Technical and Bibliographic Notes / Notes techniques et bibliographiques

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

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

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

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

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

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

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

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

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

CANADIAN
ELECTRICAL NEWS
AND
STEAM ENGINEERING JOURNAL

OLD SERIES, VOL. XV.—No. 4.
NEW SERIES, VOL. IV.—No. 5.
MAY, 1894
PRICE 10 CENTS
$1.00 PER YEAR.

MONTREAL INSULATED WIRE WORKS.

J. ROSS, SON & CO.

MANUFACTURERS OF

INSULATED ELECTRIC WIRES

And Wires for Annunciators, Offices, Magnets and Dynamos.

FACTORY: 41½ WILLIAM ST.,

MONTREAL.

Orders solicited and carefully executed.

P. O. Box, 1496.

E. CARL BREITHAUPT

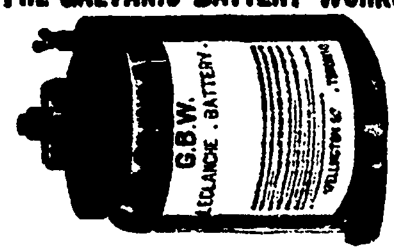
CONSULTING

ELECTRICAL ENGINEER

Graduate in Electrical Engineering at Johns Hopkins University Baltimore.

Address: BERLIN, ONT.

THE GALVANIC BATTERY WORKS



145 Wellington St. West, : TORONTO

STEAM USERS

Desiring the services of COMPETENT ENGINEERS of any class, can obtain sober, intelligent and reliable men, by applying to

CANADIAN ASSOCIATION STATIONARY ENGINEERS.

GEO. HUNT, President, 625 Dorchester Street, Montreal.

J. J. YORK, Secretary Montreal Branch, Board of Trade Building, Montreal.

Use Something Good

PEERLESS OILS

TAKE NO OTHER.

MADE SPECIALLY FOR YOUR USE.

THE PEERLESS BRAND IS SECURED BY LETTERS PATENT.

Best Oil in the market. Does better work and more of it. Saves the Machinery and lasts longer. Try it.

12 GOLD MEDALS IN 6 YEARS

SOLE MANUFACTURERS

SAMUEL ROGERS & CO.

30 FRONT STREET EAST, TORONTO, ONT.

EUGENE F. PHILLIPS, President. JOHN CARROLL, Sec. and Treas.

EUGENE F. PHILLIPS ELECTRICAL WORKS

(LIMITED)

MANUFACTURERS OF

ELECTRIC LIGHT WIRE,

Magnet Wire, Office and Annunciator Wire,

Rubber Covered Wire, Lead Encased Wire,

TELEPHONE AND INCANDESCENT CORDS.

FARADAY CABLES.

RAILWAY FEEDER AND TROLLEY WIRE

OFFICE AND FACTORY:

New York Office: 10 Cortlandt Street.
Providence R. I.: American Electrical Works.

Montreal, Canada.

Columbia Metal

THE BEST ANTI-FRICTION METAL ON THE MARKET!

LESS FRICTION; LESS WEAR; LESS HEATING IN JOURNALS; AND LESS OIL USED THAN WITH ANY OTHER METAL.

As liquid as water when melted. Once used, always used. Prices right.

A TRIAL SOLICITED.

W. S. BATES - MEAFORD, ONT.

The F. E. Dixon Belting Co.

(LIMITED)

MANUFACTURERS OF

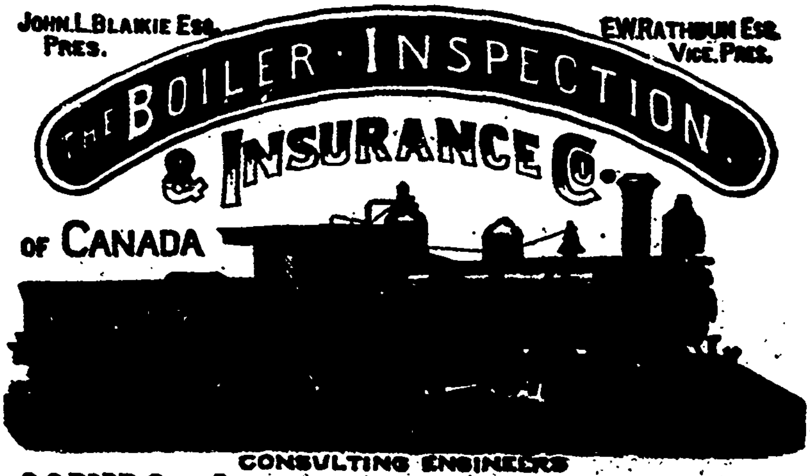
LEATHER BELTING

70 KING STREET EAST, TORONTO.

Headquarters for Electric and Dynamo Belting.

JOHN L. BLAIKIE ESQ. PRES.

E. W. RATHBUN ESQ. VICE PRES.

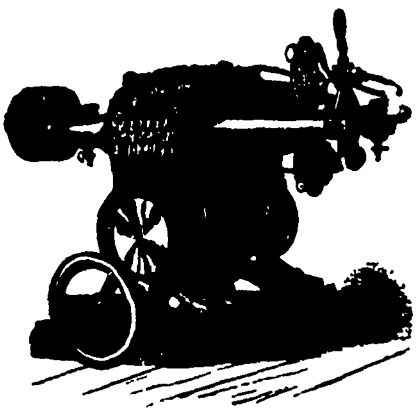


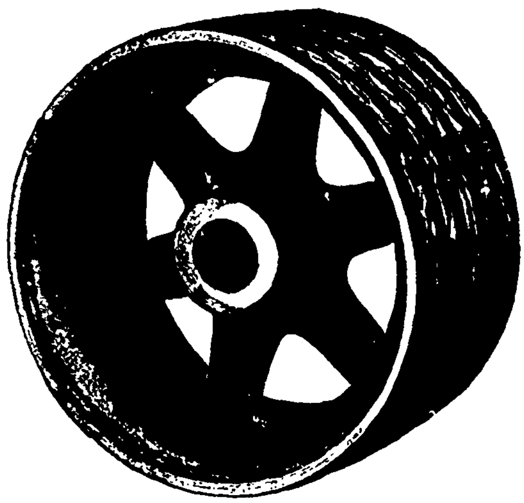
CONSULTING ENGINEERS

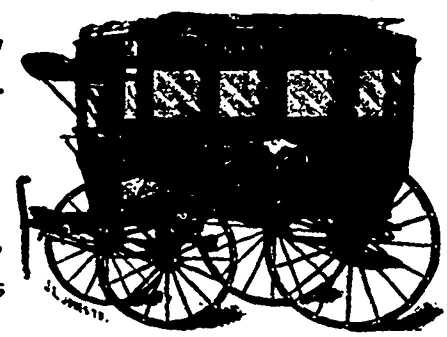
G. C. ROBB CHIEF ENGINEER

A. FRASER SEC. TRES

HEAD OFFICE TORONTO

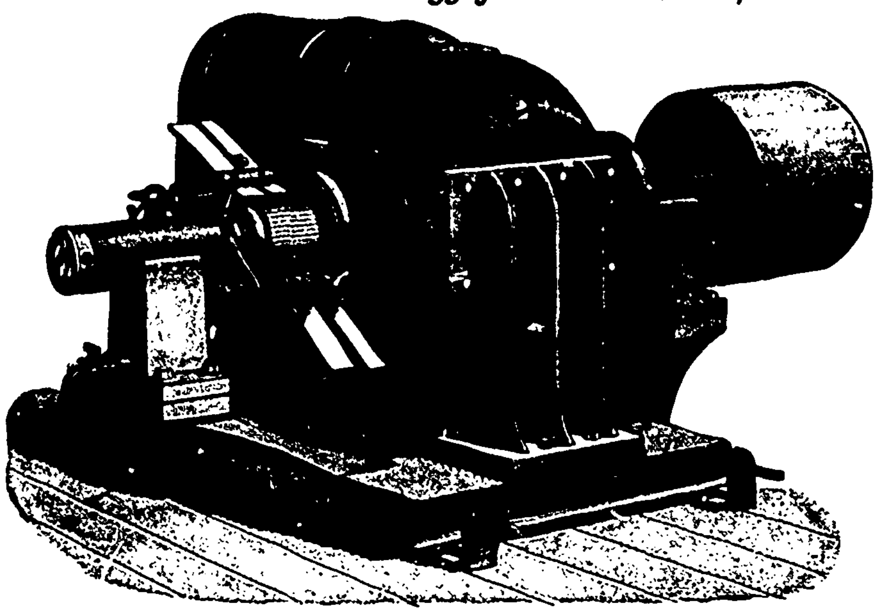






KAY ELECTRIC WORKS

No. 255 James Street N., Hamilton, Ont.



... MANUFACTURERS OF ...

DYNAMOS

For Arc and ......
Incandescent Lighting.

MOTORS

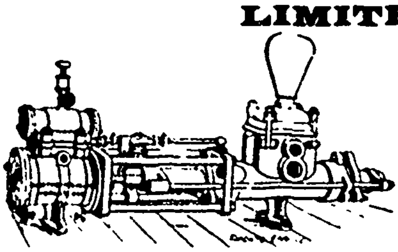
From ¼ H. P. to 50 H. P.

Electro Plating Machines and General Electrical Appliances. Special attention to Mill and Factory Lighting. ....

WRITE FOR CIRCULARS.

NORTHEY MFG. CO. • TORONTO.... ...ONTARIO.

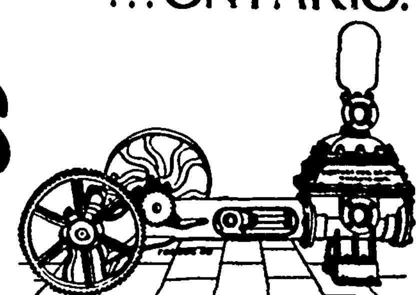
LIMITED



MANUFACTURERS OF

STEAM AND POWER PUMPS

For General Water Supply and Fire Protection.



BOILER FEED PUMPS AND PUMPS FOR ALL DUTIES

CONDENSERS, ETC.

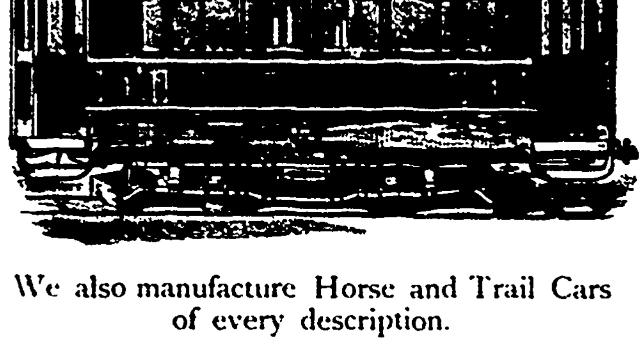
HIGH CLASS PUMPING ENGINES

FOR HIGH DUTY, SUITABLE FOR TOWN AND CITY WATERWORKS.

FINE - - ELECTRIC ·◆·

Street Cars

....OUR SPECIALTY....



We also manufacture Horse and Trail Cars of every description.

PATTERSON & CORBIN,

ST. CATHARINES, ONT.

TELEPHONES

THE "T. W. NESS"

Automatic - - -

- - - Telephone

PATENTED
Canada, Sept. 12th, 1893.
United States, Sept. 19th, 1893.
France, Sept. 19th, 1893.

Specially Designed for Warehouse and Factory Use.

Send for new catalogue No. 7.

SAMPLE LETTER.

MONTREAL, Oct. 10, 1893.

MESSRS. T. W. NESS & CO.,
749 Craig St., Montreal, P. Q.

DEAR SIRS:—In reply to yours of the 9th, we beg to say that we have used one of your Automatic Telephones for some time, and find it satisfactory in every respect.

Yours truly,
GREEN & SONS CO.

T. W. NESS & CO.

749 Craig St. - MONTREAL

CANADIAN

ELECTRICAL NEWS

AND

STEAM ENGINEERING JOURNAL.

VOL. IV. MAY, 1894 No. 5.

AN ANCIENT TELEPHONE.

IT is a pretty widely-known fact that as early as 1667 the English physicist, Robert Hooke, described the transmission of sound to a very considerable distance. He says that, by the help of a tightly-drawn wire, which even might be bent in many angles, sound might be propagated to a long distance, and with a rapidity which, though inferior to that of light, was, at any rate, infinitely superior to that of sound in the open air. It is a most curious fact, and one which is not so generally known, that Jacob Christoph Von Grimmelshausen, a German author of the seventeenth century, in the first chapter of the third book of his celebrated novel, "Simplicius Simplicissimus," mentions an instrument which, according to his description, not only corresponds to Robert Hooke's apparatus, but leads to the assumption of the existence of a contrivance at the time of the Thirty Years' War very similar to our present telephone. The passage from the book reads literally as follows: "I was, as already mentioned, so eager to gain honour and renown, that I could not sleep while all this was passing through my head. And when I had such fancies, and lay awake many a night thinking how I might contrive new finds and stratagems, I had very curious notions; consequently I bethought myself of an instrument with which I could on a calm night hear a trumpet being blown at three hours distance, and a horse neighing and a dog barking at two hours and a man talking at one hour's distance. In the daytime the instrument was not so useful to me unless it were in a quiet place, because one would have heard the horses and the cattle down to the least bird in the air, or frog in the water, all together, so that one would not have understood one in consequence of the noise of the other. Now, I know quite well that there are people at this very hour who do not believe me; but, whether they believe me or not, it is the truth. I undertake, by means of an instrument invented by me, to recognise at night by his voice a man who does not speak louder than his usual custom. And no one would believe me of those who saw with their own eyes how I used the aforesaid instrument, and when I said to them, 'I hear horsemen galloping, for the horses are shod,' or 'I hear peasants, for the men go barefooted'; then, 'there goes a herd of cattle, for I hear sheep bleating, bulls bellowing, and pigs grunting, and so forth.' My own comrades at first took these speeches for 'fibs,' but when they found in reality that I was always speaking the truth, then they called it witchcraft taught me secretly by the devil's own mother. I am of opinion that if I had taught this science openly I should have become very popular, because it would have proved of great advantage to those engaged in war, especially in sieges. This is what Grimmelshausen says about his 'far-hearing instrument,' to which must be accredited a certain resemblance with the present telephone."
—Machinery.

QUESTIONS AND ANSWERS.

C. W. C., Rat Portage, Ont., writes: Can you tell me where the markets for mica are, how it is graded, and for what purposes it is used?

ANSWER.—The principal market for Canadian amber mica lies with the large electrical manufacturing companies of the United States. These companies prefer to use the smaller sheets, and from these, when required, they build up larger sheets to suit their purpose. The principal users of white mica are the stove manufacturers. We understand that the quality in both amber and white, is graded largely according to the size of the sheet. We presume that of course the clearness, etc., would also have considerable to do with determining the grade. Refuse mica is also made use of by paint manufacturers, who grind it up for use in their materials.

E. A., Newmarket, Ont., writes: On page 36 of the Calendar of School of Practical Science for 1893-4, it says; "Candidates for electrical engineering are required to present in evidence that they have had one years practical experience with mechanical works as machinist, patternmaker, etc." As there are several of your readers who would like to know, would you please answer the following questions through your paper: (1) Will this year have to be put in before going to School of Practical Science? (2) Would a year in an electric station answer? (3) Would it do to put the year in four months at a time in the holidays?

ANSWER.—In reply to our request for information on the above points, Professor Galbraith, Principal of the School of Practical Science, writes us as follows. - "The year of practical work required in the case of candidates for the diploma in the department of mechanical and electrical engineering may be put in before coming to the school. Part of the time may also be put in during the vacations, say four months in each vacation. If the whole year has not been put in before the candidate has passed his final examination (3rd year) his diploma is withheld until the time has been completed. A year in an electrical station would be accepted if it were employed in mechanical and electrical work. The object of the provision is to ensure that holders of the diploma in question have had a certain amount of manual workshop training."

The following answer to a question by "Meter," Arnprior, Ont., in the NEWS for March, was accidentally omitted from the April number:- The fan motor which is most extensively used with alternating currents is not essentially an alternating current motor. The principle of its action is a rotary magnetic field produced mechanically. The field magnet is a cylinder with pole pieces spaced equally around it, projecting radially inwards. The armature shaft is the axis of the cylinder. There is a coil round each pole piece and the terminals of these coils are brought to contact pieces arranged in a circle concentric with the shaft. The armature is a soft iron bar revolving inside the field magnet ring so that the ends of the armature bar clear the pole pieces. The circuit is made through brushes carried by the shaft and sliding over the circle of contacts, by which means the pole pieces are energized in rotation and a little in advance of the instantaneous position of the armature. Both field magnets and armature are laminated. This motor will also work on a straight current circuit. Whichever way the current is sent through an ordinary straight current series motor it will always revolve in the same direction. It will therefore also work—though from other causes inefficiently—on an alternating current, if the field magnets are laminated. This is well known and the principle has been used for alternating current fan motors.

MOONLIGHT SCHEDULE FOR MAY.

Day of Month.	Light.	Extinguish.	No. of Hours.
	H.M.	H.M.	
1......	P. M. 7.30	A. M. 4.10	8.40
2	" 7.30	" 4.10	8.40
3 ...	" 7.30	" 4.10	8.40
4 ...	" 7 30	" 4.10	8.40
5...	" 7.40	" 4.10	8.30
6.	" 7.40	" 4.00	8.20
7. ..	" 7.40	" 4.00	8.20
8	" 7.40	" 4.00	8.20
9. ...	" 8.40	" 4.00	7.20
10... ..	" 10.50	" 4.00	5.10
11... .	" 11.10	" 4.00	4.50
12... ..	" 11.50	.....	} 4.10
13 .	....	" 4.00	
14	A.M. 1.00	" 4.00	3.00
15......	" 1.40	" 4.00	2.20
16......	" 2.10	" 3.50	1.40
17... ..	No light.	No light.	....
18......	No light.	No light.	.
19. ...	No light.	No light.	
20	P. M. 7.50	P. M. 9.50	2.00
21......	" 7.50	" 10.20	2.30
22......	" 7.50	" 11.00	3.10
23... ..	" 7.50	" 11.30	3.40
24. ...	" 7.50	" 12.00	4.10
25 . ..	" 7.50	A. M. 12.50	5.00
26. ...	" 8.00	" 1.20	5.20
27... ..	" 8.00	" 1.50	5.50
28......	" 8.00	" 2.20	6.20
29.....	" 8.00	" 2.50	6.50
30......	" 8.00	" 3.20	7.20
31......	" 8 0	" 3.40	7.40
		Total,	156.30

CORRESPONDENCE

HIGH VS. SLOW SPEED ENGINES FOR ELECTRICAL WORK.

Editor of ELECTRICAL NEWS.

DEAR SIR, Having been an interested reader of the controversy, regarding the best style of engines for electrical purposes, I object to the sweeping condemnation that Mr. Killey gives the high speed engines in your paper. I firmly believe that there is a place for both styles of engine, and that the special place for the high speed engine is furnishing power for plants requiring say 100 h p or less That they are running to advantage in larger plants I am quite willing to admit, but when the power required is more than this I would prefer the slow speed engine To go back to the high speed argument, my reasons for preferring the high speed for small plants are many, and with your permission I will enumerate a few of them.

1st, In the first place the high speed can be built in the very best manner and sold at from 30 to 40 less than the slow speed of equal power.

2nd, In cost of foundations, - the high speed has the advantage to the extent of fully 100 per cent.

3rd, As regards the floor space occupied a very important item in most plants I might instance a private lighting plant in one of our largest dry goods stores in this city the power being furnished by a 4 valved automatic engine, a beautiful machine but totally unfit for the purpose used. The greater part of the basement of the building is taken up with engine, countershafting and dynamo, and as the room just there is very valuable, the loss of space must be quite an item.

4th, The simplicity of the high speed engine is a most important feature. In a 4 valve engine there is a great deal of mechanism in connection with the valve motion continually wearing and requiring adjustment There is no class of mechanics that have made greater strides in educating themselves during the last 10 years than the Stationary Engineers,' still it is safe to assume that not ten out of 100 engineers in charge of small plants, say in villages, have an indicator to set their valves with, and an indicator card from some of the 4 valve engines after running a few years is sometimes quite a curiosity. In the high speed engine the valve is as simple as a plain slide valve, and any ordinary engineer can set the valve in a few minutes.

5th, The almost perfect regulation of the high speed engine is also a very important item in an electric plant. Most makers of high speed engines are willing to guarantee a regulation within 2 between full load and no load ; now I do not know a slow speed that will do this.

6th, The economy of the engine. I notice that Mr. Killey credits a 6" × 8" high speed engine, 14.85 2 h. p. with 3.85 lbs. of coal per hour per indicated horse power. I have seen his report to the builders of the engine, in which he gives the result of the test as 3.58. In either case, high speed men have no cause to be ashamed of the result in an engine of that size, though I quite agree with him in believing that there are many Corliss compounds giving better results. I have known high speed engines to replace 4 valved automatic slow speed engines, with a great saving at the coal pile. I think myself that with an overloaded engine the slow speed would prove the more economical ; with an underloaded engine the high speed would have the advantage ; and with a fair load there would not be much difference.

In conclusion, let me ask the opponents of the high speed not to confound the properly built high speed engine with the slow and medium speed engine of a few years ago, run at a high rate of speed with hot crank pins and eccentrics, that were so common with these engines. If the engine is built for the speed with large bearings and crank-pins, and perfectly balanced valves, there is nothing to be feared in that respect.

Yours truly,

"HIGH SPEED."

HIGH VERSUS SLOW SPEED ENGINES FOR ELECTRICAL WORK.

Editor ELECTRICAL NEWS.

DEAR SIR, I agree with Mr. Killey's statement that commercial appreciation is the best test of the value of either class of engines but the commercial public, and even engineers, do not always appreciate the value of any new thing until it has worked its way into their confidence ; and although progress in engineering has always been in the direction of higher speeds, higher steam pressures and more compact form, it is self-evident the attainment of these objects must necessarily present difficulties to the engineer. In the line of locomotive and marine engines, circumstances have forced a rapid development in these directions, and we find engines running at high speeds under heavy steam pressures and in compact form, and in the case of marine engines giving the highest economy in fuel. But in stationary engines the conditions are not so imperative, because it is possible in many cases to use an engine which takes more room ; engines having been developed which give high economy in fuel but which are limited by the form of cut off gear to slow rotative speed, the progress in the direction of higher speed has necessarily been slower than in the other branches referred to, and like all progress is subject to alternate action and reaction, but that there has been steady progress in the manufacture and use of high speed engines in the United States and England during the past fifteen years, cannot be questioned. I think Mr. Killey and many other experienced engineers sometimes mistake the natural demand for larger engines to replace smaller ones for a reaction in favor of slow speed. In regard to the cases cited, where long stroke engines have been put in, it is evident that in most of these cases it was the result of a demand for increased power which enabled the purchaser in some cases to substitute one large engine for a number of small ones, of course resulting in a saving of fuel. And as very few, if any large high speed engines have been built in Canada, and even in the States high speed engines of large size are comparatively new, it was most natural that the best known type of low speed engine would be selected.

In regard to the plant referred to at London, I happen to know that no addition was made to the number of long stroke engines, but simply a pair of Wheelock engines were moved from an older power house to the new one, and one of the engines was replaced by a new one. At the same time two high speed compound engines were added to the plant.

At Windsor, Ontario, two high speed compound engines are being put in to drive a railway and lighting plant, one of which is at present doing the work formerly done by one of the well-known makes of slow speed engine, and is giving better regulation and a considerable saving in fuel. I understand a change is being made in Cincinnati, from low speed to high speed engines for railway work, and tests made at Minneapolis and St. Paul show, that a railway plant driven by high speed compound engines is more economical than two other plants driven by low speed triple expansion engines. No doubt much evidence could be given on both sides of the question, but as I cannot spare time to go into further discussion of the subject at present, I think I cannot do better than ask you, Mr. Editor, to publish for the information of your readers a tabulated statement made by that eminent and experienced engineer, Dr. Chas. E. Emory, giving the cost of producing horse power by various classes of engines, both high and low speed, including the cost of fuel, attendance, repairs and interest on first cost. This paper simply shows that the total economy does not depend so much upon whether the engine is high or low speed, as upon whether it be compound or simple, condensing or non-condensing, and still more upon the cost of fuel and other conditions. To quote from the report of Dr. Emory's paper, given by the Electrical World : "He (Dr. Emory), therefore concludes that to secure the best results, both electrical and otherwise, in the cities and towns along the line of communication already established the cheaper engines of simple construction, though not so economical of fuel, will so reduce the capital upon which interests and dividends are to be paid, as on the whole to represent not only better commercial policy, but better engineering."

Yours truly,

D. W. ROBB.

[The table compiled by Dr. Emory, to which Mr. Robb refers, was published in the issues of the ELECTRICAL NEWS for May and June, 1893, and therefore it has not been thought necessary to reproduce it here.—Editor NEWS.]

HIGH VERSUS SLOW SPEED ENGINES FOR ELECTRICAL WORK.

Editor CANADIAN ELECTRICAL NEWS.

DEAR SIR,—A number of your interesting journal having found its way into my office recently, my attention was attracted by a discussion therein as to the relative merits of high or low speed engines for electric light and power work. I have not seen Mr. Robb's letter referred to by Mr. Brown, and do not know just what he claimed for the high speed type. However, it does not require a very extended experience in the installation of light and power plants to convince one that the choice of an engine, for the above duty, depends very largely on conditions which vary for each case, and the fact that a slow speed engine is the more economical or shows a slightly higher efficiency under the most favorable conditions, does not *per se* decide the question in favor of this type.

Careful and most complete tests made recently on a number of engines of both classes, showed, that to produce 500 h. p. with the slow speed engine and its jack shaft, 556 h. p. was required. With the high speed type under same conditions, except absence of jack shaft, but 542 h. p. was called for ; both engines were compound condensing. The slow speed, set up ready to run, averaged $30.00 per h. p., and the high speed, $24.50. Both engines were operated under a steady load and the slow speed engine took coal at a rate (with the price at $2.00 per ton) that would amount to $21.97 per annum, while the operation of the high speed would cost, on same basis, $21.51 per h. p., thus showing a difference of 53c. per h. p. per annum in favor of the slow speed type. It will be found, however, that in the smaller units up to, say 300 h. p., the best high speed compound condensing engines will be used in preference to the Corliss type, as the labor required is the same, and the extra cost of the latter engine, together with the greater room taken up by it, as well as the jack shaft, and the fixtures of the same, will more than compensate for the slightly higher efficiency of the engine itself. In the case of a small power plant, having a total output of, say, 500 h. p., with the load constantly varying, say, 75 per cent., which is often the case, and where the dynamos or generating units are small, a more inefficient arrangement could not be well devised than to put in one 500 h. p. slow speed engine, long and usually wobbly jack shaft, with a series of expensive clutches mounted thereon, often fearfully and wonderfully made, requiring frequent repairs, and consuming 10 to 20 per cent. in friction.

Let us consider the above case further, as it is now and will be still more common in your towns and cities. Say five 80 K. W. generators are to be operated and the question of engines arises; two 500 h. p. slow speed engines would be needed, one for spare these would cost, ready to run, on above basis, $3,000. It will be impossible to keep either of them nearly or quite loaded, and the actual efficiency from this cause, as well as the jack shaft friction, will in nearly every case be found lower than if two 250 h. p. high speed engines are installed, costing $1,225, plus $612 for extra engine, and as one or both of these units can be operated at something near their load at all times and a difference of $1,165 in first cost is in their favor, it can be easily seen why the slow speed type is not used in such cases where the plant has been installed under skilled supervision.

A closer inspection of the cases in the United States, mentioned by Mr. Brown, will show, that in almost every instance the adoption of large slow speed engines has been accompanied by the throwing out of small and use of large dynamos as well—the change simply showing that, owing to increased output, the large units can be operated near their capacity and the best results obtained in efficiency; also the cost of labor is much reduced with the few large units, as compared with a large number of comparatively small engines and dynamos.

As a general rule, it may be said, that the best practice obtaining here is to use high speed compound condensing engines up to about 300 h. p. each unit, and where units of 500 h. p. or more can be run under a constant average load of threequarters to full capacity, the slow speed type is demanded. Hoping the above may serve to show the necessity of looking on both sides of a question like this, and regretting my inability to use less space in the endeavour to make the matter clear, I remain,

Yours very truly,

DONALD M. BLISS,
Electrical Engineer, Brookline, Mass.

RELATIVE ECONOMY OF BLAKE AND KILLEY PUMPING ENGINE.

HAMILTON, April 23, 1894.

Editor ELECTRICAL NEWS.

DEAR SIR, In consequence of a paragraph that appeared in THE NEWS, Mr. G. C. Mooring has placed a report of the test with diagrams from Blake pumping engines in the hands of the Stationary Engineers' Society of Hamilton. These I have carefully gone over, and will assure Mr. Mooring that he is mistaken or misinformed as to the respective marks of the Hamilton pumping engines built here and designed by Mr. Killey, as contrasted with Blake pumping engine now running in Toronto. In reference to report of the test now before me, he states that no such duty as shown by this test can be shown for Hamilton, Kingston or London pumping engines. If this gentleman had taken the trouble to inform himself more fully on this question I am satisfied he would not have written as he has done in THE NEWS.

The test of the new Hamilton pumping engines took place in Feb., 1888. The test was a very exhaustive one as will be seen from a paper of that date in which the whole test is published and which is now in the writer's possession. The test was conducted by Messrs. Worswick and Jones and occupied 14 days. The actual duty of the test of the first engine tested was 114,566,991 ft. pounds per 100 lbs. of coal burned under two 54" x 14' boilers, no deduction being made for cinders, ashes, clinkers, steam for feed pump or steam in radiators for heating engine room. This duty was from coal carefully weighed before being used. The duty given by Mr. Mooring as being that of the Blake engine in Toronto, was not the duty per 100 lbs. of coal, but was for 115.5 lbs. of coal, as the amount of waste, including cinders, ashes, etc., in 100 lbs. of coal was added to the coal, making it 115.5, or nearly so, instead of 100 lbs. By this method of calculation, the duty, in the case of the Hamilton engine, exceeded that of the Blake. This refers to test of the first of the new pumping engines in Hamilton. The test of the second engine was conducted when the first engines were running. It also had two boilers of the same size as the others in use. Every precaution was taken as in the first test. The duty of this engine was 118,398,800 ft. lbs. per 100 lbs. of coal, no deduction having been made, as in first test.

If the duty of this engine had been calculated as in the Blake test, it would have been nearly 4,000,000 ft. lbs. in excess of the Blake engine. It is but fair to say, Mr. John Galt, C.E., in his record of the test does not claim the duty per 100 lbs. of coal stated by your correspondent, but gives the duty as per 100 lbs. of conbustible—quite another thing—the correctness of which I have no doubt of.

This letter is not written in disparagement of the Blake or any other engine, but simply to supply facts with regard to Mr. Killey's engine here. I may add that these pumping engines have run night and day since their erection, keeping up their record of a very high duty without break-down or stoppage, and now after nearly six years in use are in perfect order. Hoping you will excuse this rather long explanation,

Yours respectfully,

ROBERT MACKIE.

THE EVOLUTION OF THE STEAM BOILER.

BY J. H. KILLEY, HAMILTON, ONT.

This communication is the result of observations made by the writer during his engineering career.

When quite a young man serving my time in a Liverpool ironworks, I had in my opportunities of seeing the various classes of steam boilers then in use. From that time to the present, having a natural inclination for the practice and study of mechanics, I have retained most of the information gleaned then and up to the present time. Soon after going to my trade I had occasion to go on board of the steamer "Mars," belonging to the Liverpool and Dublin Steam Packet Company. Steam was up. I asked the engineer in charge what steam pressure he carried. He went to the front of the boiler on which was fixed a bent iron tube in the shape of a V. From the open end of the tube there projected a stick of wood about 8 inches high. He measured it and said 3½ lbs. there, and ½ lb. to the square inch. I asked him if that was all the pressure he carried when on full steam. He said, "yes, I cannot carry any more, if I did the mercury would blow out of the tube," this was his steam guage, there being, so far as I know, no guage at that time such as we have now.

It was years after that before I was made acquainted with a clock-faced guage. The stick the engineer measured was resting on a column of mercury inside the bent tube that raised and lowered it as the pressure of the steam increased or diminished in the boilers. At this time steamers belonging to the British Government ran the mails between Liverpool and Dublin. I recollect them well, as they were the crack boats of the day, and were named the "Urgent," the "Medina" and the "Medusa." They were commanded by lieutenants in the Royal Navy, and had the reputation of going out and making their passages in all weathers. A circumstance in this connection that may amuse your readers, was narrated in the Liverpool papers of that time. One night the Urgent was at the old George's Dock landing stage taking on the mails and passengers for Dublin. It was blowing a hurricane at the time. Lieutenant Williams in command was on the bridge. The captain of the landing stage asked him if he intended to go out. He said, "yes, it is for H— or Dublin this night." An old quaker and his wife were going up the gangway at the time and heard the remark, and turning back said, "thee can go then if thou wilt it, I will not accompany thee." The steamer, however, made the passage safely. The steam pressure carried on these boats did not exceed 10 lbs. to the inch.

At the time I speak of a British Government steamer named the "Rhadamanthus," was getting her engines and boilers placed on board. She was a paddle boat, there being no screw steamers in the service then. The pressure in the boilers with full power was 10 lbs. to the inch. There were no boilers at that time such as are built for steamers now. The shells of the boilers were great rectangular boxes with furnaces placed in square flues that traversed the boiler three or four times, and thence to the uptake and chimney. The first eight Cunard trans-Atlantic steamers had boilers of this kind. All were paddle boats. They made an average of 8½ miles per hour on their trip. All had side lever engines. They carried from 15 to 20 lbs. of steam; steam being made from salt water. It was not practicable to construct them in the same manner as at present, as large spaces had to be allowed around the furnaces to receive the salt deposited in them, surface scum pipes not being then in use—only the bottom blow-off. Neither were there surface condensers.

The locomotive multitubular boilers were in the same form or nearly so as when we have them now. There were no multitubular boilers on steamboats until the surface condenser came into use, yet for a long time after the adoption of these condensers, and with an improved form of boilers, the pressure was not increased to more than 25 lbs. until after the adoption of compound engines. The large saw and other mill engines in Liverpool ran with not more than 10 to 15 lbs. of steam. They were all walking beam engines of ponderous design, and did not have a piston speed of more than from 180 to 200 feet per minute, same as the steamers.

To feed the boilers with water, a pipe stood up above the shell some 20 feet. On the top of this pipe was a small cistern in which was placed a valve operated by a stone float in the boiler balanced outside. As the water went down this float opened the valve, and so kept the water at a level in the boiler, the head of water in pipe being sufficient to overcome the steam pressure. Of course these engines were all condensing. With 10 lbs. boiler pressure, an average pressure of 20 lbs. was received on the engine pistons. The fuel consumed was from 6 to 8 lbs. per h. p. per hour.

Returning to steam boilers, there were two classes used for stationary work in cities at that time. The most generally used for high pressure engines then coming into use were plain cylindrical egg-ended ones. They were cheaply constructed and could be easily cleaned out. They were fired under the bottom and had a wheel draft all around the sides. They were not economical of fuel, as they did not evaporate more than 5 lbs. of water per lb. of good coal.

The other boiler in use was called the Lancashire, and was generally from 26 to 30 ft. long, with two internal furnaces of circular form. Modifications of these boilers are still in general use in the English manufacturing districts. It is claimed for them that their economy of fuel is equal to the multitubular boiler in common use now. A number of these boilers imported from England within the last few years are in use in Canada. Frequent disastrous explosions of these boilers took place, and were looked upon as mysterious, until Mr. William Fairbairn demonstrated that their strength was inversely as the length and diameter of their furnaces. This brought about an improved form of furnace with strengthening rings. Since their introduction and the general adoption of steam boiler inspection, explosions have become very rare. In my younger days, Charles Wye Williams, a consulting engineer in the employ of the City of Dublin Steam Packet Company, was engaged in experimenting on steam boilers, with a view to their greater efficiency and the prevention of smoke. I had an opportunity of seeing one of his boilers tested in the yard of the City of Dublin Company, Liverpool, under M. Williams' superintendence. Although his furnace was shown to prevent smoke to a great extent, it did not come into general use, as it was not shown that it was more economical than those in use. I may however state, that Mr. Williams constructed a fire box boiler of the locomotive type, the tubes of which were 8 ft. long, divided into eight water-tight divisions, the first division being 6 inches from the fire-box tube plate. The result of this experiment showed that the firebox made more steam than the balance of the boiler, and the first 6 inches of the tube more than all the rest—the two last divisions making no steam, as the temperature of the water in them could not be raised to the boiling point.

About the same time the Stephenson long boiler locomotive engine was constructed, with very long tubes. It was not found to make steam any better than the short boilers, and its manufacture was soon abandoned.

In the colliery districts of Lancashire, the haystack and waggon boilers then in use did not run with more than 1½ to 2 lbs. of steam. The pumping engines had open topped cylinders, the steam being used to displace the air, and then condensed by a jet of water in the bottom of the cylinder, the pressure of the atmosphere on the piston doing the work of pumping. The boys used to amuse themselves by getting on the beam and piston when the engines were in motion, the strokes not being more than 3 or 4 per minute. I have been informed that some of these engines and boilers are still at work in the colliery districts.

When multitubular boilers first came into use for stationary purposes, the manufacturers placed too many tubes in them, and kept them too close to the shell bottom over the fire. As a consequence they gave a large amount of trouble, the shell plates giving way and getting hot through the want of proper circulation of the water. The writer was often asked at that time as to the cause of the trouble. I showed the impossibility of the water getting down on the furnace plates while the large body of steam was ascending through the tortuous passages around the tubes. I have seen a new boiler constructed this way, and made of the best lowmoor iron, give out entirely in two weeks, while those that were constructed with sufficient space for circulation, worked very economically and gave no trouble whatever.

The matter of circulation of the water and liberation of the steam was exhaustively experimented on by Mr. Robert Isherwood, Chief Engineer of the United States navy, on the steamer Michigan of this navy. This gentleman caused a reduction of the number of tubes in the boilers by about one-third, reducing the consumption of fuel, and increasing the steam available to propel the ship—clearly proving that increased circulation of water in a steam boiler largely increases the production of steam and adds to the life of the boiler.

A new steam boiler was built and placed in position in a foundry and machine shop in Toronto in 1867. The owner designed it himself and filled it close to shell and bottom with tubes. In one month it had to be replaced by a new one, as it bagged over the fire until the plate split. It made very little steam considering its heating surface. I saw this boiler before it was set in brickwork, and told them what might be expected. The same thing happened from the same cause to three boilers in Hamilton. Repeated failures of steam boilers from this cause has taught a lesson to the manufacturers that has passed through the trade, so that most of the boilers are now not deficient in this respect.

When I went to Liverpool to serve my time, there was no official inspector of boilers, engines or steamboats, nor any examination of or certificates given to steamboat engineers, the managers or the owners of the boats taking the best or cheapest men from the shops, or from those that had raised themselves from firemen in the boats. Neither were there any boiler inspectors on shore, or boiler insurance companies. As a consequence, explosions and loss of life were very frequent, very much more so than at the present time when there are boiler insurance and inspection companies always available.

I recollect going into a factory on Sparling Street, Liverpool, at the dinner hour; I saw a man sitting by a steam boiler with two heavy weights on the lever of the safety valve. I said to him, "what have you the two weights on for?" He said, "Mr. Twiss told me not to let the steam blow off, it rusts the machinery." I told him to lift it up gradually until it let all the steam out that would come out, leaving the old weight on, and made off down the street as quickly as possible.

I have met many men in this country in charge of boilers who had very little more knowledge of steam than this one. Any man in charge of steam boilers can now have no excuse for his want of knowledge in this respect, as he may join the Stationary Engineers' Society, and receive necessary instruction that would fit him to take charge of any land engine or boiler without fear of accident.

I do not understand how it is, looking to the many boiler explosions that take place in Canada, with the consequent loss of life and property, that the Ontario Government can not be prevailed upon to pass a law making examination of engineers compulsory, as also inspection and tests of steam boilers. Perhaps the lives saved by a law would not be a sufficient set-off to the political patronage but from those who selfishly oppose getting such a law.

This letter is, I am afraid too long; I am therefore constrained to stop here before being through with my subject. By your leave I will return to it in a future number, when I hope to relate some experiences with engines and boilers that your readers were not previously conversant with.

THE EASTON ARC DYNAMO AND LAMPS.*

By T. F. Pickett.

The invention of the Easton system of arc lamps is due almost solely to the efforts of Mr Jas. W. Easton, who designed and perfected the system. He was employed at first by the Ball Electric Light Co., of Canada, in London, Ontario, and afterwards by the Ball Electric Light Co., of New York. During this service he suggested many of the distinctive features which made the Ball dynamo a practical and commercial success. So far as was desirable these features were incorporated in his subsequent work, and for this reason the external appearance of the Ball and Easton dynamos is somewhat similar.

The fragility of parts inseparable from a profitable manufacture of a double armature machine gave endless troubles from break-downs, and Mr. Easton was certain that a better type could be designed. With that end in view he studied the defects of all the dynamos under his observation. The "burning out" of armature sections was the first defect he succeeded in overcoming, after he awoke to the fact that his previous work had been calmly appropriated by others. This defect was ordinarily due to a defect in the commutator, seldom occurring from an inherent armature trouble, and the device for overcoming it consisted in connecting the armature in a closed circuit, independent of any external connection to the *commutator*, and making the connection between the armature and commutator by fusible wires.

By the accompanying diagram it is seen that the current flowing through the armature wire does not flow out past A2, unless the brush is in contact with C2, and therefore F2 carries current only while the brushes make such contact, which is about 1-60 part of the time, and the fusible connections are adapted to carry about 1-60 of the normal current of the dynamo. If a short circuit is formed as between C1 and C2 the current generated in the wire between A1 and A2 flows in this short circuit through the fuses for the *whole* time, and therefore if the short circuit has sufficient resistance, so that only the normal current flows through it, the fuses will be subjected to about 60 times the normal heating effect and will blow out, but as the short circuit is usually of low resistance and the current abnormally large, the heating effect is increased in the fuses as well as in the armature coil and the fuse blows at once, so that the protection is the more rapid as the possibility of damage is increased. In actual tests, there is no appreciable lapse of time between energizing the magnets, and blowing of fuse, when the short circuit is practically of no resistance. The two short circuited plates in the commutator become practically one and two sections in the armature operate as one section of double length connected and protected by the fuses F and F2. The number of sections being large, the consequent increase of spark at this double section is not destructive; in fact machines have been knowingly operated for months with a number of fuses out, without any serious damage to the commutator, so that there is no necessity to shut down for a short circuit in the commutator of this machine. The next most noticeable improvement was the automatically tightening armature mounting device. The need for such an improvement was pressed upon the inventor's attention from the trouble experienced in mounting the smooth "Gramme ring" armature, which has been so satisfactory for high tension work. These armatures when mounted upon the ordinary spider, *would* get loose and cause wires to break, and the whole armature would sometimes move bodily "out of centre" and strike the polar faces of the magnets. As the causes of loosening were almost solely attributable to the shrinkage of the insulating material in the mounting, and compacting of the armature wire, the correction could be practically uniform all around in "taking up the slack." The device for overcoming this defect consists in making the shaft itself, a single screw bolt the strain of driving the armature being perpetually applied to force a conical nut or cone into a conical seat, and thus expand the insulating material, against the inner surface of the armature, and any looseness is at once taken up by a relative movement of the shaft and mounting. As the shaft is dead true, the running gear can turn upon it without altering the centre of motion, or the balance. Actual experience proves that the shaft, with a screw of two threads to the inch, gains about one turn in the first ten millions, and this tightens everything up solid, the relative motion of the two parts being very slow thereafter. The result of this device has been to effectually overcome the troubles which called it into existence.

Another radical departure from the known types of machines, was the one intended to secure the maximum action from the minimum of material in the armature core. This consists in placing the polar faces of the magnets so that the centre of the armature is subjected to the direct inductive action of both poles, while each end is subjected to the direct action of one only, and the indirect action of the other. The theory for this is found in the fact that the self repellant action of magnetic lines of force have similar direction of flow, causing the ends of a cylinder subjected to a uniform distribution of inductive action to become saturated first and requiring expenditure of energy to get the centre saturated under these conditions.

The same property of magnetic lines of force also causes the ends of a magnet polar face to be the strongest in effect, and the inductive action to

* Paper read before the Montreal Electric Club.

be non-uniform with the same tendencies already existing in the armature core.

Placing the magnets in the positions as described applies the most powerful action to the centre of the length of the cylindrical core, and thus utilizes the self-repellant properties to secure a uniform and practical distribution throughout the entire core.

These three devices are the original patented and specially distinctive features of the Easton arc dynamo, while the proportioning which was effective in securing a steady current through the notably unsteady resistance of arc lamps was also important, although not deemed patentable, the secret of it has been independently discovered and is now fairly well known. I believe Mr. Easton was the first to realize the effect of armature re-actions in a dynamo and utilize them intelligently for a definite purpose. The voltage of this dynamo with fixed brushes, speed, and number of turns effective in magnetic field, is actually highest at about three-fourths of the normal working current, consequently a change of resistance does not have a bad effect on the lamps as the tendency is self-corrective to a marked degree. The reasons for this are, that the magnet coils practically saturate the magnetic circuit at three-fourths of the normal current, and any increase of current affects the excitement very little, while the armature re-actions become more energetic and actually reduce the lines of magnetic force passing through the armature. Any decrease of resistance tending to an increase of current, is partially checked by the decrease of induction in the armature, and any increase of resistance tending to a decrease of current is partially checked by the increase of induction due to armature re-actions, unless the resistance becomes so great as to affect the energizing power of the magnet coils, and so the unsteady resistance of the arcs is met by a corresponding unsteady voltage, which is equally quick and corrective in influencing the volume or amperage of the current, which is therefore fairly uniform under regular conditions.

The recent developments and improvements on this machine are valuable additions to the features before described, the oil reservoir and ring oiling bearings being more cleanly and far more reliable than either grease or oil cups, and require much less attention. An automatic regulator or controller is also attached to the latest type. The regulator operates entirely different to anything yet placed on the market.

The dynamo may be run with or without it as desired, as it is independent of the machine itself. The brushes remain stationary for all variations of load, and the machine may be run on a short circuit for any length of time without any injurious results; in fact with this controller, a machine running at full load may be short circuited by placing a wire directly across the terminals, with no other effect than a slight increase in the spark at the brushes for a few moments. This increase of sparking is probably due to the fact that it takes a small space of time for the magnetic strength to be reduced or changed in the iron of the machine, as the regulator is instantaneous in its action for any change of the load. The dynamo also has a lower internal resistance with a light load than with a full load, and therefore runs cooler on the light load, although the ampere output is the same. This is a contrary state of affairs to that experienced with most arc machines, as usually when they are cut down below one-fourth of their full load, they run decidedly warmer.

The arc lamp of the Reliance system is a very simple form of the "Alteneck" type, probably the simplest form in use to-day. The use of dash pots is avoided by proportioning the coils and core somewhat analagous to that giving steadiness to the dynamo current. The automatic cut-out in this lamp is simply a pair of contacts, one of which is fixed and the other is attached to the movement frame in such a manner as to make a contact after the frame has passed beyond the point at which the lamps should feed freely. The special feature of the feed movement is the arrangement of the escapement wheel and pallet, wherein by varying the distance between the centre of motion of the wheel and that of the pallet, the movement locks and prevents the pallet from vibrating, allows it to vibrate slowly, or rapidly or to disengage all together, according to the relative position of the wheel and pallet; this position being regulated by the relative power of the shunt and series coils. This lamp is, however, being partially superseded by the "Universal Lamp," which is also one of Mr. Easton's productions. It has been suggested by some that this lamp ought to be called a constant potential lamp, as the voltage remains constant, while the current may be varied from 4 to 12 amperes. This feature allows the candle power of the the lamps to be varied at will by the attendant in charge, without any adjustment of the lamps themselves. It also provides a lamp that will work on any of the high tension arc systems at present in use without any change in the windings or adjustment. The lamp is very compact, substantial, and light, weighing about 25 lbs. complete with globe and hood, making it desirable for use on pole brackets, especially where they are required to extend well out from the pole, or where they are to be suspended in the middle of a street.

The early history of the system dates back to about 1884, when Mr Easton in company with H. W. Spang, of Reading, Pa., built an experimental machine of the offset pole type. This was a constant potential machine wound for an output of 25 amperes at 70 volts, and was used to light the experimental shop at Reading. The second machine finished was also of the constant potential type wound for 40 amperes at 200 volts, and was used for a number of years for charging storage batteries and for operating 4 arc lamps in series, with the usual resistance, at the Highland House Park, at Reading. The third dynamo completed was built for 5 arc lights, and was perfectly satisfactory in every way. The next machine was built for 35 arc lights and with this dynamo they had a "circus."

The armature re-actions in this machine were very desirable, as they assisted in the maintenance of a steady current, but the sparking was too severe to ever be durable. The cause of this was not fully realized at that time, and the inventor was very much discouraged at not being able to prevent it. As a last resort he hit upon the idea of the double brush. The actions of the double brush are two-fold, the first and chief being that enough sections are included in the short circuit from brush to brush, to give enough E. M. F. to get a current flowing in the coils so that they left the lead brushes in an active condition ready to take up their normal work. The polar effect of the armature coil was also distributed over a larger area, and the effect of commutation was much less sharply defined. The result was all that could be desired. This machine was run for a short time at the Scott Foundry in Reading, and was very successful in its operation.

After these experiments had been concluded, Mr. Easton came back to Canada, and succeeded in organizing the Reliance Co., who began the manufacture of the Easton apparatus in Waterford, Ont. The first machine built by them was sent to a town in Eastern Ontario and was operated by the local company for commercial lighting. This machine is still in operation, and has had but few and trifling repairs with one exception. This exception illustrates what small events are sometimes the vital keys to a situation, and what presumably honest men will do to save money. This dynamo ran splendidly for nearly a year, and then it and a mate which had only been in operation for 4 months, both made a clean burn-out, a perfect roast. Easton went down to get at the facts, but could see no satisfactory reason for the accident, nor would the dynamo tender or owners advance anything that would clear it up. Easton prepared to leave the town in despair; as he did not know the cause he could not devise a remedy. Just as he got on the bus for an early morning train the porter said to him "There was a funny thing happened the other morning; when I went out for the one-thirty train, the lamp in the front of the confectioner's was lit, and it was the only light in town." As they were eight hour lamps, and the plant was being started at about 5 p.m. and supposed to shut down at midnight, it seem funny to Easton also, and it flashed upon his mind that the dynamo tender had gone asleep and left the water all on (the plant being run by water power), that the lamps had burned out one by one until this particular lamp was the last one to go out, and that the water necessary to run 60 lamps would soon roast out a machine. He then went back and jumped on the dynamo tender, asking him how he came to go to sleep, naming the exact time. He made no attempt to deny it, and replied that he got a shock and got knocked out. He claimed that he fell, and in falling put one hand on each terminal of the machine, and to have recovered his senses about 4 a.m., but as he was caught several times afterwards drunk and asleep, for which he was finally discharged, and he had no sign of a burn on his hands, the probability is that he lied, and that he slept until daylight. As the dynamos ran about two weeks after that without special trouble, the owners had all hoped that no damage had been done. This is at once an example of the staying powers of the Easton dynamo and the importance of the close observance of small things.

This discovery revived Easton's hopes, in fact more than re-assured everybody concerned that the machine were all right. A short time after this the Easton Electric Co., of New York, was formed, and the manufacture of the machines in the U. S. was begun. This company while never going into business on a very large scale, installed quite a number of arc plants in different parts of the U. S., nearly all of which have been in successful daily operation ever since. During the two years in which I was employed by this company, I saw but one armature in the shop for repairs, and this one had evidently been ill treated for upon taking it to pieces, we took several pounds of coal dust out of the inside of it. The last lighting plant I had charge of had two of these machines which were run most of the time from 5 p. m. to 7 a. m., and about all the attention they required was to see that the grease boxes were full before starting and to trim and re-set the brushes once a week. In fact the brushes often ran two or three weeks without touching.

In conclusion, I beg to thank you all for the attentive manner in which you have listened to me, and hope you will excuse any mistakes or omissions which I have made, and that this paper has been of interest to everybody present.

CANADIAN ASSOCIATION OF STATIONARY ENGINEERS.

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

HAMILTON NO. 2.

ON the 22nd of March the annual dinner of the above Association was held at the Commercial Hotel. The President, Wm. Sweet, presided, the vice chair being occupied by Wm. Morris. Quite a number of the Toronto brethren were present as well as some from other points who ably responded to the toast to "The Sister Associations."

The executive officers spoke encouragingly of the advancement which the Association is making, Bro. Edkins giving particulars regarding the organization of several new Associations at the present time.

The usual toasts were heartily responded to and a number of songs well rendered. Altogether, the evening was, in the opinion of all present, a most enjoyable one. I have been requested by the Association to state that the question which recently appeared in the ELECTRICAL NEWS concerning the new Blake pumping engine at Toronto, was not, so far as known, preferred by any member of this organization; and further that no correspondence is sanctioned by this Association which is not signed by the corresponding secretary.

WM. NORRIS, Cor. Secretary.

[The above correspondence arrived too late to be inserted in our April issue.—ED. E. NEWS.]

ORGANIZATION OF KINCARDINE ASSOCIATION NO. 12.

Mr. A. M. Wickens, writes, that on the 21st of April he visited Kincardine, and effected the organization of Kincardine Association No. 12.

The following members were duly elected and installed as officers for the ensuing term:

President, Bro. Joseph Walker, Chief Engineer Water-works; Treasurer, D. Bennett; Financial Secretary, A. Scott; Conductor, R. Murker; Door-keeper, J. Carroll.

There were also present, Bros. Percy C. Walker, J. Gillespie, A. T. Scott and Wm. Carey.

It is a pleasure to learn that while in point of numbers this new association may not equal the older ones, its career, judging by the enthusiasm and character of the membership, will be a successful one.

MONTREAL JUNIOR ELECTRIC CLUB.

Regular weekly meetings of the above club were held on the dates following, at which papers were read on the subjects named:—

March 26th.—Paper by E. W. Sayer, on a general review of past papers.

April 2nd.—Paper by R. H. Street, on Storage Batteries, 1st part.

April 9th.—Paper by S. W. Smith, on Arc Lamp Cut-outs, switches, etc.

April 16th.—Paper by Wm. T. Sutton, on Annunciators and their construction.

The Royal Electric Co., have recently sold to the T. Eaton Co., Toronto, a 600 light direct current dynamo, and to Mr. H. Cook, of Hensall, Ont., a 400 light alternating plant.

CANADIAN
ELECTRICAL NEWS
AND
STEAM ENGINEERING JOURNAL

PUBLISHED ON THE FIRST OF EVERY MONTH BY

CHAS. H. MORTIMER,

OFFICE: CONFEDERATION LIFE BUILDING,
Corner Yonge and Richmond Streets,
TORONTO, - - CANADA.
Telephone 2362.

NEW YORK LIFE INSURANCE BUILDING, MONTREAL.
Bell Telephone 2299.

ADVERTISEMENTS.

Advertising rates sent promptly on application. Orders for advertising should reach the office of publication not later than the 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 may be remitted by currency, in registered letter, or by postal order payable to C. H. Mortimer. Please do not send cheques on local banks unless 25 cents is added for cost of discount. Money sent in unregistered letters must be at senders' risk. Subscriptions from foreign countries embraced in the General Postal Union, $1.50 per annum. Subscriptions are payable in advance. The paper will be discontinued at expiration of term paid for if so stipulated by the subscriber, but where no such understanding exists, will be continued until instructions to 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 papers *promptly and regularly.*

EDITOR'S ANNOUNCEMENTS.

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

THE "CANADIAN ELECTRICAL NEWS" HAS BEEN APPOINTED THE OFFICIAL PAPER OF THE CANADIAN ELECTRICAL ASSOCIATION.

CANADIAN ELECTRICAL ASSOCIATION.

OFFICERS:

PRESIDENT.
J. J. WRIGHT Manager Toronto Electric Light Company.

1ST VICE-PRESIDENT:
K. J. DUNSTAN, Local Manager Bell Telephone Company, Toronto.

2ND VICE-PRESIDENT:
JOHN CARROLL, Sec-Treas. Eugene Phillips Electrical Works, Montreal.

SECRETARY-TREASURER:
C. H. MORTIMER, Publisher ELECTRICAL NEWS, Toronto

EXECUTIVE COMMITTEE.
D. THOMSON, Hamilton, Ont.
D. A. STARR Royal Electric Company, Montreal.
H. O. FISK, Electrician Electric Light Company, Peterboro', Ont.
GEO. BLACK, G. N. W. Telegraph Co., Hamilton.
A. B. SMITH, Inspector Canadian Board Fire Underwriters, Toronto.
L. B. McFARLANE, Bell Telephone Company, Montreal.
T. R. ROSEBRUGH, Lecturer in Electricity, School of Practical Science, Toronto.
E. C. BREITHAUPT, Berlin, Ont.
JOHN YULE, Manager Guelph Gas and Electric Light Company, Guelph, Ont.
THOS. AHEARN, of Ahearn & Soper, Ottawa, Ont.

MONTREAL ELECTRIC CLUB.

OFFICERS:

President, W. B. SHAW,	Montreal Electric Co.
Vice President, H. WOODMAN	Montreal Street Railway Co.
Secretary, JAMES BURNETT,	19 Shuter Street.
Treasurer, L. M. PINOLET,	1401 Dorchester Street.
Committee of Management H. BROWN,	JAS. DOUGLAS, D. BLACK.

CANADIAN ASSOCIATION OF STATIONARY ENGINEERS.

EXECUTIVE BOARD:

President, G. HUNT,	Montreal, Que.
Vice-President, WM. SUTTON,	Toronto, Ont.
Secretary, J. J. YORK,	Board of Trade Bldg, Montreal.
Treasurer, W. G. BLACKGROVE,	Toronto, Ont.
Conductor, T. KING,	Dresden, Ont.
Door Keeper, F. ROBERTS	Ottawa, Ont.

TORONTO BRANCH NO. 1.—Meets 2nd and 4th Friday each month in Room D, Shaftesbury Hall. Wilson Phillips, President, H. E. Terry, Secretary, 19 Hayter street

HAMILTON BRANCH NO. 2 Meets 1st and 3rd Friday each month, in Maccabee's Hall. W. Sweet, President; Wm. Norris, Secretary, 211 Wellington Street North

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

BRANTFORD BRANCH NO. 4.—Meets 2nd and 4th Friday each month. Thos. Pilgrim, President, Joseph Ogle, Secretary, Brantford Cordage Co.

LONDON BRANCH NO. 5.—Meets in Sherwood Hall first Thursday and last Friday in each month. F. Mitchell, President; William Meaden, Secretary Treasurer, 533 Richmond Street.

MONTREAL BRANCH NO. 1.—Meets 1st and 3rd Thursday each month, in Engineers' Hall, Craig street. President, Jos. Robertson; first vice-president, H. Nuttall, second vice-president, Jos. Badger, secretary, J. J. York, Board of Trade Building; treasurer, Thos. Ryan.

ST. LAURENT BRANCH NO. 2.—Meets 1st and 3rd Tuesday each month, in Mechanics' Institute, 204 St. James street. Matthias Guimond, President, Alfred Latour, Secretary, 306 Delisle street, St. Cunegonde.

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

GUELPH BRANCH NO. 6.—Meets 1st and 3rd Wednesday each month at 7:30. p.m. C. Jorden, President; H. T. Flewelling, Secretary, Box No 8.

OTTAWA BRANCH, NO. 7.—Meets 2nd and 4th Tuesday, each month, corner Bank and Sparks streets; Frank Robert, President; F. Merrill, Secretary, 352 Wellington Street.

DRESDEN BRANCH NO. 8.—Meets every 2nd week in each month; Thos. Merrill, Secretary.

BERLIN BRANCH NO. 9.—Meets 2nd and 4th Saturday each month at 8 p. m. W. J. Rhodes, President, G. Steinmetz, Secretary, Berlin Ont.

KINGSTON BRANCH NO. 10.—Meets 1st and 3rd Tuesday in each month in Fraser Hall, King Street, at 8 p.m. J. Devlin, President; A. Strong, Secretary.

WINNIPEG BRANCH NO. 11.—President, Chas. E. Robertson, Recording Secretary, L. Brandon, Financial Secretary, Arthur Harper.

KINCARDINE BRANCH NO. 12.—President, Joseph Walker; Secretary, A. Scott.

ONTARIO ASSOCIATION OF STATIONARY ENGINEERS.

BOARD OF EXAMINERS.

President, A. E. EDKINS,	139 Borden st., Toronto.
Vice-President, R. DICKINSON,	Electric Light Co., Hamilton.
Registrar, A. M. WICKENS,	280 Berkeley st., Toronto.
Treasurer, R. MACKIE,	28 Napier st., Hamilton.
Solicitor, J. A. MCANDREWS,	Toronto.

TORONTO—A. E. Edkins, A. M. Wickens, E. J. Phillips, F. Donaldson.
HAMILTON—P. Stott, R. Mackie, R. Dickinson.
PETERBORO'—S. Potter, care General Electric Co.
BRANTFORD—A. Ames, care Patterson & Sons.
KINGSTON—J. Devlin (Chief Engineer Penetentiary), J. Campbell.
LONDON—F. Mitchell.

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

NOTICE OF REMOVAL.

Subscribers and advertisers are asked to note that on the first of May the Branch Office of the CANADIAN ELECTRICAL NEWS in Montreal was removed to the *New York Life Insurance Building.*

ELSEWHERE in this paper will be found the report of a committee of the National Electric Light Association showing the average consumption of fuel in electric stations in the United States. The report indicates that in the electric stations across the line, the highest point of economy in the use of fuel is yet far from being reached. We would be pleased if some of our readers would tell us to what extent the consumption of fuel in electric stations in Canada corresponds to the figures given in this report. There are few subjects which might more profitably be discussed than the means which should be employed for the purpose of securing the greatest amount of power with the least *consumption of fuel. Who will be the first to give his experience* on this line?

IT is announced that the government will introduce a bill providing for the inspection of electric light meters, and that it is not the intention to appoint any additional officers to carry out the workings of the bill. The necessary inspection is to be *done by the present gas inspectors, and the inspectors of weights* and measures. This economy is commendable, in spite of the drawback that these officials are quite ignorant—and likely to remain so—of the principles on which electric meters operate. But the two classes of officials selected show that the department has devoted some anxious thought to adapting the means at its disposal to the end to be attained. The Edison chemical meters, which measure by weight of zinc deposited by the current, will fall naturally to the lot of the inspectors of weights and measures, and as the deposit is weighed by milligrammes the inspectors will find their new duties comparatively light. On the other hand the Thomson and Shallenberger dial recording meters have such a strong external resemblance to the gas meters, that the gas inspectors will feel quite at home if they wisely refrain from looking inside. In view of this evident effort to please, criticism would be unkind. The notice posted in western concert saloons, "Please don't shoot at the pianist, he's doin' the best he knows" applies to this case; and so long as the manufacturers maintain the present standard of of meter accuracy, these novel electricians, if they do no good, can at least do little harm.

A MEETING of the Executive Committee of the Canadian Electrical Association will be held in Toronto a few days hence, when the preliminary arrangements for the annual meeting to be held in Montreal next September, will be considered, Members of the Executive will be notified of the date, time and place of the meeting, and it is hoped they will all endeavor to be present. Much of the work in connection with this convention will necessarily devolve upon members of the Association resident in Montreal, and we are pleased to learn that the arrangements are already engaging their attention. There is much to be done, and it is none too early to begin the work. If every member will give what assistance he can, the convention in Montreal should equal if not surpass any previous one.

A correspondent writes making enquiry regarding removable fire-door arches. We are not aware of any firm keeping these in stock for sale, but they can be readily enough made. One form is made by bending flat bar iron into an arch with the ends of the bars turned in to point to the center from which the arch is drawn. Into these bars build a brick arch. The arch bars form the top of the arch, and hold the bricks together, so that the whole mass may be lifted into place. When in position, the iron in not exposed to the heat as the bricks are between it and the furnace. Another method is to make a frame of piping, with connections into the boiler, and cover the pipes with thin fire brick and fire clay. Sometimes the feed water is made to pass through this piping, but if the water makes much scale it will choke up with deposit. If any of our readers have met with any other kind of fire door arch for boilers we shall be pleased to hear about them.

AN electric launch from the World's Fair has been introduced upon the Grand Canal at Venice and the trial has been pronounced successful. This time it cannot well be said that progress is not an improvement for, apart from the fact that the graceful movements of the electric launch will be more in harmony with the style of Venice than were the steamboats which are to be displaced, the damage to the marbles of the palaces from the contamination of the atmosphere by smoke, which Ruskin deplored, will be removed. The silent progress of the electric launches is also in harmony with the quiet of a city in which there is neither wheel or hoop and in which the noise of the little steamboats was an intrusion. But, and here there is another side to the question, the steamboats on account of their necessarily large size, were confined to the Grand Canal (where in truth they have been a great comfort) but a storage battery electric launch can be built small enough to navigate the small canals, and the gondola is in danger. The gondola amply exhibited its inferiority at the World's Fair where it plied over the same ground as the electric launches. But this very inferiority may save it. To those who had seen the gondola at home and watched constantly with increasing delight the ease and rapidity with which it threads its way through the traffic on the narrow canals, the lumbering appearance it presented on the lagoons of the World's Fair was a surprise and disappointment. The apparent speed of the gondola at home turns out to be only relative to the obstruction it meets.

THE General Electric Company of the U. S. occupies such a prominent place in the electrical world, and is involved in so many electrical interests, that the condition of its affairs affects in some measure the whole electrical business of the United States, and reacts upon us in Canada. The heavy losses this company was known to have sustained during the past year, caused its annual statement to be looked for with more than ordinary interest. This was presented at the meeting of the stockholders held at Schenectady, on April 2nd. With a capital of $35,000,000 and a bonded debt of $10,000,000, the surplus of $1,024,954.59 shown by last year's balance sheet is this year converted into a deficit of $12,454,967.42. This tremendous shrinkage of thirteen and a half millions is in a measure offset by the very great improvement in the condition of its floating debt, the unwieldy dimensions of which were the cause of its embarrassment last summer. On July 31st, 1893, more than a month after its troubles began its direct obligations from notes and accounts payable were $5,340,000 with indirect obligations in addition, from customers' paper discounted under endorsement, amounting to $3,394,000. At the date of the report, April 2nd, 1894, these figures had been reduced to about $350,000 direct obligations and about $750,000 customers' paper under discount. The forced sale of securities to provide cash to meet the floating indebtedness accounts for a great part of the shrinkage of the assets, but large amounts are also written off the inventory of stock, and sweeping reductions are made in the valuation of securities owned by the company. The report in many ways shows a much healthier condition than last year. The principal adverse criticisms of the report are directed at the large figure ($8,159,264.92, the same as last year) carried as an asset on account of Patents and Franchises, but the reductions in the valuation of the other assets have been so sweeping and apparently so uncompromising, that the directors may perhaps be permitted a lingering hope that values will improve with the times, and be excused if they have given the Patents and Franchises item the benefit of a doubt. The offices of all departments have been concentrated at the principal factory at Schenectady. This is a very wise move which should result in much economy and greatly increased efficiency in handling the business of the company.

THE bill introduced into the Ontario Legislature by Mr. Tait on behalf of the Ontario Association of Engineers did not pass. It was defeated on the second reading by a vote of 24 to 12. Mr. Balfour objected to the bill because of its being a piece of special legislation for a particular class. This seems to have been a strong argument against the bill in the form in which it appeared. Yet class legislation is not new; the education and and work of lawyers, doctors, teachers, druggists, and others are provided for by class legislation; why should engineers be treated differently? When the bill to provide for the education and work of engineers is as carefully prepared and has in it all the necessary guards for the protection of the individual rights, both of the engineers and the public, no doubt the cry of class legislation will have lost its force. Some thought the bill was too one-sided and would not have had the effect expected by its promoters. The interest of both employer and employed must be considered and properly guarded, else such a measure, even if it did become law, would fail in being beneficial to either party. We think that, in this young country, it would be wisdom to follow the lead of the older lands, especially of our own mother country, where experience has been gained during so many years. The present law in Britain compels owners of steam boilers to have them examined by a competent person. Every accident, however trifling in itself, if of the nature of an explosion, or bust, which occurs to any boiler or its connection, has to be reported to the government. An investigation is held by a court of enquiry, something like a coroner's inquest, except that the government supplies competent men to form the court, and a lawyer to prosecute investigation. The cause of the accident is traced, and if the fault is due to the maker, or seller, or user, or attendant of the boiler, the offender is punished. This act has given great satisfaction during more than ten years, and has had the effect of making boiler owners more careful in regard to the purchase of boilers, and as to the men employed to take care of them. In case of accident the owner has to prove that the men whom he employed were competent, and as every trifling accident, such as the blowing out of a joint, or the breaking of a blow-off cock, has to be reported, it makes owners careful that every little detail shall be properly attended to. As no one can use a steam boiler without in some degree causing risk of injury to other people and other peoples' property, this British Act seems a most reasonable way of compelling boiler users to take care of them.

The construction of the Hamilton, Grimsby and Beamsville Electric Railway is being proceeded with, some forty men and ten teams being engaged on the grading, and a dozen line men and diggers on the overhead construction. The number of men is being increased, and every effort made under the direction of Mr. F. E. Handy, superintendent of the road, to complete construction by the 1st of July. The power station at Stony Creek is ready for the roof, and the boilers will be in position in a few days. A large tank has been made, 130 by 80 feet, 14 feet deep, for the storage of water. The chimney will be 100 feet high, stone foundation, set on concrete. The company have had some little difficulty within the last few days with the township council of Salt Fleet, over the question of right of way, but the matter is in a fair way to be amicably adjusted.

TAXATION OF ELECTRIC AND GAS STREET PLANT.

MR. O'Connor's bill, now pending in the Ontario Legislature, to declare the mains and general plant of gas and electric companies non-assessable for municipal taxation, is meeting with considerable opposition from some quarters. The reasons alleged for this opposition are briefly, that the lighting companies are rich and can stand the tax, that to declare their plant non-assessable would be to "rob" the municipal treasuries, and further, that as a broad principle of plain justice, investments in lighting plants should be taxed the same as investments in buildings or merchandise. This last objection is simply begging the question. Lord Palmerston once enunciated a similar broad principle, when he said in his jaunty off-hand manner, that he did not see why spirits should not be sold freely like molasses by every grocer. He ignored the very essential point that spirits are not like molasses. In the case of Mr. O'Connor's bill the point is, that investments in gas and electric plants are not the same as investments in buildings or merchandise, and the question is, whether the special circumstances under which they have been developed are not such as to make it wise for the legislature to intervene, to insure that these investments in plant should continue exempt from municipal taxation. We say continue exempt, for it must be borne in mind that it is the taxation which is new, not the exemption.

The County Court judge's decision last year, on the assessment then for the first time made on the distributing mains of the Toronto companies was, that the municipalities have the legal right to assess. But this right had not been previously exercised, except possibly in a few instances. The effect of Mr. O'Connor's bill in general, is therefore not to "rob" the municipal treasuries of any benefit they have hitherto derived from this source; it does not cut off a portion of their revenues and hand it back as a bonus to a few taxpayers who have hitherto managed to carry on their business and pay taxes without the aid of a bonus; it simply deprives the municipalities of a right, which they have hitherto wisely refrained from exercising, of imposing what would practically be a new tax upon a class of industries which are perhaps more than any other of general benefit to the communities in which they exist: and a tax which in probably the majority of cases of the small towns would mean at present the difference between a profit and a loss to the enterprises concerned. Now the opponents of the bill do not propose that the electric lighting companies should carry on business at a loss, or even at a smaller profit than they could obtain with much less risk by investment in mortgage; and in order to live the companies must in some way recoup themselves of the amount of the tax, to make good their diminished or vanished profits. They cannot reduce their expenses and there is nothing left to do but to increase their rates. But in the very great majority of cases, their largest—by far their largest—customers are the municipalities themselves, who at increased rates would take out of their treasury with one hand nearly as much as they put into it with the other. The difference, which the municipality nets, represents the increased cost to the private users of light, who may be presumed to be the most active, enterprising and desirable class of citizens, and whose superior merit this tax would reward and encourage by what is practically an extra assessment; not to pay the lighting company inordinate profits, but that the lighting company may be enabled to live and furnish the public lighting; in other words, an extra assessment levied only upon their lights, in order that their less enterprising fellow citizens may pay less than their proportionate share of the general town lighting.

Where the rates for town lights are fixed for a term of years by a contract made at a time when the plant was not taxed, the imposition of a tax now without modification of the contract rate would—even if legal—constitute an act of injustice which in the healthy and intelligent public life of our small towns we do not think would be permitted. In our larger towns not only is the municipal government less in touch with public feeling, but unfortunately the latter is less active. The companies are larger, their dividend rate is good, and the injustice of the added taxation is less obvious, as its effects are more far reaching. Public feeling cannot or will not protect them and dividends must be reduced to pay the tax or it must be paid out of the accumulated reserve—where there is any. In either case the market value of the stock falls correspondingly, and the shrinkage is practically a forced subscription from those who are stockholders at that time. Now who are these stockholders who constitute the "rich corporation" and "can stand it?" A glance at the stock exchange list will show that the public thinks well of these stocks as an investment, that they are quoted at a high premium, and that gas, telephone and electric light stocks are changing hands daily at prices which yield a return to the purchasers of only 4½ to 5½ per cent. The original stockholders whose courage launched the enterprise, and whose care and skill guided it to the successful issue they had foreseen for it, have reaped some of the reward due to their daring and ability, and have sold all or a portion of their stock at a premium. The immediate or ultimate purchaser is generally the man who by steady work in his business or profession makes both ends more than meet. He has a yearly surplus to invest. He is pre-eminently a sensible man, and he knows that for him to put his money into any new venture promising large returns, but to which he himself could give no attention, would be culpable folly. He is content to put up with a low rate of interest in return for investments which are not likely to be much affected by hard times, and which are always readily saleable. At his death they form part of the provision he leaves for his wife and family. In his investments he plays a doubly useful part in the community by discouraging the promoter who is so ready to be venturesome with other people's money, and by encouraging the sound enterprise of the business man who develops with his own money a new source of wealth. He pays the latter the premium successfully earned, and liberates his augmented capital to be employed with proved skill and riper experience in new enterprises which develop the latent resources of the country and add permanently to the wealth of the nation.

Investors of this class are obscure but exceedingly useful, and any action which would create in them a feeling of distrust would be, to say the least, very inexpedient. They are innocent holders of the securities, and as such their just interests should be jealously safeguarded. These men, their widows and unmarried daughters, are ultimately the principal owners of gas and electric companies in the larger towns, and the result of Mr. O'Connor's bill in the larger towns is not to "rob" the municipal treasuries, but to prevent the municipalities from confiscating at a blow a portion of these men's savings, on the specious plea of levying a tax upon their earnings.

To sum up, merchandise may seek a market anywhere; buildings though confined to one locality may be put to many uses; but lighting plants can be used for only one purpose and are narrowly restricted to one locality in seeking customers, and in many cases are almost confined to one customer only. The investments were made and the business developed under conditions which the opponents of this bill desire to retain the right to alter. Where the enterprises have proved successful they have largely passed out of the hands of their originators into those of many small owners, who receive a low rate of interest on their investment, and part of whose capital would be wiped out to capitalize the annual payment of the tax in the large towns, whilst in the smaller towns the benefit to the municipal treasury would be largely illusory. It is not sufficient answer to say that this taxation would be legal. The question is, is it expedient? Is it wise? Is it just? In passing this bill the legislature will be exercising one of its most important functions, that of righting by new enactments the wrongs which result from the application of old laws to new conditions. Mr. O'Connor's bill has passed the committee, and we trust that it will be equally successful in passing the House, which by enacting this bill will show that it truly represents the people of the province, whose approval of the principle of the bill is shown by the good sense with which the small towns and villages have abstained from exacting those legal rights which this bill now seeks to abolish.

Since the above was written the friends of the measure decided upon its withdrawal owing to the increased opposition manifested by a majority of the members of the House. The question of the correctness or otherwise of Judge McDougall's decision will now presumably have to be decided in the Superior Courts.

Arrangements are being made to install a new incandescent lighting plant at Orillia, Ont.

THE BRITISH BOILER EXPLOSIONS ACTS.

IN Britain there are acts of Parliament relating to the use of steam boilers known as The Boiler Explosions Acts, 1882 and 1890. Under these Acts the owners of steam boilers must report every accident of the nature of an explosion within 24 hours of its occurrence. From the last report to the Secretary of the Board of Trade by the Solicitor having charge of the workings of these Acts, we learn that the year ending June 30th, 1893, there were 72 investigations held. Some of these were merely preliminary inquiries, but 26 were formal investigations. Of the 72 accidents, 32 were from deterioration, or corrosion or some part of the apparatus having become defective. 23 were from ignorance or carelessness on the part of the attendant, 8 were from defects in design or workmanship, and in 9 cases the causes could not be definitely placed under any of these divisions.

It is interesting to note that the English law does not compel a boiler owner to place his boiler under the charge of a man holding any kind of a certificate, but the law holds the owner responsible, and in event of an accident he must prove that he employed a "competent" man. It goes further, and if at any of these formal investigations, it is proved that the accident was due to negligence on the part of anyone, whether attendant or owner, maker or seller of the boiler or its attachments, the law is strong enough to reach him, and inflict some form of punishment.

Here are samples from the report before us. No. 582—Manufacturing engineers blamed for reckless conduct, and to pay £20 costs; No. 590.—Managing director blamed for neglect and ordered to pay £40, costs; No. 608.—Owner blamed for not employing a competent person and ordered to pay £85, costs; No. 623.—Owner blamed for want of proper supervision, and attendant blamed for neglect. Owner to pay £20, and attendant £5, costs; No.651.—Owner held responsible for negligence of his engineer, and a blacksmith who ignorantly advised owner as to the working pressure was blamed. Owner to pay 20 shillings and the blacksmith £20, costs.

We commend this to all parties interested in steam boilers. The acts have been in force a number of years, and have given good satisfaction. A similar act in Canada would do much to improve the steam appliances, and would make owners careful as to what kind of a man they employed.

The investigations refer not merely to what are usually called boiler explosions, but cover accidents to any connection of the boiler which is under steam pressure. The breaking of a steam pipe, the rupture of a tube or the bursting of a blow-off pipe must be reported, hence owners are much more careful.

Some of the accidents investigated were of boilers which were insured. The report says: "As regards the Boiler Insurance Companies, no cause has arisen in connection with the working of the Acts which shows any serious neglect on the part of their inspectors, nor has any blame been attached to them by the Court in any formal inspection which has been held during the year."

NOTES FOR ENGINEERS.

A CHAIN is no stronger than its weakest link, and a steam boiler may have some one spot weaker than other parts, and in estimating the safe pressure, the strength of this weaker part should be taken into account.

Factors of safety, as they are called by mathematicians, are used as a means of making allowance for unseen or suspected or possible weaknesses. For example, a boiler shell is made of plates the strength of which is known, but the riveted joint is weaker than the plate, and the fit of the rivets in the holes may not be perfect, hence some allowance must be made for unknown imperfections.

It is common to make a calculation of the amount of metal left after the rivet holes are cut, and of the metal in the rivets, and determine the supposed amount necessary to break the plate. A well designed, double riveted joint should, however, give 70% or nearly three fourths the strength of the plate.

Stays, and especially screwed stays, may corrode and soon become much weaker.

It is common to calculate the strength of the riveted joint and divide by five as a factor of safety, so that the working pressure is only one-fifth that required to rupture the joint. The factor of safety used for stays and parts liable to be corroded is larger, often as high as ten, so that when new these parts are much stronger than the plate joint.

In connection with steam boilers there is another way of looking at the need for using a factor of safety. The rates still in use were adopted years ago when the quality of the metal was much more uncertain than it is now, and when the methods of working the metal were more likely to injure its strength than is the case with those now used by first-class makers. We have now a better guarantee that the finished boiler will really be of the strength intended. If this be so, then that part of the factor of safety which was used to allow for uncertainty of the strength and workmanship is not now so necessary.

Boilers made of steel by makers having good appliances are now in use with a pressure where the factor of safety is four, and possibly even this may in time be reduced.

We are not arguing in favor of engineers taking greater risks in using steam boilers, but we are arguing that boilers which have been made in the most skillful way and of the best material should not be rated as being only equal to those made of poorer material and in a less skillful manner.

HOISTING MACHINERY.

THERE is probably no non-productive machine about a shop that earns as much, *to put the matter paradoxically, writes* J. H. Allen in the Illustrated Carpenter and Builder, as the crane. When we see a group of men working until every muscle is strained to the very limit of its endurance in attempting to lift a heavy casting into position on a lathe or planer, all in default of a suitable hand hoist wherewith one man could do the work in one-tenth the time with one-thousandth the actual exertion, we are disposed to look upon the proprietor of that shop as being an old fogey who is so far behind the times that it is a hopeless task for him to so much as make the attempt to catch up.

There is no shop so small, no business so poor, that should not have its complement of cranes and hoists. First of all there should be the self-sustaining hoist with a capacity equal to the heaviest of the probable requirements. When we come to the cranes they may be a simple ring in the ceiling into which the hoist is to be hooked, or the elaborate travelling crane. But for the small shop there are a multitude of simple designs that can be made at a low cost and which will serve their purposes most admirably. The most common is the straight bar, slightly curved up at the outer end, and suspended by a stay to the post, about which it swings. Old railroad iron seems to be the most *suitable material for such a swinging jib. It has the advantage* over the plain flat bar, in that the head and flange give it a lateral stiffness, so that it is not likely to buckle, and the unnecessary metal which it contains receives a compensation in the very low price at which it can be bought. Such a jib can be hung to a post or to the wall; the only care that need be taken is that the horizontal pull should be carefully calculated, so that it may not exceed the resistance of the wall and pull it down. It seems superfluous to call to the attention of our readers that the greater the distance between the point of attachment of the upper end of the stay and the heel of the jib, the less will be the horizontal pull on the wall.

Sometimes, however, there is no post or pillar near at hand, and the jib must be held by its own swinging post. Belts and machines may be thickly strewn around, and yet when the trolley cannot be made to serve, the swinging jib crane can usually be worked. It goes without saying that there must be some space in the floor and the ceiling above for stepping and fastening the post. So we first locate this, and then proceed to put in the longest jib that will swing over the desired arc and clear the belts. Of course, this is not long enough to pick up our work and put it where we want it; so we devise an extension jib. This can be done by building our main jib in two parts, and carrying a set of rolls flush with the bottom and top, and running our extension between the two parts, and taking the upward and downward thrusts on the rollers. If they are well put up and kept level, one will be surprised at the ease with which the heavily-loaded extension can be worked in and out, and the load swung in and around the belts, that at first sight would seem to preclude all possibility of the use of a crane.

When we pass beyond the domain of the simpler tools, it is doubtful if it will pay any proprietor to construct his own hoisting tools, unless he does it to keep his men busy in a dull season and to avoid breaking into the efficiency of his working force.

If the need arises for a peculiar construction of crane for doing a special piece of work, it is probable that someone has had the same need before, and that the shop of some crane builder will have the pattern to furnish just exactly what you want. The height of hoist, the weight to be hoisted, and the power available can all be combined, and the result will be a tool especially suited to your wants.

The first travelling crane with which we had to do was one of our own designing, and of home manufacture. Its capacity was ten tons, and its span 40 ft. A railroad shop received the benefit. It was operated by hand, it moved slowly, and the general manager thought it no good. But when he learned that with this infant the time required for putting a cylinder on the planer was dropped from an hour and a half with four men to five minutes with two he looked interested. When the time of taking an engine cab from its place and putting it on the painting scaffold was cut down from three hours to twenty minutes, he ceased to gibe at our little tool made of four by six pine sticks; and when he saw a boiler come travelling down the shop far above the impediments of the floor, he owned the tool to be a handy one, and before it had been in the shop a year, he OK'd a requisition for a power tool that would lift thirty tons and cost a very pretty penny. Such is the educational influence of small things.

A by-law will shortly be submitted to the ratepayers of Hamilton, Ont., to authorize the expenditure of $100,000 for the purchase of an electric plant for lighting the streets under the control of the city.

A new power station for the Toronto Electric Railway Co. is under construction and being rapidly pushed to completion. Foundations have been completed for the two large Siemens-Halske generators which are to be installed. The chimney stack for this station will be 250 feet in height, and will have a foundation resting upon solid rock, 15 feet beneath the surface of the ground, and 40 feet square.

DEVELOPMENT OF SWITCHBOARDS FOR MODERN CENTRAL STATIONS.

By A. B. Herrick*

In the designing of central stations a great deal of attention has been given by electrical engineers to the subject of switchboards. Too much attention cannot be well directed to this branch, both in regard to the concentration and the consequent reduction in the space which it occupies, which leads to reduction in first cost. Care also has to be given in combining and placing the apparatus in such a way that the cost of attendance will be as small as possible, besides always having in view methods to give the greatest flexibility possible to the system.

In regard to the location of the board, the universal modern practice, both abroad and at home, is to place the switchboard in a gallery or in some elevated position where the attendant has full observation of the operation of the different units under his charge, and can judge, in the case of any peculiar behaviour of the generators, the proper remedy to be applied, and be prepared to take the unit off the circuit if necessary. There is another marked general tendency in switchboard construction—that is, to make the whole structure absolutely fire-proof.

In the case of low equal potential distributing systems, especially in the three-wire feeder and main system, the switchboard arrangements bear a very important relation to the satisfactory operation of the system. The advance in this line has been so marked in the last few years that it will repay us to review the past history of the low potential systems of distribution in a few words, and to seek clearly the causes that have made it necessary to introduce the modern novel methods to increase the economy of operation in production and an effective distribution of the current.

In order to distribute the current at a high economy by means of the feeder and main system, it is necessary to place the station at the average centre of distribution. This simple proposition is complicated by the fact that a city is divided into business and residential portions, each having different periods of maximum demands on the station, and as these districts are not generally symmetrically located as regards the station, the centre of maximum efficiency of distribution travels over considerable distances during the day.

Different methods have been adopted in the past in order that the station may deliver its current to the mains at an equal potential: in other words, artificial means have to be used to bring the varying centre of the distribution to the station.

The first means resorted to was to introduce into various feeders an artificial adjustable resistance, to compensate for the unequal losses occurring in the feeders This method has become obsolete in good practice. The immediate remedy was to put in more copper in the form of new feeders and larger mains, but as the low potential systems have been expanding over larger areas, to include a greater number of customers, it has again become necessary to deliver current at the station ends of these feeders at different potentials to compensate for the unequal loading of the system. This was originally effected by running the dynamos at different potentials, feeding into independent busses, the feeders being so arranged that they could be thrown on any of these busses and supplied with current at the proper potential, to deliver their current to the mains at a uniform potential. When the units in the station were small, they could be divided up on the different busses with comparatively high economy, but as central station business has expanded units had to be adopted both for economy and first cost per kilowatt, higher economy in current production, and to obtain a larger kilowatt output per square foot floor space. With the introduction of these large units, two conditions confront the engineer; one—it was necessary to run the unit at nearly the maximum output, in order to get the maximum efficiency of the generators and engines combined; and the other—to deliver this current at two or more potentials to different groups of feeders.

To follow the ordinary load diagram of a station, beginning at the lowest point, it is very rarely required to produce the current at more than one potential. Here all the feeders may be thrown on one bus bar, or the bus bars may be tied together. As the load rises, certain feeders will become more heavily loaded, and they will have to be supplied with a current of high potential, but to run a large unit on this potential bus, where the load it has to carry is a small part of its total capacity, it would be an uneconomical method of producing this current, as the unit under these conditions is working disadvantageously both as regards expansion of steam in the engine the friction field and armature losses. Several different methods are now used to effect a higher economy in the delivery of the current to the busses. Mr. Barstow, general manager of the Brooklyn Illuminating Company, has devised the well known "booster" system. This method works out very well where three potentials are required. In the three-wire system two "boosters" are required for each potential, and it is the usual practice to couple these "boosters" together, making one continuous line of shafting, to which is also coupled a motor for the purpose of keeping the "boosters" up to full speed and making good the losses due to transformation and unequal loading of the high and low busses. The losses inherent in the "booster" system are those occurring from friction, armature losses, and field excitation.

A method has been devised by which to obviate these losses: a dynamo can be used to produce on a single armature two or more potentials. Where the difference of potential is small, and where the load on the high and low busses does not fluctuate very rapidly, a smooth body multipolar direct driven dynamo can be used; but where the differences of potential and load are extreme, a special dynamo is applied and different parts of the armature run at different potentials and on two or more separate busses. Its action will be similar in every respect to that of two or more independent dynamos. The different parts of the armature giving different potentials are controlled by separate regulators and the load on these separate busses carried to a point at which it will be economical to operate a separate unit. Then this special dynamo can be connected to any one of the busses in the same manner as any other unit in the station. The different parts of the armature are brought to one potential and thrown in on any required bus in the same manner as in the operation of three separate dynamos. In this way some of the losses inherent in the booster method are obviated, and full economy of the supplementary bus output is always obtained; and the full load of these auxiliary busses being carried by the one dynamo brings the output of this dynamo up to an efficient point as regards the operation of the engine and dynamo.

In the introduction of the modern multipolar machine great attention was necessary in the field circuit arrangement, and the proper method of exciting dynamos is still an open topic. Two methods are commonly used, each having its own peculiar advantages and especially applicable to different systems—the self-exciting, bus exciting. The advantages and disadvantages of these methods are as follows:

In the self-exciting method the field terminals are connected to the brushes. The advantage of this is that the field gradually dies away as the dynamo slows downs, and when the dynamo has stopped the field has entirely disappeared. The danger of a sudden discharge of the field, which would submit the field winding to a strain on account of the high potential induced, or breaking down the armature, is thus avoided. The disadvantages of this method are: 1st, the slowness with which the dynamo builds up its own field, as the dynamo frequently runs at full speed for some time before it develops sufficient electromotive force to be connected to the system; 2d, the possibility that the field may build up reversed. This may be caused by the sudden discharge of the field by a short circuit, or even by proximity to another dynamo.

In the bus-exciting method the fields are connected to the station mains or busses. The advantage of this method is that the field is instantly made and the dynamo connected into the system as soon as it is up to speed. The polarity of the field is always the same and cannot be reversed. In bus-exciting of large multipolar dynamos the taking of the field off the bus introduces into a system of low potential, a high potential discharge, which submits the field insulation to a strain which can be avoided in several ways. One method is by having a special switch, which, before severing the fields from the bus, connects the fields in such a way that it is divided into two halves; the electro-motive forces of discharge are opposed against each other and consequently die away without having any effect.

The disadvantages of the bus-exciting method are: 1st, that in case the system is short circuited sufficient potential can not be generated to burn out the short circuit; 2d, if the dynamo is operated on a different bus from which it is excited, full output of the machine cannot be obtained in case the exciting potential is lower than its working potential.

It will be noticed that all conducting parts and switch contacts are made more massive than in the old type appliances. The economy of this is very apparent; for instance, if a thousand ampere switch were used which had an average elevation of temperature of 20 degrees Fahr. above the average air temperature of the station, this would mean an average loss of 72.2 watts. And with electrical horse power delivered at $60.00 per year the energy expended in heating this switch would cost nearly $6.00 per year. From this it is evident that a switch possessing more material and contact surface would be a very economical investment. These points of sufficient carrying capacity unfortunately do not become evident until the station becomes fully loaded.

If any part of the switchboard passes an average of 20 degs. Fahr. above the surrounding air, the high water mark for economy has been passed in the design of this board, and it is unprofitable to pass the current through devices whose temperature averages more than 20 degs. Fahr. In this case the manufactured product of the station is uselessly wasted in its transmission. It should be utilized for earning dividends by passing it through the meter of the consumer instead of wasting it in the station.

*Abstract of paper read before the National Electric Light Association Convention, Washington, D. C., February 27, 28, and March 1, 1894.

Mr. John W. Anderson of North Toronto, a large shareholder in the Metropolitan Electric Railway Co., has caused a writ to be issued to restrain the directors from selling the franchise to the Toronto Railway Company.

The Ontario Legislature has passed a bill authorizing the amalgamation of the City and Suburban Electric Railway and the Davenport Street Railway Co. The company will henceforth be known as the Toronto Suburban Railway Company.

SOME TROUBLES: LOCATING AND OVERCOMING THEM.

NEARLY all trouble in the electric lighting plant is due to neglect, or a lack of information regarding the principles and details of the machinery used. In a number of plants where alternating machinery is employed, trouble has been experienced on account of the exciters running hot and the machines not working up to their full capacity. In one particular case of this kind it was noticed that on some evenings the exciter would run cool and the alternator work up to its full capacity and as nicely as could be expected, while on the next evening, probably, the exciter would run very hot and it would be necessary to throw out all the resistance and even then the alternator could not carry the load up to full voltage. As this trouble was not experienced each evening, the cause was a mystery and for a long while baffled those in charge. At last, someone with a more extensive knowledge of the principles, being present at the time the machines were shut down, noticed that when the exciter current was cut off it was done by opening a switch in the exciter circuit.

Opening the switch suddenly in this way produced a strong extra current in the field coils of the machines which, being in a direction opposite to that of the usual excitation, changed the polarity of the field magnets so that the exciter current worked in opposition to that of the auxiliary current from the self-exciting alternator.

In these alternators a certain portion of the current is taken from a commutator, thus straightening it, and making it direct so that it can be used for exciting the field ; but it is not enough to excite them to the extent required and neither is it intended to do so. The exciter current is used to produce a certain *strength of field to excite the machine primarily and also increases* the strength of field to overcome any drop of potential that may occur on the lines ; and when the polarity of the exciter is reversed the machines do not work together in the way they should.

To overcome the above defect it was only necessary that the current from the exciter should be allowed to die away gradually, thus preserving the original polarity of the field magnet. This same difficulty has occurred in a number of lighting stations and there are, no doubt, some stations at the present time where the operatives are struggling with the same annoyance.

There is one difficulty that frequently occurs in the handling of T. H. arc light machines which results in frequent flashing at the commutator. This flashing becomes persistent and is most annoying, as everything about the machine and circuits will appear to be all right so far as the ordinary tests show.

The machine will start up all right and run nicely for a short time when, in some cases, the commutator will begin to cut and the machine begin to flash and will continue to do so until shut down at the end of the run. One cause of such difficulty, which is of frequent occurrence and is often overlooked, is that the screens on the air blower are allowed to become dirty, thus closing the apertures so that an insufficient supply of air is obtained. not enough to blow out the arc which forms between the commutator segments—this is the cause of the flashing, by the current bridging over from one segment to another because there is not sufficient blast of air.

Another difficulty which occurs with the same device is that the oil holes sometimes become closed and the friction in the blower heats it to such an extent that warm air and vapor is blown on to the commutator. The warm air is a sufficient conductor of electricity so that it provides an opportunity for the arc to form, which it does immediately, and the consequence is a flash.

A commutator seldom gets hot unless the shaft becomes over warm and this is generally heated from the bearings when such trouble occurs. When the commutator becomes hot it will vaporize, to a certain extent, any oil, shellac, etc., that may have been used in, or on, the commutator. This warm vapor, being a fair conductor, allows the current to jump across the insulation, forming an arc which often extends around the commutator, producing a flash and putting out the lamps for an instant.

Flashing occurs much more frequently on arc than on incandescent machines, for the reason that the potentials carried are much higher. A defect that will cause flashing on an arc machine would produce nothing noticeable in the workings of a low tension machine, although the same neglect has allowed parts to become dirty or bearings to become warmer than they should.

Some dynamo attendants make a practice when feeling of bearings to ascertain whether they are warm, of placing their fingers on the cap of the bearings, instead of on the bottom as they should. A dynamo shaft works altogether on the lower bearing and sometimes the cap is set on liners which are non-conductors of heat. In such case the shaft and lower bearing might become quite warm without the cap showing any noticeable rise in temperature. For this reason it is always advisable that the attendant should always feel of the lower bearings to ascertain if they are becoming warm ; and many a superintendent or electrician would save himself considerable annoyance with flashing machines if he will direct the attendants to look particularly to this point.

Another cause of flashing, on one particular type of arc machine, is too great an accumulation of oil on the commutator, or rather on the lower brushes, for this is where it gathers, until the amount is sufficient to fly off in large drops. An accumulation of oil at such point will, by bridging over the insulation or air space, cause flashing as soon as the oil becomes warm. This it will do because the oil is interposed between the brush and commutator segments and by reducing the electric conductivity cause heating. This can only occur from oversight or neglect and can be easily removed when noticed. Verily, cleanliness is next to Godliness in the electric light or power plant.

FUEL ECONOMY IN ELECTRIC STATIONS.

At the recent convention of the National Electric Light Association, a committee presented a report upon the coal consumption of electric stations, which seems to indicate that the average of electric stations are wasteful in the use of fuel, and that there is an immense opportunity for improvement. The committee states :

We are requested to furnish this convention with the facts regarding the amount of coal used in actual practice to produce a given quantity of electricity. The information was obtained by correspondence, and furnished the committee in amperes, volts and hours on each circuit, and the amount of coal used covering this period, including that used for banking fires, etc. The aggregate electrical output for twenty-four hours was then calculated and compared with the total amount of fuel used, giving the watt hours per pound of coal. All improbable and apparently erroneous reports were discarded, and the tabulated statement herewith comprises intelligent replies from a large number of electric stations, including many of the leading corporations. The great saving in operating in large units and running continuously is plainly shown by the report, which shows 208 watt hours per pound of hard screenings where about 8,000,000 watts were generated, running full twenty-four hours, as against the report, which claims only thirty watt hours per pound of soft coal, the total output being less than 60,000 watts and the service being furnished only seven hours. The best results do not compare favorably with the results secured in generating power for manufacturing purposes.

In order to facilitate this comparison we have prepared a table based on 90 per cent. mechanical efficiency in the engine, and the same efficiency in the dynamo.

$$\text{Then } \frac{746 \times .90 \times .90}{\text{coal per hour.}} = \text{watt hrs. per lb. of coal.}$$

Coal per hour per I. H. P.		Watt hours per lb. of coal.
1.5	pounds should produce	402.84
2	" " "	302.13
3	" " "	201.42
4	" " "	151.06
5	" " "	120.85
6	" " "	100.71
7	" " "	86.32
8	" " "	75.53
9	" " "	67.14
10	" " "	60.43
11	" " "	54.93
12	" " "	50.35
15	" " "	40.28
18	" " "	33.57
20	" " "	30.22

From this estimate of engine and dynamo loss, 1½ pounds of coal should produce 402.24 watt hours. We have a report from the Chelsea jute mills, of Brooklyn, N. Y., covering a period of six days, where an average of 653.3 indicated horse power was developed from a coal consumption of 1.482 pounds per indicated horse power per hour, the load varying from 495.21 to 764.96 horse power.

This equipment consists of Corliss compound condensing engines and vertical tubular boilers. The plant was in operation ten hours each day. The figures given cover the whole amount of fuel used, including banking, etc. The fuel used was George's Creek bituminous coal.

If our percentage of efficiency is correct, and if we could have a fairly uniform electrical output this plant ought to produce over 400 watt hours, or double that of the most favorable report given us, more than double that of the next best report, thirteen times the efficiency of the plant making the lowest report, and between four and five times the average efficiency of the whole report.

No attempt has been made in this report to classify equipments, as was originally intended, but with the information here furnished as a basis the work can be readily classified, additional information secured, and the original scheme of establishing an average basis of efficiency for the several lines of equipment can be carried out.

The correspondence shows a marked interest in the work, and many returns were accompanied by a request for information showing how their report compared with others. We believe the tendency of the work is to encourage more careful records, which in turn assist in locating and eliminating losses, and we hope future reports by this committee will show a much better average than 88.4 watt hours for one pound of coal.

After a considerable amount of discussion, the Ontario Legislature refused to grant incorporation to the Toronto and Richmond Hill Electric Railway Company.

PERSONAL.

Mr. M. W. Corbitt, who is well-known from his long connection with the electrical trade, has been appointed representative of the Montreal Electric Co.

Mr. L. W. Crannell has resigned his position with the Royal Electric Co. and accepted that of general agent for C. W. Henderson, electrical contractor and manufacturer, of Montreal.

Mr. D. A. Starr, who has for many years been connected with the Royal Electric Co. of Montreal, has lately severed his connection with that concern, and has opened an office as consulting electrical engineer, in the Board of Trade building, Montreal.

Mr. G. R. Long, of Brooklyn, N. Y., has been appointed mechanical superintendent for T. W. Ness & Co. of Montreal, and has charge of the factory of this company. Mr. Long is extremely well qualified for the position, having had an extensive experience in the manufacture of electrical apparatus.

Mr. Ross McKenzie has assumed the duties of his new position as manager of the Niagara Falls Park & River Railway. Mr. McKenzie is very familiar with railway work, having served for ten years past as assistant superintendent of the eastern division of the Canadian Pacific Railway.

Mr. Sulby of the Crompton Howell Electric Storage Battery Co., paid a flying visit to Montreal the other day to witness the successful starting of the battery plant in the Royal Victoria Hospital which has been installed by the Crompton Howell Co., thus making the third large storage plant put in by them in Montreal.

Mr. W. A. Grant, who so successfully managed the Niagara Falls Park and River Railway Company during the first year of the operation of the road, has retired from the management, and has been succeeded by Mr. Ross McKenzie of Montreal. Mr. Grant again assumes a position with the Canadian Pacific Railway at Montreal. Prior to his departure for that city, he was the recipient, at the hands of the employees of the road, of a handsome gold watch, chain and locket.

SPARKS.

The assignment is reported of Mr. C. R. Ernst, electrician, New Hamburg, Ont.

A 1000 light Westinghouse plant is being installed by the Windsor, N. S., Electric Co.

Mr. W. H. Baker, electrician, of London, Ont., is reported to have abandoned his estate.

Mr. A. Ramage, Chesley, Ont., has recently installed a 600 light Westinghouse alternating plant.

An electric light plant has recently been installed by the Reliance Electric Manufacturing Co., at Cayuga.

Mr. W. C. Freydenburg is interested in securing the installation of an electric light plant at Westport, Ont.

A 500 light incandescent light system is to be installed at Mitchell, Ont., by the Royal Electric Co., of Montreal.

The Fenelon Falls Electric Light Co., of Fenelon Falls, Ont., has just been incorporated with a capital stock of $3,000.

Mr. W. C. Price, left Toronto a few days ago for Honolulu, for the purpose of introducing Canadian electrical machinery.

The report of the city engineer of Quebec show that the city is at present lighted by 300 arc lights, at a cost of $80 per lamp per year.

Mr. H. N. Rorison has purchased the electric light plant at Moose Jaw, N. W. T., and is making additions and improvements thereto.

It is said to be the intention of the Nanaimo, B. C., Electric Light Co., to discard their present plant and install an entirely new system.

Mr. R. B. Angus has resigned from the directorate of the Montreal Street Railway Co., Montreal, and has been succeeded by Mr. James Ross.

Messrs. Healey Bros., of Munster, Ont., are constructing a telephone line from Richmond to Stittsville and Carp, a distance of about 30 miles.

A new 700 light incandescent plant, purchased from Messrs. Ahearn & Soper, of Ottawa, is being installed by the St. Hyacinthe Gas Co., St. Hyacinthe, Que.

A new company is about to commence the manufacture of electric machinery at Oakville, Ont., under the name of the Oakville Electric Manufacturing Co.

The Chambers Electric Light Co., of Truro, N.S., to meet the demands of their increasing business will add to their present plant a 100 horse power engine and 500 light dynamo.

The Council of the Township of York have granted to the Toronto & Scarboro' Electric Railway Co. an extension of time for one year for the construction of the road to Little York.

The Montreal Street Railway Co. are experimenting with the fender selected by the Fender Committee of Boston and recommended by the Railroad Commissioners of Massachusetts.

At a recent meeting of the Directors of the Galt & Preston Street Railway Co., Mr. T. M. Burt was elected President, and Mr. Fred. Clare, Vice-president and Secretary and Treasurer.

The vacancy on the Board of Directors of the Royal Electric Co., caused by the resignation of Mr. G. R. Robertson, has been filled by the election to the position of Mr. Alfred Brunet.

It is said to be the intention of the Danville, Que., Slate Co., to construct an electric railway to carry freight and passengers from their quarries to Danville station, a distance of three and one-half miles.

The City Council of Hamilton have passed a by-law extending the franchise of the Hamilton & Dundas Railway to the year 1913, and authorizing the company to substitute electricity for steam power.

Mr. G. J. Scott, of Oshawa, Ont., has been given the contract for the construction of a police and fire alarm telegraph system for the town of Collingwood, Ont., at the price of $528.00, exclusive of wiring.

The Ottawa Car Co. have just completed a new three story building in which to manufacture electric cars. Outside the building a drum elevator is being constructed for raising the cars from the first to the upper floors.

The Reliance Electric Manufacturing Co., Limited, of Waterford, Ont., write us in contradiction of rumors which have been to some extent current of late to the effect that their position financially had been affected by the failure of a local banking house at Waterford. The company state that only a portion of their banking business was done at this institution, and that their position will in no wise be affected by its failure. They further state that their company has operated at a profit from the time it commenced business until the present, and that it is to-day in a financially strong position.

Mr. J. L. Harris, of Moncton, N. B., is the leading promoter of a company recently organized at that place for the purpose of constructing an electric railway. The construction of the road will be commenced at an early date.

The Dominion Government has given a contract to the Canadian General Electric Co., of Toronto, and Messrs. Ahearn & Soper, of Ottawa, for the construction of ten electric motors, with which to operate the locks at the Sault Ste. Marie Canal.

It is said to be the intention of the Nova Scotia Telephone Co., to commence immediately the construction of a metallic circuit line between Truro and Halifax. The company claim that this line when finished, will equal the metallic circuit lines between New York and Boston.

The amalgamation of the horse and electric street railways of Winnipeg, was consummated on the 1st of May, and the horse cars are at once to be withdrawn. The rate of fare which prevailed prior to the cut in rates, brought about by the competition between the two companies, has been restored.

The Windsor, Sandwich & Amherstburg Electric Railway Co., have, it is reported, decided to build the line to Amherstburg during the present summer. The river route will be adopted, and the line equipped with vestibule cars. Construction will begin almost immediately.

Mr. I. Viau, has made application to the City Council of Hull, Quebec, on behalf of a company who are desirous of obtaining a 50 years franchise for the construction and operation of an electric railway to connect the city of Hull with Aylmer, Gatineau Point and Ironsides. The matter has been referred to a committee.

The City Engineer of Toronto and his assistant have gone on a visit to the United States for the purpose of inspecting some of the municipal electric lighting plants, and securing data which will enable the City Council of Toronto to decide whether or not it would be to the advantage of the city to own and operate its own lighting plant.

In connection with the double tracking of the Niagara Falls Park and River Railway, surveys have been made with a view to the straightening of the road. These surveys show that the steel towers of the upper suspension bridge project four feet into the street, and that the south-east corner of the Clifton House projects even farther upon the highway. The courts will be asked to decide whether or not the bridge company can be compelled to remove the towers.

Application for incorporation is being made by the Niagara River Tramway Co. The object of the company is to construct a cable tramway across the Niagara River for the conveyance of passengers. The headquarters of the company is to be at Niagara Falls, and its capital stock is $40,000. The promoters are: John Flett and Joseph Tait, M.P.P., Toronto; L. C. Raymond, Welland; R. N. Campbell, Niagara Falls, N.Y., and G. W. Pound.

Notice is given of the application for incorporation of the Colonial Telephone and Telegraph Co., Limited, of Niagara Falls, Ont., with a capital of $25,000. The applicants are: Jacob Dilcher, Buffalo, N.Y., banker; James Bampfield, gentleman, and John Joseph Bampfield, merchant, both of Niagara Falls, Ontario; James Francis Cleary, Troy, N.Y., broker; Henry Steinert, counseller-at-law, and John Harrington, merchant, both of the city of New York, U.S.; of whom the three first are to be the provisional directors of the said company.

The City Council of Hamilton have refused to adopt the recommendation of the Board of Works, that Frank B. Rae, of Detroit, be pa d a retaining fee of $300 and a commission of five per cent of the cost to estimate for and put down an electric plant for the city. This is taken to mean that for the present, at least, the city authorities have abandoned the intention of attempting to purchase plant and do their own lighting. The Hamilton Electric Light & Power Co., are reported to have submitted to the council a proposition to continue to light the city for a further period of two years, at the price of 28 cents per lamp per night.

An agreement has been arrived at between the amalgamated electric light companies of Ottawa, and the Council of that city for the lighting of the city for the period of ten years from the 1st May, 1895. The lamps are to be lit in accordance with the moonlight schedule. The price is to be $65 per year for each 2000 c. p. lamp with a discount of 25 per cent. on private lights. These prices are not to be increased unless the company should be compelled by law to place their wires underground. The city is to have the right to string wires on the company's poles without charge and of allowing others to string wires by paying the company a reasonable compensation for the privilege.

On the afternoon of the 1st of May, a fire broke out in the incandescent light department of the Royal Electric Co.'s works at Montreal. The fire brigade were at the time on parade, having been called out for inspection by the Governor-General. They were consequently not in as good condition as they would otherwise have been to deal with the fire. When they arrived on the scene the whole of the western building on Prince street was in flames, and beyond their ability to save. They succeeded, however, in saving the offices and dynamo house. The incandescent station and pattern room were destroyed, and during the progress of the fire a large fly wheel attached to the engine exploded, the fragments flying in all directions and carrying away the roof of the building, but without causing injury to the crowd surrounding the building. The company's loss is variously estimated at from $25,000 to $50,000, and is understood to be covered by insurance.

Messrs. Scott Bros., who have lately purchased the municipal lighting plant from the town of Seaforth, Ont., have purchased a site on which to erect a brick power station, in which it is proposed to install two large boilers, a powerful engine, and a complete incandescent light plant. For these purposes, about $12,000 will be spent.

The annual meeting of the shareholders of the Royal Electric Co., was held at Montreal on the 3rd of April. The gross revenue for the year was shown to have been, $487,365.70, and the expenses $375,517.93 leaving a balance of $112,857.77. Out of that sum dividends were declared equal to 8 per cent. on the stock amounting to $77,047.14, leaving the sum of $34,810.63 to be carried to the Profit and Loss account.

The suit for damages brought against the Royal Electric Co., by Mr. Fred. Thomson, who was formerly electrician of the company, came up for argument in the Montreal Courts a fortnight ago. Mr. Thomson claims $2,000 for wrongful dismissal, while the company contend that his including Prof. Elihu Thomson, of Lynn, Mass., brother of the plaintiff, and dismissal was due to incompetency. A number of well-known electrical people Mr. J. J. Wright, manager of the Toronto Electric Light Co., were called upon to give expert evidence in the case. A decision has not yet been reached.

PUBLICATIONS.

The May Arena closes the ninth volume of this leader among the progressive and reformative reviews of the English-speaking world. The table of contents is very strong and inviting to those interested in live questions and advanced thought.

... THE ...

Canadian General Electric Company

LIMITED

HEAD OFFICE:
65 to 71 Front Street West.
TORONTO, ONT.

CAPITAL,
$1,500,000.

FACTORIES:
Peterborough, Ont.

Branch Offices and Warerooms:
124 Hollis Street, HALIFAX, - N. S.
1802 Notre Dame St., MONTREAL, - QUE.
350 Main Street, WINNIPEG, - MAN.
Granville Street, VANCOUVER, - B. C.

Electric Mining Locomotives, Hoists, Pumps, and Mining Supplies.

Electric Railway Motors and Supplies.

Electric Power Transmission Apparatus.

Arc Lighting Apparatus.

Alternating Current Incandescent Lighting Apparatus.

Continuous Current Incandescent Lighting Apparatus.

Generators for Lighting or Power Circuits connected direct to Engine Shafts.

Three Phase Power Generators and Motors for long distance transmission.

We manufacture only the most modern and perfect machinery, and our standard of workmanship is the highest.

We have just issued new illustrated catalogues on

RAILWAY APPARATUS . . . .
ARC LIGHTING APPARATUS . . . .
INCANDESCENT LIGHTING APPARATUS (Direct and Alternating)

THE EXPANSION OF CHIMNEYS.

It is seldom that facilities are afforded for the making of exact measurements of the expansion and contraction of a factory chimney. It is generally conceded that boiler chimney shafts should not be attached to the walls of any important building on account of the risk of cracking the walls by the expansion of heated brickwork, but data on the subject are scanty, and there are even persons who have doubts whether brickwork really expands or contracts when heated. An excellent opportunity of settling this question has recently presented itself in England. It was necessary to erect a casing of ornamental brickwork around a boiler chimney of 90 feet high, the inside of which was provided with a brick flue up to over one third of its height. The near completion of the brickwork surrounding the chimney gave the opportunity of observing from the top of the casing any movement of expansion or contraction of the chimney itself. As the boiler fires were drawn on Saturday afternoon, and relighted on Monday morning, the chimney cooled down, and observations made from the top of the casing will show a contraction of the chimney of 5 millimeters, or 2·10 inches during that time. As the surrounding wall was still about six feet below the top of the chimney when the measurements were made, and the first 33 feet of the shaft remained practically cold on account of the air space between it and the centre flue, it may be taken that the length of the brickwork in which the expansion took place was about 50 feet. According to this a shaft 100 feet high would *expand 4 10 inches when in use. It is probable that the expansion* observed would have been 50 per cent. greater if the chimney had been allowed a longer time to cool down.

A Smiths Falls paper tells of a lamp installed by the Packard Lamp Co. of Montreal, which was in continuous operation for 4,584 hours.

SPARKS.

The Supreme Court has dismissed the appeals taken by the Royal Electric Co., in the suit brought against it by the City of Three Rivers, and in connection with its suit against E. Leonard & Sons.

The Amherst, N. S., Gazette, states that it is extremely doubtful if there is to-day in the Maritime Provinces a single electric light company doing business on a paying basis, notwithstanding that coal is obtainable at a very low figure.

The Packard Electrical Co., of Montreal, is asking for incorporation. The applicants are Packard Bros., of Warren, Ohio; Howry Bros., of Saginaw, Mich., and A. McKenzie, barrister, of Toronto. The capital *of the proposed company is placed at $300,000.*

The hotel-keepers of Brantford are said to be utilizing electricity to escape detection for selling liquor after hours. It is said that watchers are stationed outside the building, and when an officer is seen approaching, a button is pressed and by this means the lights are extinguished.

Application is being made for incorporation by the Dominion Gas and Electric Co., Winnipeg, Man. The company ask for power to manufacture gas and electricity for commercial purposes, and apparatus and appliances for use in connection with the production of gas and electricity. The capital stock of the company is to be $1,000,000.

The bill to amend the charter of the Hamilton Radial Electric Street Railway Co., which came up for consideration recently in the Ontario Legislature was strongly opposed by the solicitor for the Grand Trunk Railway, and several of the members of the House, who contended that it gave to the electric roads powers and privileges in excess of those extended to the Grand Trunk and other old established railroads in which large capital was invested. Mr. Gibson, the member for Hamilton, and a deputation of citizens from that city supported the measure on the ground that the construction of such a road would assure cheap and ready access to the *market of Hamilton. The preamble of the bill was passed. The bill* substitutes the name "Hamilton Radial Electric Railway" for that in which the company was first incorporated, and authorizes the construction of tracks to be operated by any power except steam in various directions, radiating from Hamilton to Guelph, Berlin, Oakville, Niagara Falls, Brantford and Mimico. It also authorizes an increase in the capital stock of the company to $2,000,000.

SPARKS.

A five years' franchise for lighting the streets of Amherstburgh, Ont., has been granted to Mr. W. H. McEvoy.

Mr. W. S. Shaw's electric plant suffered destruction in the fire which recently wiped out the greater part of the town of Huntsville, Ont.

An act has been approved of by the Government, granting power to the Bell Telephone Co., to issue debentures or bonds from time to time to the amount of 75 per cent. of its actual paid up capital stock.

The application of the London Springbank Electric Railway Co., for a charter to construct an electric railway from London to the neighboring suburb of Springbank, was refused by the legislature. The application was strongly opposed by the Mayor and citizens of London, on the ground that it would interfere with the water supply of the city.

On the 15th of April, the large fly wheel attached to the engine in the electric light station at Chatham, Ont., burst into pieces. Fortunately, Mr. Robert Trott, the electrician, and his assistant, Mr. J. R. Edwards, escaped uninjured. It is said that the wheel was too light for the duty it had to perform. A local paper starts off its report of the accident in the following highly imaginative and amusing manner. " It was not a case of the twelve foolish virgins who had neglected to see that a good supply of oil on hand. The array of promptly paid electric fluid bills amply attested to keener business principles. As this sudden darkness came at an hour when merchants most require light a great deal of vigorous "kicking" was indulged in, and anathemas were wafted skyward from all quarters."

It is announced that power is being sought from the legislature of New York State, for the incorporation of a company to run a line of observation cars suspended from a cable 50 feet above the Niagara River, and following the crest of the Canadian and American Falls. It is proposed to suspend the cars, which will be entirely of glass and iron, from a cable two inches in diameter. In this connection it may be mentioned that a serious accident took place a few days ago on the suspended railway at Knoxville, Tenn., a brief description of which was given in the ELECTRICAL NEWS recently. The hauling cable broke, and one passenger was killed by the recoil of the broken end crashing into the car. The balance of the passengers were let down to a steamer anchored beneath the cable way. It seems doubtful whether suspended cable ways of this character will ever be very popular.

A dispatch from St. John, N. B., states that plans were laid by local and American speculators to secure at a ridiculously low figure, the assets of the Consolidated Electric Co., of that city. When the time came for the sale of the property, however, the speculators were greatly surprised by the action of Mr. E. C. Jones, representing the Bank of Montreal, who entered the bidding and forced the price up far beyond the figure at which they had concluded they could obtain the property. Mr. Jones was finally declared the purchaser at the price of $92 000. There are said to be liens amounting to about $30,000 against the property, and these will have to be paid off, but it is considered that Mr. Jones secured a great bargain. One of these liens for $20,000 is held by the Bank of Montreal, and it is understood that it was with the view of securing payment that Mr. Jones was instructed to take the action he did. It is further understood that the Bank of Montreal are acting in concert with Messrs. James Ross, R. B. Angus, Holt and other well-known capitalists of Montreal, who will become the proprietors of the road, and who propose to put it in a condition of first-class efficiency, and will expend over a quarter of a million dollars for this purpose.

TRADE NOTES.

Mr. John Forman, Montreal, has secured the contract to fit up the paper-bag factory of Alex. McArthur & Co., with a large Crompton Motor, and to wire the factory for incandescent lights.

The Robb Engineering Co., of Amherst, Nova Scotia, are at present engaged in manufacturing their first direct connected engine for electrical work. The engine is being manufactured for the Canadian General Electric Co.

The Vulcanized Fibre Co., of Wilmington, Del., and 14 Dey St., New York, have issued a neat calendar of convenient size, which besides giving sizes, weights, prices, etc., of the vulcanized fibre which they manufacture, includes a description of the material, and describes some of the uses to which it is applicable in the electrical and mechanical world. We learn that vulcanized fibre is produced by treating specially prepared vegetable fibre with powerful chemical agents, whereby the exterior portion of each separate fibre becomes glutinous, and while in this condition the whole mass is consolidated under very heavy pressure and becomes practically homogeneous. After this the chemicals are extracted, the mass is manipulated, rolled, pressed and cured by various methods. The material is made both hard and flexible according to the use to which it is to be put. The material is largely used for insulating purposes in electrical work.

Following is a copy of a letter recently received by the Magnolia Metal Co., New York:

FAIRBANKS' STANDARD SCALES.

OFFICE OF

THE FAIRBANKS COMPANY, 83 Milk Street, Boston.

CABLE ADDRESS—"FAIRBANKS."

Magnolia Metal Company, New York, N. Y.

Gentlemen:—We are compiling a new catalogue, comprising all the articles which we are now selling in our department of Railway and Manufactory Supplies. We desire to take this opportunity to add to the line of goods which we are handling, and would like to make arrangements with you to take up the sale of your goods and illustrate the same in our catalogue. The book we intend to issue will consist of 300 pages of the size of 8 x 11½ outside measure, and will be placed in the hands of every customer of ours, both at home and abroad. We handle only the highest grade of goods, and BELIEVING THAT YOUR MANUFACTURES ARE STRICTLY FIRST CLASS IN EVERY RESPECT, we wish to give you an opportunity to have them listed in our catalogue to the extent of one or more pages, provided you are willing to bear the expense, which will not be great. The cost of distribution will be borne by us.

Please favor us with an early reply, as we are making this offer only to a limited number of manufacturers, and our book will shortly be ready for the press.

Yours truly,

THE FAIRBANKS COMPANY.
(Signed) R. L. T. Evans.

THOMAS AHEARN. WARREN Y SOPER.

Contracting Electrical Engineers

AHEARN & SOPER

OTTAWA, ONT.

CANADIAN REPRESENTATIVES OF THE

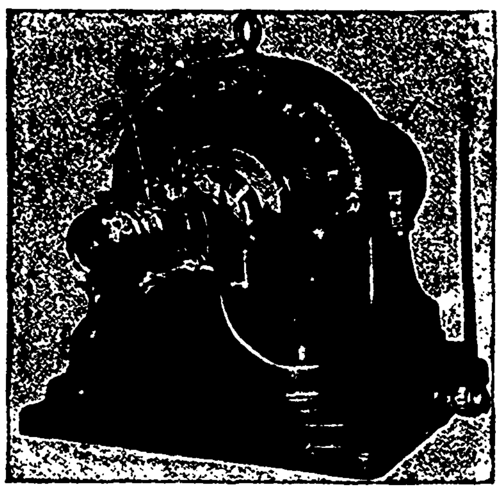
WESTINGHOUSE ELECTRIC & MFG. CO.

Slow Speed

Single and

Multiphase

Alternators



Slow Speed

Direct Current

Dynamos

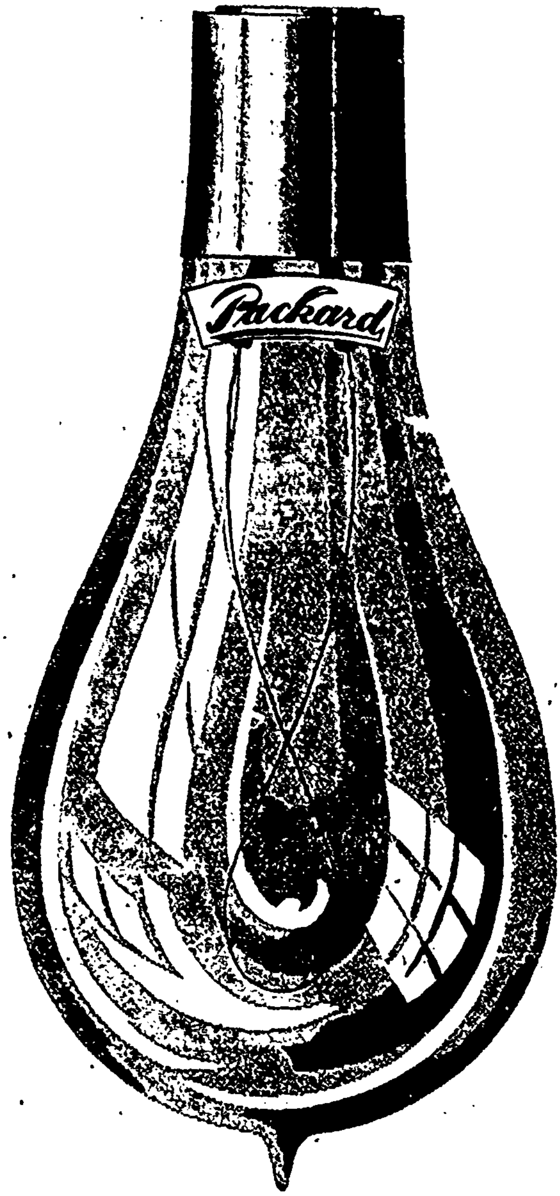
and Motors

Electric Railway Equipments Complete. Transformers.
Celebrated Shallenberger Electricity Meters.
Sawyer-Man Stopper Lamps.
Ahearn Electric Heaters for Direct or Alternating Circuits.
Long Distance Power Transmission a Specialty.

NOTICE. The **Westinghouse** Alternator is the **only** Alternator of its type in which the Armature Coils are **removable** and may be **kept in stock.** Coils are lathe wound, thereby securing the highest insulation. **All** armatures are **iron clad.**

FOR ESTIMATES AND FURTHER INFORMATION, ADDRESS

AHEARN & SOPER - OTTAWA



PACKARD LAMP CO.

(LIMITED)

MONTREAL

... MANUFACTURERS OF ...

STRICTLY HIGH GRADE INCANDESCENT LAMPS

We can supply you with a fully guaranteed lamp in any candle power from 5 to 500 c. p., in any voltage and to fit any socket. . . . .

WRITE US FOR PRICES AND FURTHER INFORMATION.