has been stopped by the city authorities, pending a legal decision on the above point.

A bill is now under consideration in the Dominion Parliament for the incorporation of the Mather Bridge and Power Company. The object of the company is to bridge the Niagara river at Port Erie and to generate electrical power by means of an immense paddle wheel attached to the centre of the bridge. The bill is being opposed on the grounds that the wheel would be an obstruction to navigation, and that the country should receive a revenue from the utilization of the water power.

The streets of the town of Newmarket have been in darkness since last April, at which time the electric light service was discontinued, on the ground of unprofitableness. Ten thousand dollars have recently been invested by the municipality in a new plant, from which arc lighting for the streets and incandescent lighting for commercial and private use will be furnished. The new system is being rapidly put in working order, and is expected to go into operation within a week from date.

The International Trading Co. will submit to the City Council of Kaslo, B. C., a proposition to install an efficient lighting system, arc and incandescent, on condition that the city will contract at the price of $100 per month for twelve arc lights, for ten years, and exempt the property of the company from taxation. The company guarantee also to furnish light to private consumers at a reasonable figure, and to sell their plant to the city at a figure to be agreed upon at the expiration of the term of their contract.

The town of Peterboro' recently invited tenders for public lighting. No tenders, were however, received. A letter was read from the Peterboro' Light & Power Co., stating that they refrained from submitting a tender on the ground that the contract was too stringent. They objected specially to the clauses stipulating that the poles be painted and that a penalty of 75 cts. per lamp be imposed should the candle power be found to be at any time less than 2,000. The Council are now considering the question of purchasing a plant and operating it as a municipal enterprise.

Strained relations have existed for some time past between the City Council of Winnipeg, and the Electric Street Railway Company of that city. The Council contend that the company have forfeited their franchise by ignoring the terms of their charter as to character of service and condition of maintenance of the road. Mr. Wm. McKenzie, the president of the road, has just visited Winnipeg with the purpose of arriving at a settlement of the difficulty. He has offered to sell the road to the city, as he claims that it has been a source of trouble to the present owners ever since it was put in operation.

The formal opening of the Lachine Rapids Hydraulic and Power Company's works for the utilization and transmission to Montreal of the power of the Lachine Rapids, took place last month, and was attended by a number of prominent citizens. Mr. Burland, President of the company, reviewed the history of the enterprise, and stated that up to the present about $800,000 had been paid into the company, proof sufficient of confidence on the part of the directors and shareholders in the success of the scheme. Much credit was deservedly bestowed upon Messrs. W. McLea Walbank and E. T. Pringle, who were the original promoters and subsequently the engineers of the work.

The Chambly Water Power Co. have let the contract to Mr. Peter Lyall, of Montreal, for the construction of a dam across the Richelieu river at Chambly for generating electric power. A contract has also been given to the Stillwell-Bierce Co., of Dayton, Ohio, for the required machinery, while tenders have also been invited for sub-contracts amounting to upwards of half a million dollars. It is proposed to transmit electric power from Chambly to Montreal, a distance of 15 miles. It is expected that about 20,000 horse power can be generated. It is understood that the Royal Electric Co., of Montreal, who are shareholders in the Chambly Power Co., have contracted for a considerable portion of the available power.

In reply to Mayor Fleming, who called in question the impartiality of the tests of the electric light supplied in Toronto, Mr. Higman, Chief of the Inspection Department at Ottawa, declares his report to be an exact record of the conditions as he found them. He states further that no arrangement was made with either party as to the time when the test should be made, nor had either party any opportunity of "padding" the report or exerting any influence that would tend to bias the report for or against either party. Mr. Higman also points to the fact that arc lighting dynamos being constant current machines, it would be exceedingly difficult and inconvenient for the company to vary the output to any appreciable extent.

Some experiments on the effect of heat on insulating materials made by Mr. C. E. Skinner, are summarized in the following conclusions: 1. The insulation resistance of all ordinary fibrous insulating materials, such as paper, cloth, etc., decreases upon being heated up, and then increases again when the moisture is expelled. 2. Continued heating of 31 hours at 120 degrees centigrade does not lower the insulation resistance of paper. 3. The insulation resistance of completed apparatus shows the same characteristics as the insulation resistance of materials taken separately. 4. A low insulation resistance is not necessarily an indication of poor insulation, but probably an indication of the conditions of the apparatus in regard to moisture. 5. A high electromotive force should not be applied to apparatus when the insulation resistance is low. 6. Material which is badly deteriorated mechanically by heat may still have a high insulation resistance but very poor insulating qualities.

SPARKS.

The City Council of St. Thomas have decided to grant a three years lighting contract to the gas company.

An effort is being made to induce the Council of North Bay to have the streets of that town lighted by electricity.

A bill has been introduced in the Dominion Parliament to incorporate the Columbia Telephone & Telegraph Co.

The Gravenhurst Electric Light & Power Co. have succeeded to the business of the Gravenhurst Electric Light Co.

The St. Johns, Que., Electric Light Co., are negotiating for the necessary supply of power to operate their system successfully.

Wm. Simpson, an electrician with the Cortland Automatic Fire Alarm Co., won the first prize in the recent bicycle road race at Toronto.

The Consolidated Railway & Light Co., Victoria, B. C., will install an additional dynamo, weighing 8,000 lbs., purchased in England.

The Peoples' Heat & Light Co., composed of Boston capitalists, is reported to have purchased the franchise and works of the Halifax Gas Light Co.

The Nova Scotia Telephone Co. have just completed their new line between Glasgow, Pictou & Truro, in connection with their long distance line to Halifax.

Mr. J. W. Taylor, late manager of the Ottawa Porcelain & Carbon Co., is said to have purchased a valuable Feldspar mine suitable for the manufacture of porcelain ware and insulating material.

It is reported that an electric railway is to be immediately constructed from Liverpool, N. S., to the pulp mill at Millton, N. S., to carry the product of the mill to the seaport, and also to carry passengers.

The Sussex, N. B., Water & Electric Light Co. has recently *been organized, and* is about to erect a station 28×50 ft. in size. The company expect to have their plant in operation before the close of the year.

The Ottawa Electric Railway Co. are equipping their cars with fenders. It is proposed to place a fender at one end of the car only, and to construct loops so that the car may be turned around at the end of the trip.

As a result of a recent visit of the president and directors of the St. John Railway Co., it was decided to remove the electric plant to the Company's new building on Smythe street, and to instal additional machinery.

The Montreal Street Railway Co. have just completed the construction of an immense new chimney, the diameter of which is 54 feet at the base, and the height 225 feet. Two million bricks were used in its construction.

A bill is before Parliament to authorize the formation of the Canadian Electric Light & Power Co., with authority to build an electric railway from Cobourg, via Port Hope, Toronto and Hamilton, to the Suspension Bridge.

Li Hung Chang, the distinguished Chinaman who recently visited Canada, took his first ride in an electric car on the Niagara Falls Park & River Electric Railway, having previously refused to embark on the American Gorge road.

The Quebec Legislature will be asked at its next session to incorporate the St. Hyacinthe City & Granby Railway Co. to construct a railway to be operated by steam, electricity or other motive power, from Brigham, Brome county, to St. Hyacinthe. Capital $100,000.

On the route of the extension of the Montreal Park and Island Railway to Lachine, there has been discovered a piece of swamp which will entail a great deal of expense in the way of filling up. About 2000 loads of slabs have already been used as filling, and the end is not yet.

The Richelieu Telephone Co.'s property has recently been purchased by the Parc & Parc Telephone Co. The company's lines run from St. Ramie to St. Guilleaume, Que., connecting with other lines, forming a system of 263 miles in length, connecting 47 towns and villages.

The corporation of St. Johns, Que., have recently entered into a new contract with the electric light company. In future only a few of the principal places in the town will be lighted with arc lights, other parts being lighted by 25 c. p. incandescent lights. The total cost to the corporation will be $1,200 per year.

Mr. W. H. Meldrum is at the head of a new company which has lately been formed in Peterboro for the purpose of supplying electric power. An electric plant, including multiphase generators and motors, costing in the neighborhood of $25,000, is being installed for the company, under the direction of Mr. J. M. Campbell, electrical engineer of Gananoque.

The following are the officers elect of the Halifax Tramway Co.: President, Henry M. Whitney; Vice-Presidents, John Y. Payzant and Hon. D. McKeen; Secretary, B. F. Pearson; Directors, John Y. Payzant, Adam Burns and Thomas Fyshe. The company have taken over the road from Mr. Brown, the contractor, and it is in successful operation.

The Hull and Aylmer Electric Railway Co. are endeavoring to obtain from the Dominion Parliament the necessary legislation to allow them to change the name of the company to the "Hull and Aylmer Railway Co.," and to cross the Suspension bridge and land passengers in Ottawa. Their application is being strongly opposed by the Ottawa Electric Railway Co.

Notice is given that application will be made at the next session of the Dominion Parliament for the incorporation of a company to construct and operate a railway easterly from Vancouver through the North-West Territory and Manitoba and the province of Ontario to the Great Lakes, and to construct and operate telegraph and telephone lines along the said railway.

A charter will be applied for on behalf of the St. Jerome Power & Electric Light Co., Ltd. The object of the company is to acquire the electric plant now in operation at St. Jerome, Que., and the water power and mill privileges by which the same is operated. The proposed capital stock is $50,000; the chief place of business to be at St. Jerome, and the head office at Montreal.

A company has been formed at Quebec to take over the franchise given by the City Council to Mr. Beemer for the construction of an electric street railway. About a quarter of a million dollars has already been subscribed, and the construction of the road is to be commenced immediately. The power for the operation of the road will be supplied by the Montmorency Electric Light & Power Co.

It is reported that owing to the unwillingness of the Dundas town Council to grant the assistance asked for, the Hamilton & Dundas Railway Co. have abandoned, for the present at least, their intention of reconstructing the road and adopting electricity as the motive power. Instead of so doing it is said to be the intention to purchase a new dummy engine and new cars, and to lay new track between Dundas and the limits of the city of Hamilton.

A report on the route of the proposed Huron & Ontario electric railway has been presented to the president and directors of the company by the engineer, Mr. A. Brunel. It is proposed to utilize a number of water powers in the county of Grey for power purposes. The entire length of the road will be 285 miles, and it is stated that the road will open up a new section of country with a population of 140,000, and secure trade which is now carried on by means of horses.

It is reported that the business of the Niagara Falls Park & River Railway Co., for the past season has been disappointing, and that steps are to be taken to reduce the cost of operation. In this connection it is also reported that Mr. Ross Mackenzie, the manager of the road, has tendered his resignation and has been succeeded by Mr. Phillips, late chief engineer, and that negotiations are in progress between the directors of this road and the Niagara Gorge road, looking to the amalgamation of the two systems.

The Lachine Rapids Hydraulic & Power Co. have commenced the erection of a receiving station at the corner of Seminary and McCord streets, from which wires will be strung on steel poles to the generating works at Lachine. On some streets, however, underground conduits will be laid, provided the dispute between the company and the city of Montreal regarding the laying of these conduits shall result favorably to the company. A contract for 507,000 lineal feet of concrete-lined iron conduit has been given to the National Conduit Co., of New York, at the price of $150,000.

The City Council of Victoria, B. C., recently passed a by-law imposing a number of restrictions upon the operation of the street car system of the Consolidated Railway Co., of that city. The railway company have obtained from the courts an order that the validity of this by-law shall be argued and legally decided. The railway company claim that the by-law is illegal, inasmuch that it seeks to impose conditions and restrictions which are at variance with the agreement of 1894 between the city and the Victoria Electric Railway & Lighting Company, to whose charter the Consolidated Railway Co. have succeeded.

PRESERVATION OF WOODEN POSTS.

The conduction of the electric current for various purposes necessitates the use of an immense number of wooden posts as supports for the conducting wires and cables, and the preservation of these posts, which are set in the ground, is a question which has caused electric and other engineers a large amount of thought.

According to "La Nature" great interests are involved, for it is estimated that in Europe, alone, there are about 20,000,000 posts in use for carrying electric wires. The wood, where it is set in the ground, "betwixt wind and water," is very soon destroyed, and a number of posts have to be replaced each year. It is estimated that in Europe, alone, the maintenance of the posts costs nearly $4,000,000 per year.

Attempts have been made to prolong the life of the post by the injection of metallic salts, as sulphate of copper, or iron, or creosoting, and a certain measure of success has been obtained; but in time rains dissolve and carry away these substances. It is now proposed to protect the weak point of a post by a stoneware cover. This has been tried and has given good results.

Numerous observations have shown that a post is attacked for a length of from ten to twelve inches from the surface of the ground, which is the depth to which rains usually penetrate. This distance is covered with two half cylinders of salt-glazed stoneware joined together, and the space between the stoneware and the post is filled with a damp-resisting cement, such as Portland cement with sand or gravel. A ring is fixed onto the post just above the level of the stoneware coat, and the top is made up of cement laid at an angle so that the rain will run off.

Very careful experiments go to show that this method of preserving a post will increase its life by more than five times, and the cost would be very slight in comparison to the benefits obtained.

LEGAL.

Re Brantford Electric and Power Co. and Draper.—Judgment on appeal by the company from order of Falconbridge, J., referring an award back to the arbitrator. The company were the assignees of the lessor, and Draper was assignee of the lessees, mentioned in the lease of water power. The lessor had an option under the terms of the lease to refuse to renew the term, in which case he was to pay for the "building and erections" on the land, at a price to be ascertained by the arbitrator. The award in question made upon the lessor's election not to renew did not award to the lessee the value of certain fixed and moveable machinery. The order of Falconbridge, J., directed that the value of the machinery should be included. The court dismissed the appeal with costs.

The suit of the Royal Electric Co., of Montreal, against the town of Maissoneuve, and the Edison General Electric Co., intervening, was argued recently before Mr. Justice Charland in the Superior Court at Montreal. The Montreal Gazette prints the following particulars and decision: "The plaintiff alleged that on the 16th October, 1891, by deed before notary, it was agreed between the parties that the plaintiff should furnish the town of Maissoneuve with a complete system for the lighting of the town by electricity, the sum stipulated being $9,300; that the plaintiff immediately manufactured the necessary apparatus and prosecuted the work with diligence until stopped by an injunction and other legal proceedings. The plaintiff claimed the sum of 4,375.50, with interest, for work done and material furnished. The defendant called in the Edison General Electric Company in warranty, and the latter company took up the suit in behalf of defendant. The Court held that the plaintiff had proved its allegations, and that the intervening party had not proved its pleas, and judgment was given in favor of the plaintiff for the amount claimed, $4,861.17.'

PERSONAL.

Mr. A. E. Edkins, of the Boiler Insurance and Inspection Co.'s staff, sailed a few days ago per steamer Lucania for England.

Mr. H. M. Whitney, formerly president of the West End Street Railway company, of Boston, has been elected president of the Halifax, N. S. Electric Tramway company.

The many friends of Mr. Ross McKenzie, manager of the Niagara Falls Park & River Railway, will be pleased to learn that he is recovering from the severe attack of typhoid fever, which at one time threatened to prove fatal.

Mr. W. E. Davis, formerly electrician of the Toronto Railway company, and more recently electrical engineer and purchasing agent of the Detroit Railway, has been appointed manager of the Bearinger electric road, operating between Saginaw and Bay City, Mich.

It is announced on the authority of Professor McCallum, who is at present in Europe in connection with arrangements for the meeting of the British Association next year, that Lord Kelvin, the celebrated electrician, will be among the scientists who will attend this meeting.

Mr. C. F. Medbury has resigned his position with Messrs. Ahearn & Soper, of Ottawa, and has accepted a position with the Western Electric Company, of Chicago, with headquarters in New York city. The removal of Mr. Medbury will be deeply regretted in electrical circles in Canada. He was acknowledged to be one of the brightest, most energetic and gentlemanly of the representatives of the manufacturing companies in the Dominion, and may be expected to give a good account of himself in whatever capacity he may be placed.

TRADE NOTES.

The Beaverton Electric Light Co. are adding a 250 light Edison dynamo to their present plant.

The Consolidated Railway Co., of Vancouver, have installed a 150 kilowatt monocyclic generator.

P. McIntosh & Sons, Toronto, have purchased a 300 light plant from the Canadian General Electric Co.

The Canadian General Electric Co. have sold a 150 kilowatt monocyclic generator to the Hull Electric Co.

The O'Keefe Brewing Co., of Toronto, are installing a 500 light direct-connected unit. The Canadian General Electric Co. have the contract.

The New Glasgow Electric Light & Power Co. are installing a 75 kilowatt alternator of the Canadian General Electric Company's monocyclic type.

The firm of Ness, McLaren & Bate, electrical supplies, Montreal, has been dissolved. Mr. Norman W. McLaren will continue the business under the former name.

The Royal Electric Co. are installing in the asylum for insane at Mimico two direct current generators with a capacity of 500 lamps, to supplement the plant which was put in there some years ago.

Messrs. John Starr, Son & Co., of Halifax, have recently issued a very complete catalogue of 70 pages, and of convenient size, containing illustrations and prices of the various kinds of electrical apparatus which they handle.

The Weekes-Eldred Co., sole manufacturers for Canada of the Improved Jones Under-Feed Mechanical Stoker, have opened an office at No. 512 Board of Trade Building, Toronto, preparatory to introducing the invention throughout the Dominion.

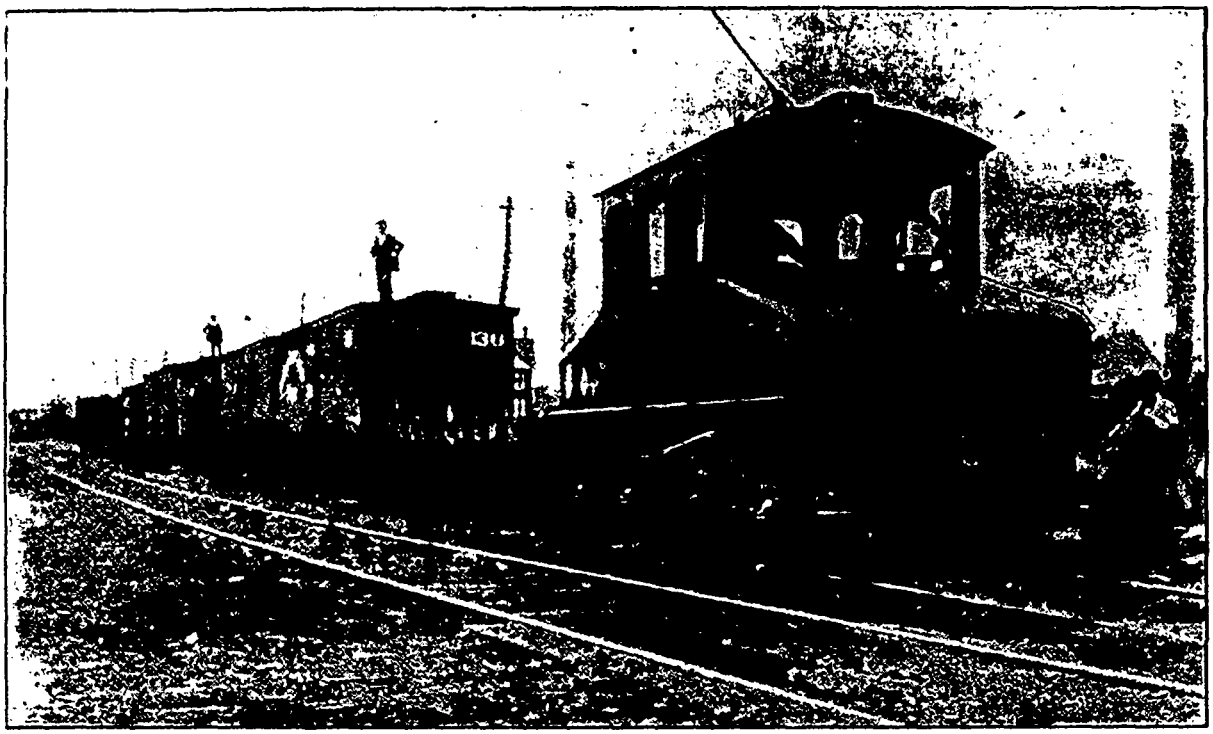
The Colliery Engineer Co., proprietors of the International Correspondence Schools, at Scranton, Pa., were partially burned out on the morning of the 30th of August. They advise us that fortunately their printing plant was in another building, and they had reserves of all instruction and question papers, drawing plates and other supplies and stationery used in the schools in still another building, so that their business will not be seriously interfered with. They have secured new and more commodious offices and are prepared to enroll and instruct students as usual.

The Corporation of the town of Sudbury have closed a contract with the Royal Electric Co., for the installation of one of their 75 kilowatt "S. K. C." two phase alternating current generators; from which they will operate 15 alternating current arc lamps for street lighting, about 1,000 incandescent lamps, and a number of motors. We are advised that this is the first alternating current plant in Ontario, other than experimental, and demonstrates the flexibility of the alternating two phase system. They can serve a night load as well as a day load, from the same dynamo, and only use one circuit, making it possible to run a lighting and power system with only one circuit and one machine.

ELECTRIC RAILWAY DEPARTMENT.

ELECTRICITY ON A STEAM ROAD.

THE latest development in Canadian electric railway work is the equipping of the Aylmer branch of the Canadian Pacific Railway with electric service. This line extends from Hull, a suburb of Ottawa, to Aylmer, where it connects with the Pontiac Pacific Junction Railway extending 60 or 70 miles up the north side of the Ottawa river. The section from Hull to Aylmer has been leased by the Hull Electric Co. for a term of 35 years, the understanding being that besides passenger and mail traffic they are to handle all through and local freight delivered to them by either the Canadian Pacific Railway or the Pontiac Pacific Junction Railway. As they are the only connecting link with the Pontiac Pacific Junction Road it can readily be understood that the quantity of freight is considerable, amounting usually to 50 or 75 cars per day. This freight is mostly handled at night, leaving the road free during the day for passenger traffic.



ELECTRIC LOCOMOTIVE—AYLMER BRANCH CANADIAN PACIFIC RAILWAY.

At the Aylmer end of the line the company owns 60 acres situated on Deschesne Lake, a sheet of water three miles wide by 27 miles long; an ideal spot for sailing and boating, thus forming a strong attraction for the Ottawa citizens. Indeed the traffic has been far beyond expectations and the train service had to be increased until they are now running 36 regular trains each way per day besides special excursion trains.

The power is obtained from Deschesne Rapids, where the lake of the same name empties itself into the Ottawa River at a point midway between the termini of the road.

The wheels are of the "New American" type manufactured by Wm. Kennedy & Sons of Owen Sound, Ont., and operate under a head of 9 feet. Four 60 inch wheels are now installed and space is provided for two more.

The electrical equipment of the power house consists of two M. P. 4-200-425 generators built by the Canadian General Electric Company. For controlling the output of these machines there is a white marble switchboard consisting of two generator panels, two feeder panels and a total output panel, all of the General Electric standard type and supplied by the Canadian Co. Besides these there are three panels containing the "Barbour" water wheel regulator by which the current output of the generators is automatically kept constant by cutting in or out dead resistance as the load varies on the line. By this means the speed of the machines is kept constant and the variation in voltage is held within a very close limit.

The car sheds and repair shops are also at Deschesne and are fully equipped with all modern appliances for handling and inspecting the rolling stock which at present consists of five closed cars and five open cars, besides a mail, baggage and express car and a locomotive. All the cars are mounted on double trucks, and are each equipped with two G. E. 1200 motors with K.21 controllers. The closed cars are 42 feet long over all and finished in mahogany throughout, the outside sheeting being also solid mahogany finish, in the natural wood. These cars have extra large vestibules at each end provided with seats for the accommodation of smokers, and divided from the main part of the car by double sliding doors. The open cars have 13 benches with reversible backs and their finish and solidity are excellent. All these cars were built and equipped at the Canadian General Electric Co.'s

Peterboro factories from where they were shipped complete ready for delivery on the track.

The locomotive is of particular interest, being the first of the kind operated in Canada. It weighs something over 20 tons and is provided with double trucks, each axle being equipped with a motor. As all the wheels are driven full traction advantage is obtained from the total weight and a draw bar pull of 10,000 lbs. can therefore be exerted, equivalent to the power of the average 35 or 40 ton steam locomotive. This was also designed and built by the Canadian General Electric Co.

In equipping this road the Hull Electric Co. have evidently constantly kept before them the maxim that the best is the cheapest in the end, and will no doubt reap the advantage by long life in their apparatus and small repair bills.

The president is Mr. Alexander Fraser; vice-president, Mr. W. J. Conroy; secretary-treasurer, Mr. Jas. Gibson; and managing director, Mr. H. B. Spencer.

Besides operating the railway, the company have also exclusive privileges for both private and public lighting in the city of Hull and the town of Aylmer, and for the purpose there is installed at the power house a 150 K. W. monocyclic generator with a standard switchboard panel and equipment.

A NEW DEPARTURE IN STREET RAILWAY PRACTICE.

THE proposition was seriously discussed, in connection with the opening of a new electric railway project in Eastern Ontario, recently, to employ good looking young women as conductors, as a means of popularizing and enhancing the receipts of the road. It remained, however, for Mr. C. E. A. Carr, manager of the London, Ont., Street Railway Co., to make a practical test of the idea.

With the object of raising funds to assist in furnishing the new Y. M. C. A. building, about eighty good looking and fashionable ladies of the city arranged with the street car company to act in the capacity of conductors on a certain day, trusting to their charms to swell the receipts and realize a surplus for the purpose mentioned. On the day preceding the one on which they were to enter upon their duties, the ladies took practice trips over the lines, and made careful mental notes of the manner in which the conductors performed their duties.

It was arranged that the ladies should divide themselves into detachments, each detachment remaining on duty for two hours at a time. Much to everybody's surprise, especially as the morning of the day fixed for the experiment proved to be a wet one, every lady conductor reported for duty at the early hour at which the cars begin running. More than half of the preceding night had been spent in decorating the cars with bunting, and when the rain came, it destroyed the results of all the labor bestowed in this direction. Instead of giving way to discouragement, the ladies soon had the interior of the cars charmingly decorated with cut flowers.

In order that the company might not violate the clause in their agreement with the city which provides that at least two men shall be in charge of each car, the manager writes us that the company's own conductors had charge as on other days, the ladies merely collecting fares with the fare box and issuing transfer tickets. One young woman, however, is credited with having done all the work in conducting her car during several shifts. She collected fares, stopped and started the car to take on and let off passengers, registered the fares, made change and issued transfers, and also ran ahead of the car at the railway crossings.

The ladies are said to have refused to recognize passes, no matter by whom presented, and certain of the city officials who are accustomed to free transportation were told that they must either put up the amount of their fare in good coin of the realm or get off and walk. Having become unaccustomed to walking, they had recourse to the other alternative.

Among the many amusing incidents of the day, a local paper records the following: "One of the officials of the road saw a very funny thing on the Springbank line just before three o'clock in the afternoon. The conductor on the car in question (which was returning to the city) did not have a chaperon or any passengers on board, and the young woman was on the front platform taking instructions from the motorman. Seeing another car coming, and thinking that some of the officials might be aboard the motorman tried to get the young woman to leave the controller, and the switch. This she would not do, and the motorman, bound to be found on duty at all events, put his both arms about the girl and also held the mechanism governing the current. Passengers on the passing car caught a glimpse of the queer sight as the up car passed, the girl smiling saucily, and the motorman looking abashed at having to hold in his arms a bundle of charms in broad daylight."

Manager Carr informs us that notwithstanding the unfavorable weather the venture was on the whole a satisfactory one for the street railway.

BERLIN AND WATERLOO ELECTRIC RAILWAY.

MR. E. Carl Briethaupt, President and Manager of the Berlin and Waterloo Electric Street Railway, is evidently determined to make this a thoroughly up-to-date road. When electricity was adopted as the motive power, light rails which were previously in use were retained. Last winter, however, proved them to be unsuitable, great difficulty being experienced from snow and ice. The old horse cars were also made to duty, after having been vestibuled. They too proved to be unsuited to the new order of things, and have been replaced by the most modern style of coaches. The necessary quantity of 60 lb. steel rails has now been purchased, to replace those at present in use; new car barns are in process of construction, and the spring of 1897 will see the road in a position to offer its patrons first-class accommodation.

CANADIAN VS. ENGLISH ENTERPRISE.

It has been recently stated on good authority, says London Lightning, that there are at work or under construction in Canada 36 electric street railroads, with a total length of nearly 600 miles. No less than 750 motor cars are in use or building, and the sum invested in the various undertakings is a little over four millions sterling. England in the meantime is just beginning to wake up, rub her eyes, and wonder whether the horse-tram could really be improved upon, and whether ½d. a mile running costs, with speed, cleanliness and comfort, are, on the whole, preferable to 7d. a mile running costs, polluted streets, frowsy 'buses, the travelling

powers of a gouty tortoise and the horrors of cruelty to animals. "But," says the dear old grandmother of nations, "we might hurt somebody, or frighten a dog; and then, after all, we have got on without these things so far," and she dozes again. The Canadian company which recently purchased control of the Manchester tramway, will shortly show our British friends how to construct and operate an up-to-date road.

The town of Orillia is receiving tenders for the supply of a fire alarm system.

The village of Huntsville is receiving tenders for the installation of an electric lighting system.

A recently quite popular method of measuring the commercial efficiency of the boiler and furnace combined, is to determine the cost of evaporating from and at 212° F. 1,000 lbs of water.

Where the feed pipe between heater and boiler is exposed there is considerable loss of heat, amounting to sufficient to lower the temperature of the water 5 to 10 degrees and even more, in some cases.

Superheated steam cannot exist in contact with the water from which it was generated. Its temperature is higher, its specific volume greater, and its density less than saturated steam of the same pressure.

FOR SALE

One 50-Light 4 Ampere (Ball) Arc Dynamo, with Station Apparatus and 46 Lamps; also one 25-Light 8 Ampere (Reliance) Dynamo, all in good order.

The above will be sold at a bargain. For particulars apply to

H. S. CANE,
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IT WILL PAY YOU

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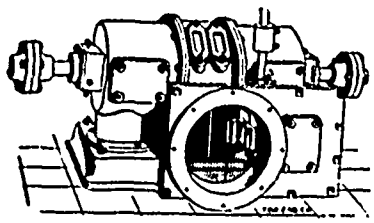

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Highest efficiency at partial gate opening. Steadiness of motion. Easily operated. Sensitive to the action of a governor. No end thrust on wheel shaft.

Descriptive Circular Sent on Application

Estimates furnished for complete power plants. Machine dressed gearing a specialty.

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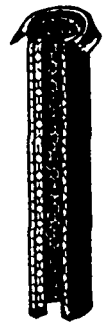

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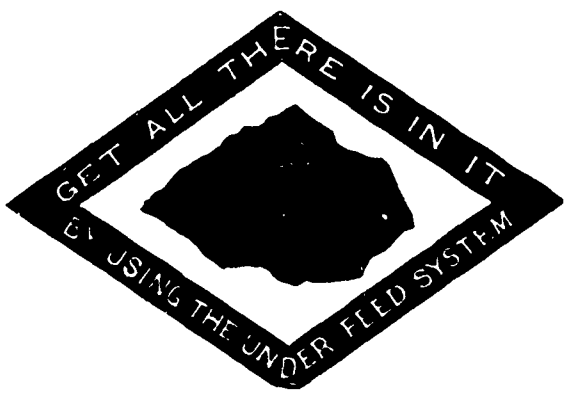

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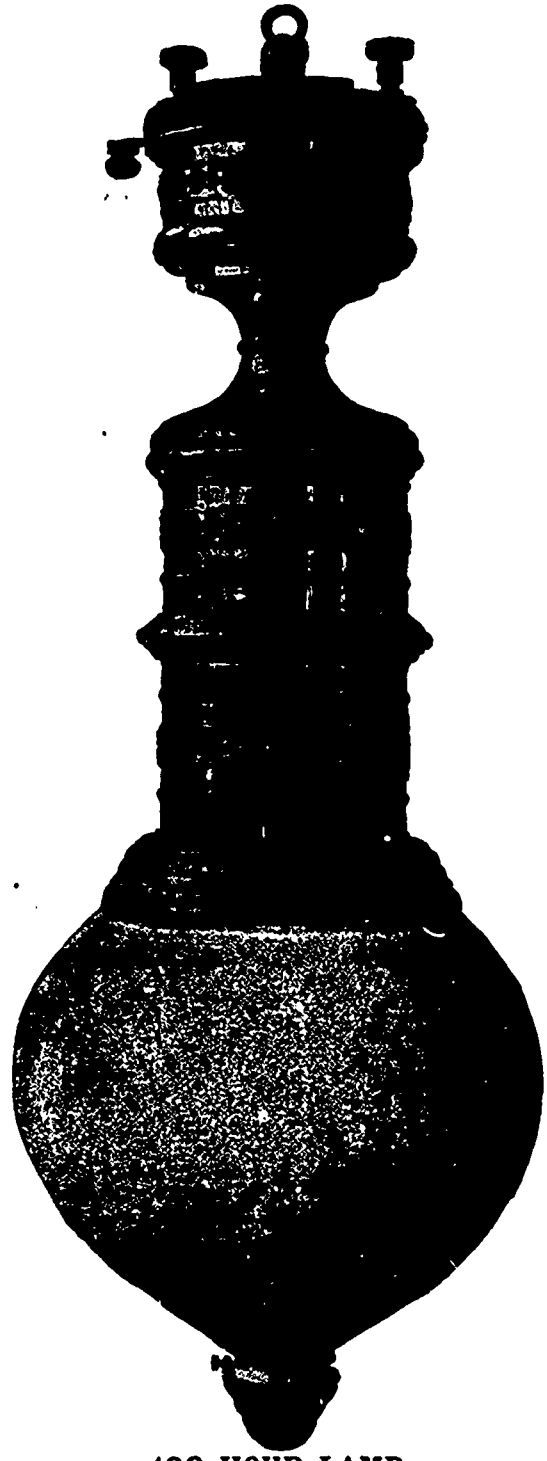

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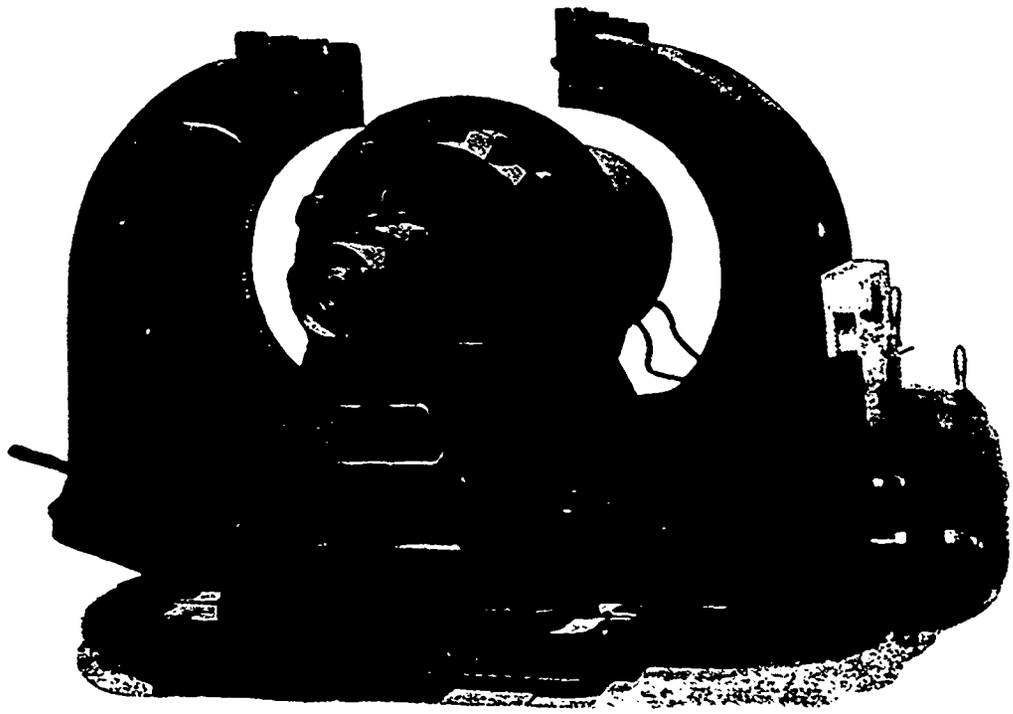

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The absolute temperature is the temperature shown by the thermometer, plus 461.

To find the volume of air at any higher temperature, multiply the volume at lower temperature by the higher absolute temperature and divide the product by the lower absolute temperature.

Example. If 50 cubic feet of air enters a heating coil at 20 degrees, what is its volume after it leaves coil at 100 degrees temperature?

(Volume) 50 561 (higher absolute temperature) 28,050 481 (lower absolute temperature) 58.3 cubic feet.

A pound of air at atmospheric pressure will occupy 12.38 cubic feet at 32 degrees temperature.

By substituting, a constant for above value is obtained, 39.8, and with this constant the cubic feet of a pound of air can be found for any temperature by this rule:

Divide the absolute temperature of the air by 39.08. By doing this for two temperatures the difference will be the change in volume due to the difference in heat for each pound of air.

The length of an indicator diagram should be twice its height, in order to be proportionate in appearance.

You should keep before the people,
For they are very apt, you know,
To forget you are in business,
If you cease to tell them so.

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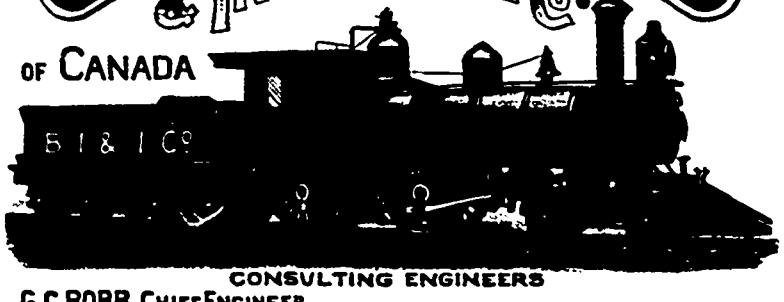

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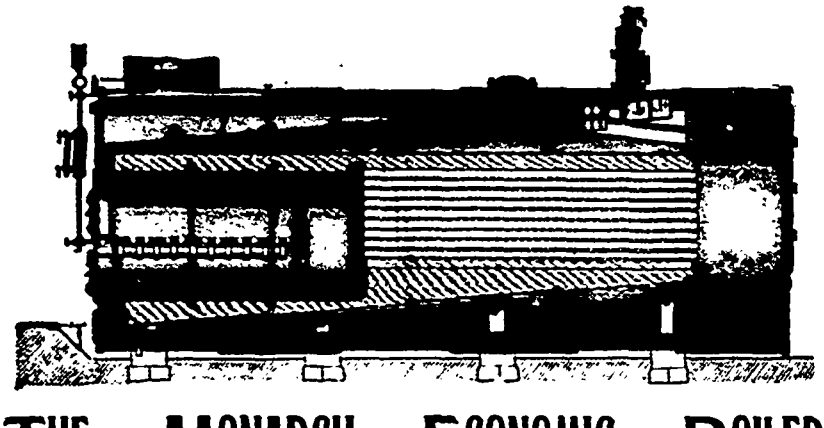

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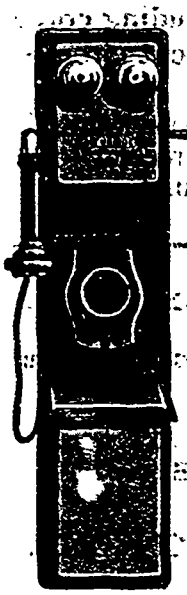

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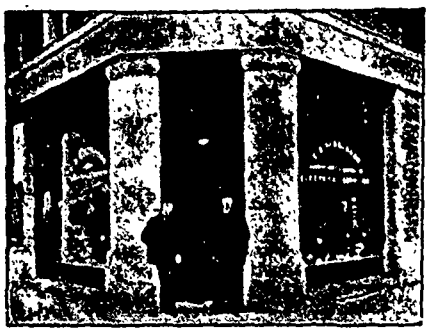

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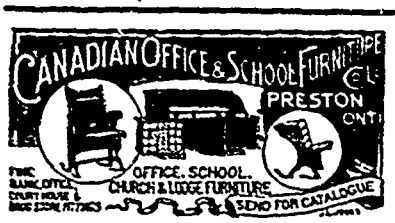

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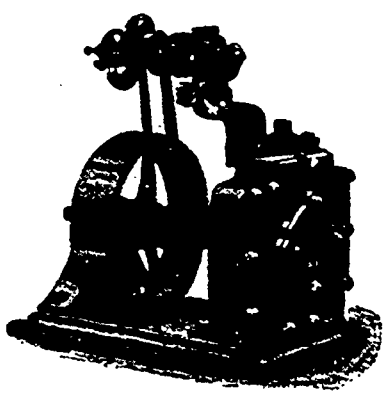

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