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

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

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

- [ ] Additional comments:/ Commentaires supplémentaires:

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

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

CANADIAN
ELECTRICAL NEWS
AND
STEAM ENGINEERING JOURNAL

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

JANUARY, 1896

PRICE 10 CENTS
$1.00 PER YEAR.

CANADIAN

ELECTRICAL NEWS

AND

STEAM ENGINEERING JOURNAL

VOL. VI.

1896:
C. H. MORTIMER, Publisher
TORONTO CANADA

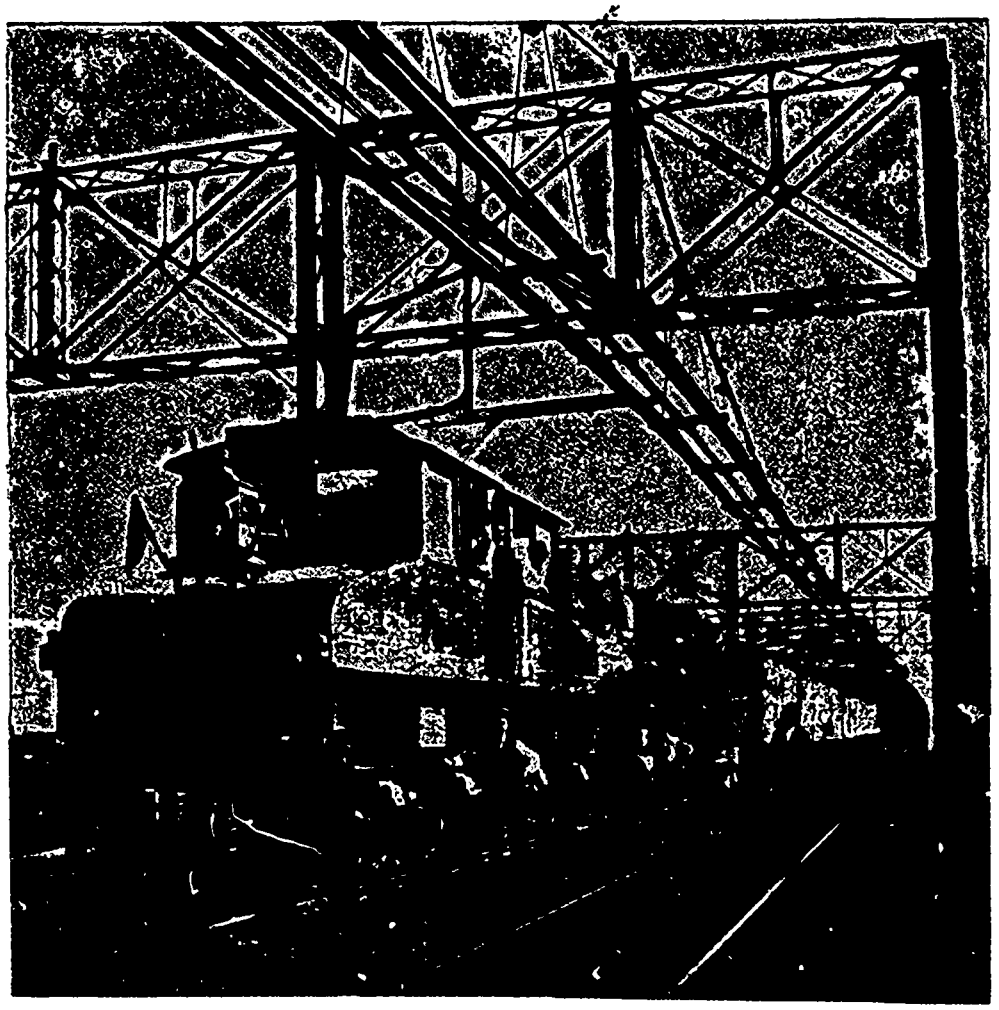
INDEX

CANADIAN
ELECTRICAL NEWS
AND
STEAM ENGINEERING JOURNAL.

VOL. VI. JANUARY, 1896 No. 1.

ELECTRIC FREIGHT LOCOMOTIVE.

SINCE the month of August last a 96-ton electric locomotive has been in successful operation for hauling freight on the Baltimore & Ohio railway. No interruptions whatever have occurred, the locomotive responding in every case without failure either of speed or power. Tests were made recently to ascertain its capacity for running a loaded train on an up-grade, in connection with which the following particulars will be of interest. The illustration presented shows the electric locomotive coupled to a north-bound freight train leaving the tunnel.



ELECTRIC LOCOMOTIVE AND FREIGHT TRAIN LEAVING TUNNEL ON THE BALTIMORE & OHIO RAILWAY.

A train consisting of two steam locomotives, not working, and 27 loaded freight cars, was brought to stop, while going north through the tunnel. Here the grade is 42 feet to the mile, and the rails were damp and greasy. The weight of the train was 1,125 tons, or 1,221 including the electric locomotive. Every drawbar was tight, no slack occurring throughout the length of the train. In this condition current was turned into the motors and movement was immediately communicated to the train. At the end of one minute the train was moving at a speed of 10½ miles an hour, and at this point the speed was increased to the usual rate. The total distance moved in 40 seconds was 150 feet and at the expiration of one minute 450 feet.

Another test was made with a dynamometer car placed between the electric locomotive and the train, which consisted of 22 cars loaded with coal, one caboose and two dead locomotives. The total weight was 1,068 tons. On the 10 per cent. grade in the tunnel an average drawbar pull of some 25,000 pounds was obtained from the dynamometer diagram. The speed at this point was 11⅛ miles per hour. Comparison with the diagrams obtained in similar service with steam locomotives showed a remarkably uniform and steady pull by the electric engine, due to the absence from it of reciprocating parts, the torque being

constant throughout the entire revolution of the wheel.

A further test was made with another train, consisting of 36 cars, one caboose and three dead engines. This was a regular through freight train with a local freight attached, and the total weight was in excess of 1,600 tons. It was hauled with ease through the tunnel, and calculations from the previous dynamometer records and the drawbar pull per ampere showed a drawbar pull of over 45,000 pounds.

On October 6th still another test was made, the character of the performance being heightened by the fact that the train which it moved measured over 1,800 feet in length and weighed about 1,900 tons, and was started from rest in the tunnel. It consisted of a north-bound freight train of 28 loaded cars and two locomotives coupled to a local freight of 15 loaded cars and one locomotive. In starting not a sputter, spark or slip of the wheel occurred, and the train moved with the same precision as if the circumstances had been of the ordinary character. The drawbar pull of 60,000 pounds was about the record in this case. The train was quickly brought to a speed of 12 miles an hour and pulled through the tunnel without difficulty, with the locomotive continuously exerting a drawbar pull of 40,000 pounds.

The above tests only show approximately what the locomotive can do, as its capacity has by no means been reached.

Two additional machines have been ordered by the Baltimore & Ohio Railway Company, which are now nearing completion at the works of the General Electric Company at Schenectady.

A CANADIAN'S RIDE ON THE WINNING MOTO-CYCLE.

While so much has been said lately of the moto-cycle or horseless carriage we thought a description of a ride on one in the late Chicago race would be of interest to our readers.

One of our representatives called on Arthur W. White, of London, Ont., of the firm of Geo. White & Sons, well known manufacturers of engines, boilers, etc., he being the only Canadian official in the Chicago road race last (U. S.) Thanksgiving Day. He and his father, Geo. White, were in Chicago for ten days before the race, during the preliminary tests.

On the morning of the race the umpires were assigned to the carriages, one to each. Arthur W. White was placed on the Duryea carriage, he not knowing till then which carriage he was to ride in. The route of sixty miles ran north from the corner of Michigan ave. and Rush street through Lincoln Park, then by way of Kenmore ave. to Evenston, a distance of thirty miles. The return run was from North Clark street and Belmont ave. to Milwaukee ave., then through Park Drive and Humbolt, Garfield, Douglass and Brighton parks, then down Western ave., 55th st. Boulevard, through Washington Park to starting point, the round trip being 60 miles.

With Mr. White on the carriage was Frank Duryea, the operator, brother of the inventor, Chas. E. Duryea. The day was fine overhead, but the roads were full of slush, which impeded the speed of the carriages. In some places the slush was six inches deep and often hid ruts, into one of which the Duryea carriage went at the corner of Erie aud Rush streets, breaking the steering gear. While they were examining the extent of the break, the Macey carriage passed them. It being a holiday, none of the blacksmith shops were open, but they hunted up a key to a shop, went in and did the work themselves. Fifty-five minutes were lost here. It took them from 8:55 a.m. to 12:45 p.m. to run to Evenston, a suburb of Chicago, making a stop of seven minutes before reaching Evenston for water. Shortly after getting water they caught up to the Macey carriage. The road here was but one broken track, with snow on each side to the depth of from six to eight inches. One of the rules of the contest was that if the leading carriage could not prove its capability to keep ahead, it was compelled to pull out and let the other go by. Mr. White asked them to comply with the rules, which the Macey people did. He was sorry to ask them to do it, but the rules had to be complied with. A short way south of Evenston a sleigh load of young people upset while turning a corner, but Mr. Duryea brought the carriage to a standstill almost instantly, just as the wheels touched the horses. The carriage at this time was going twelve miles an hour. At the corner of Clark and Lawrence ave. they lost their way, and went two miles out of the course. At Diversea street part of the mechanism broke, which necessitated the drawing out of a piece of inch ground steel; this was done in a tinsmith shop with the aid of a charcoal fire and tinsmith's hammers. They had to light the fire, and lost one hour here. Through the west side parks the snow was very deep, and to use a slang term, "the woods were full" of boys who made Messrs. White & Duryea targets for their snow balls. Mr. Duryea received "one in the neck" which dazed him. Two policemen tried to control the boys, but the boys didn't see it that way, and utterly routed the cops. Crowds lined the route and many were the cheers our friends received. The Kodak fiend, as on all occasions, was on hand—you saw him in every guise, in every place, at all times. One fiend got down on his back in the slush under the Duryea carriage to take a snap at the mechanism. The Duryea rig reached the starting point again at 7.18 p.m., being 10 hours and twenty-three minutes on the road, and winning the race. The Muller carriage came in a little above an hour afterwards. The Macey carriage became mixed up with a trolley car and did not get in till the next day.

After the race Mr. Hewitt, president of the company who will manufacture the Duryea carriage in Springfield, Mass., entertained the Duryea people and Mr. White and friends to supper, which was quite acceptable to Mr. Arthur W. White and Mr. Frank Duryea, as they had had nothing to eat since 6:30 a.m.

Mr. Arthur W. White is building an electro-moto-cycle in London, and will give it a test at the proposed races in that city on the 24th of May next. He is very desirous that a moto-cycle test should take place in Canada this year, and suggests that London, being surrounded in all directions by excellent roads, would be the most suitable place for such an event. The horseless carriage has a great future before it. The thing to be decided is what power will be the best for all occasions.

Mr. E. Lusher, Secretary of the Montreal Street Railway, has recovered from his recent illness.

A. E. Payne, a well-known electrician of Boston, Mass., has decided to make his home in Canada, and has joined the Royal Electric Company at Toronto.

COMBUSTION.*

By Thomas Wensley, Ottawa.

(Concluded.)

I will here give you an approximate list of square feet o heating surface per horse-power in different styles of boilers, and various other data for comparison:

Type of Boiler.	Square feet of heating surface for one horse-power.	Coal per square foot h.s per hour.	Relative Economy.	Relative Rapidity of steaming	Authority.
Water Tube.....	10 to 12	.3	1.00	1.00	Isherwood.
Tubular.....	14 to 18	.25	.91	.50	"
Flue.....	8 to 12	.4	.79	.25	Prof. Trowbridge
Plain Cylinder. ..	6 to 10	.5	.69	.20	
Locomotive	12 to 16	.275	.85	.55	
Vertical Tubular..	15 to 20	.25	.80	.60	

A horse-power in a steam engine or other prime mover is 550 foot lbs. raised one foot per second, or 33,000 lbs. one foot per minute.

In Engineering of August 17th, 1894, there is a report of two tests made with a triple expansion mill engine of 1,000 horse-power, built by Victor Coates & Co., limited, of Belfast, for the spinning mills of the Brookfield Linen Company, limited, of the same city. This engine was set to work on the 18th of September, 1893, and has been at work ever since, giving satisfactory results, especially in the matter of fuel consumption and steady driving. As shown by these tests, the amount of water used is remarkably small, being 11.5 lbs. per hourly horse-power, and the coal consumption was 1 lb. The diameters of the cylinders are respectively 19, 29 and 46 inches, with a stroke of 48 inches. The steam was generated in two Lancashire boilers, 7 feet 6 inches in diameter and 30 feet long; each boiler has two furnaces of the Adamson type, having five Galloway tubes in each, and the total heating surface of the two boilers is 1,900 square feet. On these tests the engines were not running at full power, but were developing 787.4 horse-power, so that the heating surface per horse-power in this case was 2.41 square feet. The feed water was heated in the economiser to 250 Fahrenheit, and if we include the heating surface of the economiser, 3,600 square feet, there would be a total of 5,500, or 7.112 square feet per horse-power. The economiser is placed in the base of the chimney, and the feed water is heated by the hot gases which are passing away to the atmosphere, and would otherwise be a total loss.

When anthracite or hard coal is used, there should be from 22 to 24 inches between the top of the bars and the lowest part of the boiler. If bituminous or soft coal is used, then from 27 to 30 inches.

It is an absolute condition of economy and efficiency that the grate bars shall at all times be well and evenly covered with the fuel, but this condition is one that is frequently neglected. If the bars are not uniformly and evenly covered, the air enters irregularly in streams, passing through the thinnest or uncovered parts; if too thickly covered it prevents the air entering. You all know that the thickness of the fire will depend upon the size of the coal used. The smaller the fuel the thinner the fire. With egg coal from 6 to 8 inches, and with furnace coal from 8 to 10 inches have been found the best results in practice. In burning soft coal the charges should be light, as the gases which are evolved will have a better opportunity of getting the requisite quantity of oxygen.

I have seen from 15 to 16 inches of coal on the bars at a time, and upon asking the fireman his reasons for having such a heavy fire, his answer has been that he could not get steam unless he had that quantity. It is argued by some that it is necessary, when a boiler is worked to a high rate of capacity, to maintain heavy fires, and that thin fires are well enough for slow rates of combustion; but when the call for steam increases, it must be met by an increased thickness in the bed of coal on the grate. The ordinary fireman is apt to favor this method, for the reason that he can introduce large quantities at a firing, and afterward he is not obliged to give the fires much attention, for perhaps an hour's time, when he will again fill the furnace full in the same manner as before. As an explanation, however, of the favor which this method receives, it is probable that the class of labor which is generally employed considers the muscular effort required much less of a task than the more frequent and careful attention which is needed when the fires are thin. Under such conditions it is almost impossible to regulate with natural draught the supply of air, upon which we must depend entirely for perfect combustion and economy.

As regards a comparison between thick and thin fires, the fact is that more capacity can be obtained from a boiler when a fire of medium thickness is carried and proper attention is given to its condition, than can be realized by any system of management when the fires are exceedingly heavy, and advocates of thick fires, who take the ground that they are a necessity, are mistaken. As to the economy of the two, some persons maintain that heavy fires give the most economical results, but this is questionable. Valuable information on the subject has recently been brought out by the results of two evaporative tests which were made on a 72-in return tubular boiler, having one hundred 3½ inch tubes, 17 feet in length. The heating surface amounted to 1,642 square feet, and the grate surface to 36 square feet, the ratio of the two being 45.6 to 1. On the thick fire test, the depth of coal on the grate varied from 10 to 20 inches, being heaviest at the rear end and lightest at the front end. On the thin fire test, the depth was maintained uniformly at about 6 inches. The coal was Kew River semi-bituminous coal. The difference in the results, as appears from the figures, is an increased evaporation due to their fires amounting to 15.6 per cent.

The quantity of heat generated in the furnace is dependent on the relative weight of hydrogen first, and carbon afterwards, chemically combined with their equivalent weights of atmospheric oxygen. If chemistry did not teach us this, our daily experience would soon convince us.

In using soft or bituminous coal, which contains a large percentage of volatile matter, it is necessary to introduce air over the fuel (unless we are working with the forced draught system), as we cannot get sufficient air through the grates, and that which comes is loaded with carbon which it has picked up in its passage through the fire. For this purpose we have apertures in the doors, or we leave the door ajar after a new charge of coal. You will readily perceive that the admission of any large quantity of air in this way must be objectionable, as it will cool the gases below the point of ignition, and if too much is admitted it will carry off heat from the furnace. There are a number of ways of admitting air to better advantage; the simplest is to conduct the air through a hollow bridge wall and discharge it through apertures in the top, the air mingling with the lower strata of the burning gases as they pass over the bridge, thus ensuring a more perfect combustion.

George W. Barrus, M.E., made tests with a boiler where provision had been made for the admission of air as above, with Cumberland, anthracite and a mixture of two parts pea and dust, and one part Cumberland. In the case of the Cumberland, the evaporation was increased about six per cent.; with the anthracite, the evaporation was decreased about one per cent. The hot air completed the combustion of the volatile products of the soft coal, which would otherwise escape unburned. The slower burning anthracite did not need this supply and did better without it. The effect which the introduction of air had upon the appearance of the products of combustion, as viewed from the "peek hole" back of the bridge wall, was very noticeable in both cases, but greatest with the soft coal; but Mr. Barrus says that there was a heightened color and increased activity to the flame, whichever fuel was used, notwithstanding the average evaporative result with the hard coal was lower. Mr. Barrus' conclusion, drawn from many tests, is that a considerable advantage attends the admission of air above the fuel when bituminous coal is employed, but that there is no advantage when mixtures of anthracite screenings and bituminous coal are used, and little or no benefit is derived when anthracite coal is used.

The importance of good draught, natural or mechanical, for the supplying of sufficient oxygen for the rapid and economical combustion of fuel, has long been felt by the engineer. The gain both in capacity and efficiency which would be obtained by the rapid and energetic combustion of the various kinds of coal, and the high furnace temperature resulting therefrom, is well established, but its importance has only been admitted within the last few years. High initial furnace temperature is essential with all kinds of boilers to obtain the greatest economy, and to obtain this high temperature requires proper draught to deliver an abundant supply of oxygen to the furnace. This result is obtained by natural draught in a well-proportioned chimney, or forced draught obtained by mechanically creating a pressure under the grates with a fan or blower. The advantages of the forced draught are: 1st. It is under complete control. 2nd. The more perfect combustion of fuel by reason of the more abundant supply of oxygen to the furnace, and the possibility of using a cheaper grade of coal, with a proper combustion of the same. It

* A paper read before the Canadian Association of Stationary Engineers.

is a fact, however, that the most perfect plant will be a failure if the firing of the boilers is not properly attended to, and the fires kept at an even and uniform thickness suitable to the grade of coal used, and it is to be regretted that so little attention is paid to this fact.

There is a furnace in use in the United States, a sketch of which I submit herewith, and known as the Hawley Down-Draught Smoke-Consuming Furnace. The characteristic features of the Hawley setting will be of interest; it consists of a double set of grate bars, one above the other, the upper, or water grate, is made of 2-inch pipe, screwed into headers or drums, connected with the circulating system of the boiler. The supply pipes to the front header are taken from near the bottom of the front end of the shell, the water passing through the grates into the rear header, which is connected to the boiler shell some distance back from the front, just below the water line, and the space between the drum and shell is built up solid with fire-brick. The operation of the down-draught furnace is directly opposite to that of the ordinary setting. Comparatively little air is admitted below the water grates, and the entire supply of coal, and practically all the air enters above. The fire burns downward, instead of upward, there being no passage except downward through the grates. The gaseous products of combustion, together with the finely divided carbon particles which form the visible smoke, are forced through the incandescent mass of coals and are highly heated, after which they meet the equally hot flame from the lower grate, on which there is burning what is practically a coke fire. The combined water of the volatile matter in the coal, as well as its moisture, are decomposed into hydrogen and carbonic oxide gases, and these combine with the air supplied below the grate, or drawn downward through it, and burn, thus adding to the efficiency of the furnace. The separated carbon meanwhile is transformed into carbonic acid gas, and the result is almost complete combustion. Whatever additional air is required is furnished through registers in the doors between the two grates, or through those of the ash pit. The style of furnace requires a somewhat increased chimney capacity, if it is desired that the boilers be capable of doing as much work as those set in the ordinary way. If the demand for steam never greatly exceeds the rated capacity of the boiler, the ordinary chimney will answer, it simply being necessary to carry thinner fires. The best results, however, in efficiency and smokelessness, as well as in capacity, are secured by having a chimney of ample height, but this is equally true with regard to ordinary settings, which rarely have enough chimney. They claim a saving for this furnace of from 20 to 30 per cent.

The highest value that has been found by actual test of a pound of coal is 14,603 heat units, and each heat unit is equivalent to 778 foot pounds, so that each pound of coal furnishes the equivalent of 11,361,134 foot pounds per hour, but we only get back 1,980,000 foot pounds, or about one-sixth of the mechanical equivalent of the heat supplied.

A pound of coal or any other fuel has a definite heat-producing capacity, and is capable of evaporating a definite quantity of water under given conditions; this is a limit beyond which even perfection cannot go, and yet, I have heard, and doubtless you have heard, of cases where inventors have claimed that their improvements will enable you to evaporate from 16 to 17 pounds of water per pound of coal, and so-called engineers have certified to these results.

You all know that this is impossible, the highest value for a pound of coal being 14,603 heat units, and it is a known fact that it takes 965.7 heat units to evaporate one pound of water from and at 212° Fahrenheit, so that dividing 14,603 by 965.7 we have 15.1 pounds of water per pound of coal, and then only when every heat unit is put into the water. The highest value of evaporation so far has been 11.5 pounds of water per pound of coal, per hour; but, as a general rule, it is from 7½ to 8 pounds per pound of coal, per hour.

In conclusion, I would say that in the combustion of fuel there is but one body combustible to be dealt with, carbon and hydrogen, and but one supporter, the oxygen of the air; that in combustion, atmospheric air is the principal element, but it is the one to which practically the least attention is given, either as to quantity or control, and that chemistry and experience teach us that combustion depends, not so much on the quantity of air passing through the incandescent fuel, as upon the weight of oxygen taken up in its passage through it. In fact, the quantity of air passing through it may be destructive of combustion if improperly introduced and distributed. That the quantit of heat generated depends upon the relative weight of carbon or hydrogen, and chemically considered, their equivalent weights of atmospheric oxygen, so also the quantity of steam generated does not depend so much upon the intensity of the fire as on the quantity of heat absorbed by the water. Now, it is well known that success in generating the most heat and steam, and consequently power, from a given amount of coal, depends upon a compliance with the necessary conditions to perfect combustion, which involves not only a theoretical knowledge of chemistry, but also a practical knowledge of the best methods of combining them with mechanical appliances, and the perfect mixing of the constituent elements with which we have to deal, in strict accordance with the laws of nature.

For the standard method of testing coal referred to in this paper, the following is the outline of procedure: For the moisture a finely ground sample is dried for one hour in an air bath at 105° to 110° C. For the other constituents a fresh sample is taken of about a gram in quantity and put in a platinum crucible, the crucible being covered; it is now heated for 3½ minutes over a Bunsen burner, followed immediately with the highest temperature of the blast lamp for an equal length of time. The loss in weight, less the moisture obtained, equals the volatile combustible matter. The fixed carbon is next burned off by removing the crucible cover and heating in the flames of the Bunsen burner, with access of air till the carbon is burned off; the loss of weight equals the carbon, the residue is ash.

THE LAW AS TO SUNDAY CARS.

FOLLOWING is the decision in full handed down by Judge Rose in the action brought by the Lord's Day Alliance to restrain the Hamilton Street Railway Company from running their cars on Sunday:—

"It was conceeded that the defendant company had the right to run its cars on Sunday as well as on the other days of the week, unless doing so was a violation of the provisions of chap. 203, R.S.O., amending an Act to prevent the profanation of the Lord's Day, sometimes called the Lord's Day Act.

The following questions then arise. (1) Does the above statute apply to the defendant company?

(2) If so, is what was shown to have been done here within the exception as being a conveying of travelers?

(3) If not within the exception, was it necessary, to entitle the plaintiff to succeed, for him to show substantial injury to the public?

(4) If necessary, has such injury been shown?

(5) And in any view, on this evidence, is an order of injunction the proper remedy for a violation of the Act?

The statute does not apply to the company unless it is one of the persons named in the first section of the Act or a person ejusdem generis with those named.

I assume that the fact that the defendant is a corporation does not prevent the Act applying.

The persons named in the Act are "Merchant, tradesman, artificer, mechanic, workman, laborer, or other person whatsoever."

It is not open on the decisions in our own courts for the plaintiff to contend that the words "or other persons whatsoever" are not to be construed to refer to persons ejusdem generis. Therefore we have to see if a person running street cars is one named by the statute or ejusdem generis with such person. This question also is, as it seems to me, practically concluded by authority.

In Sandiman v. Breach, 7 B. & C., 96, it was held by the court, the judgment being delivered by Lord Tenterden, C. J., that the words "or other person or persons whatsoever" in the 29 Car., 2, c. 7, s. 1, were not used in a sense large enough to include the owner or driver of a stage coach; that section provided "that no tradesman, artificer, workman, laborer or other person whatsoever shall do or exercise any worldly labor, business or work of their ordinary callings on the Lord's Day," etc. In Reg. v. Budway (supra), it was held by the full court (Q.B.D.) that a cab driver did not come within the words of chap. 203, and in Reg. v. Somers (supra) the same court followed its decision in Reg. v. Budway.

In the latter case the fact stated was that "The defendant was a servant of one Charles Brown, a keeper of a livery stable in the city of Toronto, and on the day in question drove a cab belonging to Brown through the streets of the city for hire." Mr. Moss urged that the two latter decisions should be confined to the facts then before the court, and did not apply to a case of a cab driver who was both owner and driver. It seems to me there is in principle no distinction between the driver who is the owner and the driver who is the servant of the owner that would apply in favor of the servant, indeed it might be contended that a servant who was the owner would more readily come within the description "workman or laborer" than would the owner who was also the driver, and in Sandiman v. Breach, as we have seen, Lord Tenterden draws no such distinction, but uses the words "owner or driver." Then if an owner or driver of a stage coach or an owner or driver of a cab is not within the Act, is one who is an owner or driver of a street car, whether such car is by horses, steam, electricity or other motive power? I am unable to see any distinction between such persons. I think there is none; and, following the above decisions, which are binding upon me, I must hold that the defendant company is not within the Act and so not prohibited from running its cars on Sunday.

But, assuming that the act does apply, then has it been shown that the company was or was not "conveying travelers"?

The exception is in the following words. "Conveying travelers or Her Majesty's mail by land or water, selling drugs or medicines and other works of necessity, and works of charity only excepted."

In Reg. v. Daggett, 1 O. R., 537, the full court (Q. B. D.) composed of Hagarty, C. J., and Armour and Cameron, J. J., held that excursionists leaving Buffalo in the State of New York on a Sunday morning and proceeding by rail to Niagara, thence by defendant's steamboat to Toronto, and back the same day, were travelers within the exception, and that there is no distinction in such a case between travelers for

pleasure and for business. The decisions under the 29th Car., 2, c. 7. were collected and referred to and accepted as defining the term "travelers" as used in our statue.

There the learned Chief Justice said: "It matters nothing in my judgment whether they travel wholly for pleasure, fresh air, relaxation from work, or with or without luggage, or actually on important business. They are travelers within the meaning of the statute. To draw any distinction between persons according to the purpose which induced them to travel would, as it seems to me, be a vain attempt, leading to impossible and irritating inquiries and tending to bring a useful and salutary enactment into contempt."

No affect was given to the argument of counsel that "conveying travelers" to be within the exception must be a work of necessity, the court evidently holding otherwise.

Among the cases referred to decided in England under the 29th Car., 2, was Peplow v. Richardson, L.R., 4 C.P., 168, where it was held that a man who walked two and a half miles from his residence to drink mineral water at spa was a traveler, and in Taylor v. Humphries, 10 C.B., N.S., 429, Erie, C.J., held that persons who had walked four miles on business or pleasure might be lawfully supplied with refreshment as travelers.

Mr. Moss endeavored to distinguish these cases on the ground that the persons had walked to a distance out of the town where they resided, but I find no distinction suggested, and it seems to me to be fanciful and not entitled to prevail. It is also manifest that the distance passed over does not determine whether one is a traveler or not.

In Reg. v. Daggett; Reg. v. Tinning, 11 U.C.R., 636, was referred to and not followed. It was declared to be not in accordance with the subsequent decisions.

In Reg. v. Tinning the court held "that persons making it their ordinary business to ply within the harbors of a town not for any purpose of carrying travelers or the mail were intended to be restrained by the Act," adding, "We think it clear that the persons carried on a Sunday between the city (Toronto) and the peninsula cannot be called travelers within the meaning of the exception. They are persons notoriously seeking mere recreation."

I must follow Reg. v. Daggett in preference to Reg. v. Tinning, leaving an appellate tribunal to say that the later decision is wrong, if it is so, for it—Reg. v. Daggett—is founded upon decisions subsequent to Reg. v. Tinning, and has remained unquestioned since it was decided in 1882.

Both decisions are of the same court, differently constituted, and the later decision is, as I think, a declaration that the former is not good law, and is a declaration of the law which binds me sitting as a judge of first instance.

It is pointed out that the Legislature by the 48 Vic., c. 44, ss 3-7 (now s 7, R.S. O., c. 203), had declared excursionists not to be travelers, but it will be observed that such section applies only to persons going and returning on the same day, by the same steamboat or railway or any other owned by the same persons or company such steamboat or railway having for the only or principal object the carriage of Sunday passengers for amusement or pleasure only, *and does not apply to persons* carried one way only or going and returning on different days. So the construction put upon the word "travelers" by the court in Reg. v. Daggett stands with the above exception.

It is instructive to note the care the Legislature exercised in declaring the limitations to such extension of the Act.

I find as a fact the defendant company has not been shown to have run its cars having for the principal or only object the carriage of Sunday passengers for amusement or pleasure only, and there is no evidence before me on which I could find that the company carried what might be called Sunday excursionists.

I find as a fact that the cars of the defendant company were shown to have been run on Sunday as on other days, only less frequently, for the carriage of travelers at the usual rate of fare, and, although it may be that persons who were not travelers were carried, such fact was not shown. It having been decided that to go two and a half miles to drink mineral waters: to walk out for fresh air, or pleasure, say three or four miles; to go upon an excursion from Buffalo to Toronto and return; or to go over to the peninsula, (now Island) opposite Toronto for recreation, constituted the person so journeying a traveler, I must either ignore the effect of such decisions or hold that at least certain persons carried by the defendant company were travelers within the meaning of the Act, e.g., persons who, coming into the city by the ordinary railway trains, desired to reach their respective destinations in the city; persons going to and returning from church; persons going to places of rest or recreation; and the like.

It follows, from the view I have taken of the decision referred to, that the company had a right to run its cars for the purpose of "conveying travelers," and, so running, the cars would create all the noise and disturbance that they are alleged to create, to the annoyance of some of the persons who gave evidence at the trial, without regard to whether they did or did not carry persons who were not travelers, and so I cannot find that, by carrying persons who were not travelers, they have created or continued a nuisance, therefore, there is no ground on which the court can interfere.

For the information of the court, if this case is carried farther, and it shall become necessary to find any facts upon the evidence found by me, I desire to say that, as far as I could judge, the several witnesses at the trial were apparently honest in their endeavor to tell the truth. Their opinions as to the running of the cars on Sunday being an annoyance seemed to be affected *by their views as to whether it was morally* right or wrong so to run them, and such views were again influenced to some extent by the fact that the running of the cars on Sunday was or was not to them or the churches or congregations to which they belonged a benefit, advantage, or convenience.

I was referred by Mr. Martin to ch. 99 of the 55 Vic. (O.), incorporating the Toronto Railway Company, and confirming the agreement therein set out. By clause 1 of the Act the company is permitted to run its cars on Sunday, when agreed to by the citizens, provided that so doing it is not a contravention of the Lord's Day Act. This probably shows that the Legislature had formed no opinion that the Lord's Day Act did clearly prohibit the running of cars on Sunday.

I was referred to the case of The Attorney-General v. Niagara Falls Tramway Co., 19 O.R., 624, and 18 A.R., 453, but that case did not turn upon any question under chap. 203, above considered.

On the whole, I am of the opinion that the plaintiff's case fails, and the action must be dismissed with costs."

THE STEAM ENGINE INDICATOR AND ITS USES.

By Wm. Thomson, Chief Engineer Montreal West Water & Light Station.

YEAR after year the beneficial results to be derived from this wonderful little instrument become more widely known throughout the engineering profession, and the study of indicator diagrams is now easy as compared with a few years ago, owing to the completeness and simplicity of the data at hand. But all engineers are unfortunately not in a position to either acquire a theoretical or practical acquaintance with the indicator, and to these I more especially desire to address myself. In these days *of progressive modern engineering* nearly every plant of any importance is provided with either one or more indicators for the use of its engineers. Owners of small plants, however, very rarely consider this instrument a necessity, as they rarely understand the purpose for which it is intended. The engineers in charge of these plants have therefore very little chance to become acquainted with the use of the indicator practically unless they put their hands in their pockets and purchase one for themselves, a course I strongly advise even though you may have to reduce your spending money for some time and go "hard up" for months. You will derive such knowledge from the use and study of this instrument, that no matter how thoroughly practical you may be, you will be so fully repaid that the outlay will never be regretted. An engineer aspiring to perfect himself in his profession loves to study the theoretical basis of his profession and to acquire such intimate knowledge that every move of his engine is thoroughly understood, and becomes to him at least a thing of pride and joy, always scrupulously clean and running as smoothly as care and knowledge can make it, satisfying to both engineer and employer. To an engineer of this type (and I know many of them) I say buy yourself an indicator rather than a watch to show you when it becomes time to quit work for the day. If an engineer of the opposite type, an indicator will not be of much use, as it will almost surely soon get as badly out of twist as the engine you so often claim is of no earthly use except for scrap iron. To practical men studying their own and their employer's interests the indicator becomes almost a necessity.

Some of the leading and most valuable items to be obtained by the use of the indicator are:

(1) The arrangement of the valves for admission cut-off, release and compression of the steam.

(2) The adequacy of the ports and passages for admission and exhaust, and, when applied to the steam chest, the adequacy of the steam pipes.

(3) The suitableness of the valve motion in point of rapidity at the right time.

(4) The quantity of power developed in the cylinder and the quantity lost in various ways, viz., by wire drawing, by back pressure, by premature release, by poor adjustment of valves, by leakage, etc.

Taken in combination with measurement of feed water and the condensation and measurement of the exhaust steam with the amount of fuel used, the indicator furnishes many other items of valuable information obtainable from no other source when the economical generation and use of steam are considered. The latter question is annually becoming of greater importance, not only to proprietors, but to the engineer. I do not for a moment claim that because your valves were set without the aid of an indicator that they are sure to be wrong, but I do say that with the intelligent use of an indicator you can readily ascertain if they are exactly right, and you can ascertain just how much power you are using and just how much is useful and how much is frictional; in other words, you have at all times the means to ascertain what you are doing and how you are doing it.

I have heard men boast time and again that they could set the most complicated valve systems without the aid of an indicator, and I have had the pleasure of indicating some of these engines and invariably found a great improvement could easily be effected, simply because the means were at hand to ascertain if any errors existed, and not because of any want of ability on the part of the engineer.

Having decided to own an indicator, the purchase of the instrument becomes a question requiring careful consideration. In the first place, indicators can be had at almost any price, but the nature of the work required on a good reliable instrument is so minute that only the very best work and materials must be employed, that you will find it to your advantage to deal with a maker having a reliable reputation for good goods rather than purchasing a poor instrument at a cheaper price. Any instrument can be made to work, but not all the instruments sold will do good work. You might as well expect to secure a really reliable engineer at half wages as to buy a good and reliable instrument at half what it is worth. The nature and style of work you have to do will very largely determine the style of instrument to purchase; for instance, you can use an instrument of much heavier make on a slow running engine than on an engine running at high speed and changing direction of paper drum travel more rapidly. Modern constructed indicators are now arranged bearing particularly on high speeds, and it is generally advisable to purchase an instrument designed for high speeds, which will be quite as useful on the average slow speed engine.

The importance of the indicator is now so generally recognized by all engine builders that nearly all first-class engines are sent from the shops with the cylinders already drilled for application. When, however, no provision has been made for the application of the indicator, holes must be drilled and tapped for not less than ½ inch pipe in such position on the cylinder that when the piston is at the ends of its travel they will be as nearly as possible in the center of the clearance space, and yet not be obstructed by the piston when at its extremes of travel. In drilling great care must be taken not to allow any chips to get into the cylinder; and when the cylinder heads cannot be removed it is best to turn on a little steam as the drill begins to enter, so as to blow all cuttings out. If you find clearance is too small to allow connection as above, the tap may be made directly into the head (which it is desirable to avoid if at all possible) to bring the indicator into a convenient position, the object being to have the indicator connected as directly as possible to the cylinder, and in all cases where the circumstances will permit screw the indicator cock into the cylinder itself. Where the tap is on the side of the cylinder, by use of nipples and elbows the indicator can be brought into a vertical position the same as if tapped on top of cylinder. When the arrangement is to be permanent, it is advisable to have a cock for each end of the cylinder. Where you are using only one instrument, the best method being to connect by means of side pipes and a 3 way cock arranged exactly in center of cylinder. The slight disadvantage arising from this indirect connection is more than counterbalanced by the facility with which diagrams can be taken without disturbing the paper drum, and by the fact that diagrams can be taken from both ends of the cylinder on the same card, making them very useful for comparison. Do not, if possible, to avoid this, use angle valves on the ends of pipe instead

of elbows with a T in the centre to attach indicator to, as is sometimes done, or the diagrams are liable to present an appearance similar to insufficient lead and "wire drawn" admission.

After cylinder is ready for application of indicator, the next step is to prepare a suitable reducing motion to get the required length of diagram on the paper drum. This is sometimes difficult to do, particularly when high rates of speed are used. There are certain important points to observe, the chief requisite that the device used shall give to the paper drum a motion which will exactly coincide with position of piston in minature at any part of stroke. The most reliable and useful device I have had the pleasure of using for this purpose is the recent invention of a well known Canadian engineer, Capt. James Wright, of Montreal, and illustrated in the ELECTRICAL NEWS of April 1895. As my readers can easily get a full description of this device by referring to their back numbers, I need not here describe it.

In setting this reducer upon an engine permanently, it is well to commence mechanically and as near correct as possible. Lay out reducing motion so that when piston is in center of travel, vertical lever of reducer is exactly at right angles with piston rod and as near center of cross-head as circumstances and nature of construction of engine will permit. It is also important that sliding bar of reducer should at all times travel parallel with cross head of engine. With ordinary care in setting up this reducer can be made to appear a portion of the engine and will actuate the revolving drum of indicator practically correct at almost any rate of speed, and paper drum can be attached or detached at will of operator without any difficulty.

To take a diagram, screw the indicator to 3 way cock already placed in center of cylinder, and connect with sliding guide on reducing motion by means of cord having as little stretch as possible. If distance from indicator to paper drum is very great, it is better to use a piece of flexible wire for this purpose. Both wire and cord must be provided with a hook and loop, so that cord can be detached at will with engine in motion. Adjust sliding bar of reducer to required length of diagram by means of movable fulcrum pin in frame. For slow speeds the best and most desirable diagram is from 3½ to 4 inches in length, but with high speeds for accuracy diagrams should not be more than about 3 inches. If spring on paper drum is properly set the length of card can be adjusted to a nicety, and an effort should always be made to have length as free from fractions as possible to simplify and assist after calculations of diagrams.

To attach a card to paper drum is a simple matter, but I should strongly advise the use of metallic faced paper to allow use of a metallic point on end of pencil lever, which must be firmly and securely fastened to prevent any possible vibration through shaking or moving of pencil, also the friction should be as light as possible and a very fine line drawn with merest touch of point on paper.

In selecting a spring always use one that will give you a diagram about 2 inches high, that is with a 80 lb. boiler pressure use a 40 spring. Each indicator usually has from 3 to 5 springs accompanying it. Before allowing steam to enter indicator remove piston from indicator cylinder and blow steam through from both ends of engine cylinder. Carefully oil indicator piston with best cylinder oil, and all other moving parts with specially prepared watch oil. An indicator piston should drop into cylinder of its own weight freely and easily, when both ends are open to the atmosphere. Screw down milled nut on indicator firmly and adjust screw to regulate pressure of pencil, keeping pressure as light as possible, and be careful to have paper securely and smoothly placed on revolving drum.

Before allowing full pressure steam to enter indicator allow steam to escape on relief valve at side of 3 way cock until steam becomes dry and clean. Allow indicator piston to work under full pressure for a few revolutions, until it becomes hot, then with both ends of piston open to atmosphere, draw the atmospheric line by applying pencil to paper while moving with reducing motion. Turn on steam under full pressure and apply pencil to paper during one or more revolutions of engine from each end of cylinder. If reducing motion and paper drum spring are properly adjusted, length of a double card should measure in length exactly the same as the length of the atmospherical line previously drawn.

After a sufficient number of diagrams have been taken, remove the piston, etc., from the indicator, while it is still upon the engine, allow steam to blow for a moment through the indicator cylinder, and see that piston, spring and all movable parts are thoroughly wiped, cleaned and oiled. Pay particular attention to the springs, as their accuracy will be seriously impaired if they are allowed to rust, and great care must be taken that no grit or foreign substance be introduced, to cut the cylinder or scratch the piston; remember you are handling a delicate and sensitive instrument, and act accordingly. The heat of the steam blown through the cylinder of the indicator will be found to have dried it perfectly, and the instrument may be put together with the assurance that it is ready for instant and immediate use when required.

The various lines drawn by the indicator on the diagram are named as follows and can be readily recognized after a little practice:

THE ATMOSPHERIC LINE is a line drawn by the pencil of the indicator when the connections with the engines are closed and both sides of the piston are open to the atmosphere. This line represents on the card the pressure of the atmosphere or zero gauge pressure.

THE VACUUM LINE is a reference line drawn about 14.7 pounds by scale below the atmospheric line and represents a perfect vacuum or line of no pressure.

THE CLEARANCE LINE is another reference line drawn at a distance from the end of the diagram, and at right angles with a line here, equal to the same per cent. of its length as the clearance is of the piston displacement. The distance between the clearance line and the end of the diagram represents the volume of the clearance and waste room of the ports and passages at the end of the cylinder.

THE LINE OF BOILER PRESSURE is a reference line drawn by hand parallel to the atmospheric line and at a distance from it by scale equal to the boiler pressure shown by the gauge. The difference in pounds pressure between it and the steam line shows the loss of pressure due to steam pipe and the ports and passages on the engine.

THE ADMISSION LINE shows the rise of pressure due to the admission of steam to the cylinder by opening the steam valve. If the steam is admitted quickly when the engine is about on the dead centre this line will be practically vertical and at right angles to the atmosphere.

THE STEAM LINE is drawn when the valve is open and steam being admitted to the cylinder. In automatic cut-off engines with sufficient port area this line will be practically parallel with atmospheric pressure.

THE POINT OF CUT-OFF is the point where the admission of steam is stopped by closing the valve. Sometimes there is a little difficulty in determining just exactly where this takes place. It is usually, however, located where the outline of the diagram changes from convex to concave.

THE EXPANSION CURVE shows the fall in pressure as the steam in the cylinder expands doing work.

THE POINT OF RELEASE shows when the exhaust valve opens.

THE EXHAUST LINE represents the change in pressure that takes place when the exhaust valve opens.

THE BACK PRESSURE LINE shows the pressure against which the piston acts during its return stroke. On diagrams taken from a non-condensing engine it is either co-incident with or above the atmospheric line. On diagrams taken from a condensing engine it is found below the atmospheric line and at a distance greater or less, according to the vacuum obtained in the cylinder.

THE POINT OF EXHAUST CLOSURE is the point where the exhaust valve closes.

THE COMPRESSION CURVE shows the rise in pressure due to the compression of the steam remaining in the cylinder after the exhaust valve has closed.

THE MEAN EFFECTIVE PRESSURE (M. E. P.) is the mean net pressure pushing the piston forward.

THE INITIAL PRESSURE (I. P.) is the pressure acting on the piston at the beginning of the stroke.

THE TERMINAL PRESSURE is the pressure above the line of perfect vacuum that would exist at the end of the stroke if the steam had not been released earlier. It is found by continuing the expansion curve to the end of the diagram. This pressure is measured from the line of perfect vacuum, hence it is the absolute terminal pressure.

It is not my intention to use diagrams, I therefore will not attempt to describe how the various calculations can be arrived at by gathering particulars from diagrams. Any engineer with a little experience in handling indicators, will be able to analyse his own diagram, if not, I am quite sure the editor of this esteemed journal will be only too glad to reproduce them, together with any questions, in his paper to allow other engineers a chance to analyse and discuss them.

The most important formulae required is that to find the horse power generated from a diagram, and this is the only one I shall take the liberty to deal with. You first require to find from the diagram the mean effective pressure on the engine piston throughout the stroke, this is easiest arrived at by the use of a small instrument called the planimeter, which with careful manipulation will give the area of the diagram within the hundredth part of an inch. When area of diagram becomes known divide by length of diagram, the result will be the mean average height of the diagram; multiply this by scale of spring used and you have the M. E. P. throughout the stroke. There are, however, several methods of finding the M. E. P. without the aid of a planimeter, one of the most convenient being as follows: Draw on the diagram ten or any other convenient number of lines at right angles to the atmospheric line and at equal distances apart. Measure the length of each ordinate within the lines of the diagram and divide the sum total of their lengths by the number of ordinates used. Multiply average length thus found as before and you have the same result.

To calculate the h. p. of an engine, multiply the mean net area of the piston in square inches, (Diameter squared × .7854 = area minus area of piston rod = mean net area) by the M. E. P. previously found in pounds per square inch acting on the piston throughout the stroke (area piston × M. E. P.) Multiply this product by the distance through which the piston travels in inches per minute. (Stroke in inches × rev. per minute × 2 strokes per revolution), this will give you the number of inch pounds exerted by the engine. Divide this by 12 to reduce to foot pounds, and as an H. P. is understood to equal 33,000 pounds raised 1 foot high in one minute, by dividing total foot pounds by 33,000 you get total h. p. generated by engine in accordance with following formula:—

$$\frac{\text{Mean net area of piston} \times \text{M. E. P.} \times \text{rev. per min.} \times 2 \times \text{stroke in inches}}{12 \times 33000} = \text{I. H. P.}$$

Mr. E. E. Cary, who has been engaged in the manufacture of incandescent lamps in the United States for the past ten years, has accepted the position of general manager of the Packard Electric Co., Ltd., of St. Catharines, Ont. Mr. Cary expects shortly to call upon and make the acquaintance of the many users of the Packard lamp and transformer throughout the Dominion.

CORRESPONDENCE

BOILER EXPLOSIONS AND THEIR CAUSES.

Editor CANADIAN ELECTRICAL NEWS.

SIR, - Your theory of the Detroit boiler explosion is correct and the only commonsense one, to wit, that the safety valve, even if operative and open, was too small to give passage to vapor forming with such rapidity as to increase its pressure from 15 lbs. to 100 lbs. in four minutes, and from 50 lbs. to 100 lbs. in one minute. Until Parliament intervenes to have safety valves made larger, explosions will continue to occur and fatalities to follow.

C. BAILLAIRGE,
City Engineer, Quebec.

THE C. A. S. E. AS A SECRET ORDER.

Editor CANADIAN ELECTRICAL NEWS.

SIR,—I notice in your last issue an editorial the first three lines of which contained the following: "It seems unfortunate that the Association of Stationary Engineers should have been organized upon the basis of a fraternal order."

Since becoming a member of the above order I have been enabled through its aid to master numerous problems pertaining to the calling, but after carefully reading your article and trying to formulate a plan by which any body of men could so hold together without either sign or password, I was obliged to give it up.

If we admit that some secrecy is necessary, we must also admit that no Association could be organized with less than the C. A. S. E. You say you do not object to such societies or lodge room methods, but the cumbersome machinery of a secret society is unnecessary where there is nothing to conceal.

Mr. Editor, you must have got into the room where we keep the goat, as he is the only cumbersome piece of machinery we have, and the fact that you have taken the 4th degree and not the first three, may be responsible for the statement you made that our initiations are not always impressive.

I will impart to you some of the secrets in the following statement. Our initiation (including all the degrees) occupies about ten minutes. Engineers being a good thing, and consequently scarce, is responsible for the very few initiations during the year, say ten at most; this is about one hour and a half spent in twelve months, and I venture this remark, Sir, that the time spent by you in copying and printing the above article occupied more time, is no more legitimate, nor beneficial than the initiations, etc., of the C. A. S. E.

In conclusion I will say that as the paraphernalia of the order consists only of a tin cent brass plated button, I will not mention it. However, if it should prove unsightly to any one I will bore holes in it and utilize it instead of wire nails to keep the bottoms of my blue bloomers from sweeping the dusty surface of my boiler room.

Toronto, Dec. 12th, 1895. J. G. BAIS.

BY THE WAY.

MR. A. W. CONGDON, now engaged in the engineering department of the Canadian General Electric Company at Toronto, was one of the pioneers in the introduction of electricity for lighting purposes in Japan. In 1889 the Edison Company, of New York, in whose employ Mr. Congdon then was, received an order from Japan for a 100 light electric plant. Partly owing to the improbability of being able to secure the services of any one competent to install the plant, and partly, no doubt, with the object of making known their goods in an entirely new field, the possibilities of which it was impossible to judge, the company decided to send Mr. Congdon and another of their employees to Japan with the electrical apparatus and the necessary steam plant to operate the same.

This was the second electric plant installed in the country, the first one having previously been put in by the Brush Company. The intention was that Mr. Congdon and his companion should remain about six months, or long enough to install the plant and get it into proper working order, and be enabled to estimate the possibilities of the field for future business. As a matter of fact, the two Americans remained in Japan for a period of nearly three years. After completing the work which they were specially sent out to do they received an order to install an arc and incandescent system for the Emperor, whose palace is now lighted with incandescent lamps, and the grounds surrounding it with arc lights.

Mr. Congdon states that, owing to the prejudice which prevails against foreigners, all business in Japan has to be done through native companies. Such companies now exist in Tokio and several of the other large cities, and it is estimated that there are at present in operation throughout the empire about 16,000 lights.

Public lighting is done by these companies under contract with the municipality and with private consumers in the same manner as in this country. Much of the current to private consumers is supplied through meters, an additional charge being paid by the customer for the use of the meter. Lighting plants are also being put in to some extent by manufacturing companies. For one cotton mill company Mr. Congdon installed a 500 light plant, which has since been increased to 1000 lights.

On account of the low standard of illumination, as compared with Europe and America, the progress of electricity for lighting has necessarily been slow. The people of Japan cannot be expected to jump from fish oil to incandescent electric light at a bound. A few years ago fish oil was the almost universal illuminant in that country. Within a comparatively recent date kerosene oil has been introduced, and is now being imported in immense quantities. As the standard of illumination rises, the increased use of electricity must necessarily follow.

Referring again to the prejudice which exists against foreigners, it is only within recent years that Japan has tolerated in any degree the people of western countries. Now, however, she is seeking to learn from and profit by the more progressive western civilization, and Japanese students are now to be found in the military, naval and scientific schools of Europe and America. I learn from Mr. Congdon that in cases where it is obligatory upon the Japanese to employ a foreigner, their policy is to pump all the information possible out of him, and when the supply is exhausted, replace him by a native whose services can be had at a comparatively trifling cost. The average wage for unskilled labor is 15 cents per day, and skilled workmen, such as carpenters, receive but 50 cents. A Jap, says Mr. Congdon, can live comfortably on 10 cents a day. On account of the antipathy to foreigners of certain classes of the people, it is the rule for a foreign judge to sit with the native judge in every legal case in which the interests of a foreigner are at stake. These foreign judges are appointed at the instance of the governments of countries such as Germany, Great Britain and the United States, which have treaties with Japan. Japan is most desirous that these treaties with the European nations, some of which are about to lapse, should be renewed; consequently when it was demanded of her that she should appoint foreign judges and pay them handsome salaries, she consented to do so without a murmur. Notwithstanding that the United States are the largest buyers of Japanese goods, Japan purchases more largely from England and Germany, always having in view no doubt the renewal of the treaties with these nations.

CENTRAL STATION BOOK-KEEPING.

By Geo. White-Fraser, E. E.

The keeping of an exact system of accounts is an absolute necessity in any kind of business, if it is to be intelligently followed as a means of livelihood, and not as a mere means of passing the time. The light thrown on the working of a business, the comprehension of its details, in fact its science, depends, one might say principally, on the minuteness and accuracy of the records kept; and without any records at all such a business can only be a formless chaos drifting about aimlessly the sport of fortune, the plaything of chance. Business may properly be called a science; a particular business is a branch of science. Science has been called the record of exact observation, and it certainly is true that every branch of knowledge of to-day is simply based on the accumulation of observations made during past ages, and without observation there could be no knowledge. Observation is the "book-keeping" of science; experience is merely the tabulations and deductions of the mental book-keeping process gone through by every intelligent person, and it will be evident that book-keeping of some kind or other, whether simple or complex, conscious or unconscious, lies at the root of all intelligence, order, knowledge and progress. The very term "accounting" implies order; if there were no records there could be no knowledge, and it seems unnecessary to point out that without knowledge progress is an attractive vision, an unattainable ideal.

Electricity is as much as any other a science in which observation is peculiarly rich in results, and likely to greatly benefit the observer. Its various workings are by no means reduced to exact knowledge yet, and as its practical applications to the uses and requirements of every day life are innumerable, it behooves every person interested in electricity as a business to keep records, as much for his own guidance as for the advancement of the science. That application which is of most practical interest to the readers of this journal is, of course, to the requirements of public and domestic lighting, and to the supply of power, both for stationary purposes and for the purposes of locomotion; and as the methods of the generation, transmission and utilization of current for the above purposes have been long and scientifically studied, and as a matter of fact have been reduced to their lowest terms (i. e., cost), it is proposed to indicate first, what those lowest terms are; next, how to attain to them. Putting it differently, it is proposed to show for how little, under favorable circumstances, current may be generated and light or power produced; and next, what method of central station bookkeeping will most clearly show how much it costs any individual station to produce current, and therefore, how much improvement can be introduced into the operations; what economies can be made, and what extra income earned. It is quite plain that unless you know what you are doing now, and how you are doing it, it is not possible for you to see your way to doing better. And if you can do better, you might as well do it. Whereas if you are doing as well as possible under the circumstances, it is well for you to know it and to keep up that high standard.

The successful carrying out of an electric light and power business involves the proper and efficient operation of so many different classes of machinery and apparatus, the maintenance of so many parts subject to wear and tear, and the minimizing of so many possible sources of waste, that some amount of careful and systematic accounting is absolutely necessary, and the more complete and comprehensive the system of records the more efficiently will the whole plant be kept. This becomes evident when it is remembered that not even the very highest class of machinery—steam or electric—is anything like perfect, and that in order to get out of it all that it is capable of doing, constant care and watchfulness are necessary. This imperfection and inefficiency is found in every piece of apparatus composing a central station plant. Of the coal you buy by the carload, some will be wasted by going to dust; a very large proportion of the heat contained in it will go up the chimney without doing any good under the boiler; more will be radiated from steam pipes and cylinders; some condensation of steam in pipes will waste heat; valves may get out of adjustment and allow more steam to be used than is absolutely required for the work to be done; belts will slip; shafting will absorb power; the best dynamo ever made will only give back about 95 per cent. of the power given to its pulley at full load; lines, leaks, transformers, lamps and consumers will all waste current, and they cannot help wasting some; but the amount thus lost may easily be kept within reasonable limits, if you only know who or what is wasting too much, and in what particular way. It does not seem to be properly recognized by a large number of those in charge of the smaller electric lighting stations, that all machinery and apparatus is necessarily more or less inefficient. A transformer on a pole, that certainly has every appearance of being sound and strong; not grounded anywhere; properly insulated and mechanically perfect in every way, still wastes current. If you don't believe it, take some transformers, connect up their primary circuits to the 1,000 volt mains, and leave their secondary circuits open. You will say "there's no load and therefore no current will flow on the primaries." Try. Start up the alternator and a sufficiently sensitive ammeter on the primary will show a current which will be larger as more transformers are put in circuit, and which you cannot stop, simply for the reason that a small leak is perfectly inevitable and inherent in the design of a transformer. This is an inefficiency, and you want to make it as small as possible. You must also thoroughly realize that every machine or piece of apparatus in your power house is more or less inefficient, and that only by watching can you make the effects as small as possible. Bookkeeping is necessary not only to show you how much you are making or losing, but to show you where you are losing; where you are not doing so well as you might; what particular piece of apparatus is of poor quality; what particular class of business is worth working up; and until a system of records is kept, not only of wages, coal, and gross receipts, but of wear and tear, leaks, lamp renewals, etc., no electric lighting business can possibly be intelligently managed. It may possibly be thought that the writer is very unnecessarily prolix as to the desirability of accounting, but in his experience the great majority of smaller central stations not only keep hardly any accounts at all, but are not aware of the directions in which improvements are possible, nor of the facts referred to above as to the inherent imperfections of all apparatus. It is therefore thought advisable to divide the general subject into parts, showing the various headings under which special accounts should be divided, for steam plant, electric plant, lines, lamps, consumers, etc., and

to explain the necessity for the various headings, by reference to the inefficiencies and possible wastes which they are designed to keep track of and to check. Having once indicated the general system, then individual station managers will no doubt be able to extend it in such directions as seem to them fit.

First then, the business of a central station is to manufacture electricity and to sell light and power. Fuel the raw material—must be got and by means of appropriate machinery turned into electric current. This must be conveyed somehow to the consumers' premises and turned into light, but between the coal-pile and the lamp there is much greater complexity than the above bald description might lead one to suppose. The most obvious and simple accounting will be to keep the amount of coal bought, and to set it against the money received for rental of lights, and everyone does this. This gives blind results, and shows whether the business is losing or gaining, but nothing more, and it is necessary to pry more closely into intermediate stages.

The first stage is the process of conversion of the heat in the fuel into motion. We burn fuel to raise steam for use in the engine. The distinct steps are (a) the combustion of the fuel; (b) the communication of heat to the water in the boiler; (c) the carrying of the steam from the boiler to the engine; (d) the utilization of the steam by direct pressure, and by expansion in the engine, and (f) the getting out of the steam after it has done its work. Each step is important and should be attended to in order to get as much return as possible, viz., to minimize waste and loss. It takes a certain amount of heat to raise steam of a required pressure from a known quantity of water of a given temperature. Therefore there is a direct connection between the amount of fuel burned and the amount of water evaporated. An accurate record of the amount of fuel burned, and of the feed water used—with the average temperature of the feed water—will therefore give a very good idea as to whether there is a reasonable proportion between them. In fact it will show what use is being made of the fuel. This will lead to an investigation into the causes of any observed discrepancy, and then it becomes a question whether the coal is poor in quality, whether the method of firing is good, or whether there be any other cause. A record not only of the amount of coal burned, but of the ashes left over, will show the amount of actual combustible material in the coal, and these give an idea of the real money value of the fuel, and a still further accurate record of the chimney temperature and of the chemical analysis of the escaping chimney gases, will very clearly show whether available heat is going up the chimney unconsumed. It is of course only the very large stations that can keep these two last records.

There are two more very important records that are very easily kept, and which may show the way to very appreciable savings in the boiler room. These are the temperatures of the feed water after it has passed through the heater and a continuous diagram shewing steam pressure from start to finish. If the temperature of feed water can be raised at all without the direct expenditure of fuel, it means that a proportionately less amount of fuel will have to be burnt under the boiler. Taking this temperature both before and after the feed has been passed through the heater, will show how much it has been raised and consequently whether it may be possible to raise it still more. Continuous record of steam guage, will show whether the firing has been such as to maintain it regular, or whether it has varied above and below the proper point. Every time it has dropped low, the manager may be perfectly certain that it has been raised by putting on coal and opening the draft, and by the consequent wasteful escape of gases up the chimney before being consumed, and a too high pressure means also wasteful firing. Boilers are subject to wear and tear, their grates can be burnt; their flues stopped up with soot; and their steaming abilites impaired by the formation of scale and the deposition of mud. It is important to know how long the grates will go without requiring to be replaced; how long the boiler may be run without requiring washing, etc., and records must be kept showing any repairs; when flues were cleaned; when boiler was scaled, with quality of scale, and the amount of compound used, with its effect on the scale. If grates go very rapidly it means either very poor firing, or very poor grates. Want of cleaning may be the reason of excessive consumption of fuel; dirt in the flues indicates that the coal has not been completely burnt in the furnace and therefore that the fireman has not been properly attending to his work. The boiler room day book may therefore take the form indicated below, those stations having a large equipment will report particular boiler by numbers. It is usual to combine the whole station report into one sheet, this can of course easily be done:

FORM FOR BOILER ROOM DAY BOOK.

											Date.				
No. of Boiler.	When started.	When stopped.	Fuel used.	Weight of ashes.	Temperature of feed before heating.	Temperature of feed after heating.	Amount of feed water used.	Flues cleaned.	Boiler cleaned.	Compound used.	Remarks as to condition of boiler, flues, grates, etc.	Repairs.	Name of Fireman.	Came on.	Went off.

The record of the steam pressure should accompany the above report and be filed with it.

Here we have the means of observing the whole working of the steam generating department, which is very simple, easy to keep, easy to work up, and likely to be of the greatest value. It is known how much fuel has been bought; how much has been consumed; how much refuse there has been; how much water has been turned into steam. With the records to be described for engine and dynamos, etc., there will thus be a complete and detailed story told every morning to the manager, as to how he is getting on, and what condition his business is in.

(To Be Continued)

CANADIAN ELECTRICAL NEWS AND STEAM ENGINEERING JOURNAL

PUBLISHED ON THE FIFTH 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 2209.

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 should be remitted by currency, registered letter, or postal order payable to C. H. Mortimer. Please do not send cheques on local banks unless 5 cents is added for cost of discount. Money sent in unregistered letters will be at senders' risk. Subscriptions from foreign countries embraced in the General Postal Union $1.50 per annum. Subscriptions are payable in advance. The paper will be discontinued at expiration of term paid for if so stipulated by the subscriber, but where no such 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 paper promptly and regularly.

EDITOR'S ANNOUNCEMENTS.

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

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

CANADIAN ELECTRICAL ASSOCIATION.

OFFICERS:

PRESIDENT:
A. B. SMITH, Superintendent G. N. W. Telegraph Co., Toronto.

1ST VICE-PRESIDENT:
C. BERKELEY POWELL, Director Ottawa Electric Light Co., Ottawa.

2ND VICE-PRESIDENT:
L. B. McFARLANE, Manager Eastern Department, Bell Telephone Company, Montreal.

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

EXECUTIVE COMMITTEE:
GEO. BLACK, G. N. W. Telegraph Co., Hamilton.
J. A. KAMMERER, General Agent, Royal Electric Co., Toronto.
E. C. BREITHAUPT, Berlin, Ont.
F. H. BADGER, JR., Superintendent Montmorency Electric Light & Power Co., Quebec.
JOHN CARROLL, Sec.-Treas. Eugene F. Phillips Electrical Works, Montreal.
K. J. DUNSTAN, Local Manager Bell Telephone Company, Toronto.
O. HIGMAN, Inland Revenue Department, Ottawa.
W. Y. SOPER, Vice-President Ottawa Electric Railway Company, Ottawa.
A. M. WICKENS, Electrician Parliament Buildings, Toronto.
J. J. WRIGHT, Manager Toronto Electric Light Company.

MONTREAL ELECTRIC CLUB.

OFFICERS:

President, W. B. SHAW,	Montreal Electric Co.
Vice-President, H. O. EDWARDS,	Montreal.
Sec'y-Treas., CECIL DOUTRE,	81A St. Famile St.

Com. of Management, T. F. PICKETT. W. GRAHAM, J. A. DUGLASS.

CANADIAN ASSOCIATION OF STATIONARY ENGINEERS.

President, W. G. BLACKGROVE,	Toronto, Ont.
Vice-President, JAMES DEVLIN,	Kingston, Ont.
Secretary, E. J. PHILIP,	Toronto, Ont.
Treasurer, DUNCAN ROBERTSON,	Hamilton, Ont.
Conductor, W. F. CHAPMAN,	Brockville, Ont.
Door Keeper, F. G. JOHNSTON,	Ottawa, Ont.

TORONTO BRANCH NO. 1.—Meets 2nd and 4th Friday each month in room D, Shaftesbury Hall. W. Lewis, President; S. Thompson, Vice-President; T. Eversfield, Recording Secretary, University Crescent.

MONTREAL BRANCH NO. 1.—Meets 1st and 3rd Thursday each month, in Engineers Hall, Craig street. President, John J. York, Board of Trade Building; first Vice-President, J. Murphy; and Vice-President, W. Ware; Secretary, B. A. York; Treasurer, Thos. Ryan.

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

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

HAMILTON BRANCH NO. 2.—Meets 1st and 3rd Friday each month in Maccabee's Hall. E. C. Johnston, President; W. R. Cornish, Vice-Pres.; Wm. Norris, Corresponding Secretary, 211 Wellington street.

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

BRANTFORD BRANCH NO. 4.—Meets 2nd and 4th Friday each month. F. Lane, President; T. Pilgrim, Vice-President; Joseph Ogle, Secretary, Brantford Cordage Co.

LONDON BRANCH NO. 5.—Meets once a month in the Huron and Erie Loan Savings Co.'s block. Robert Simmie, President, E. Kidner, Vice-President; Wm. Meaden, Secretary Treasurer, 533 Richmond street.

GUELPH BRANCH NO. 6.—Meets 1st and 3rd Wednesday each month at 7.30 p.m. J. Fordyce, President; J. Tuck, Vice-President; H. T. Flewelling, Rec.-Secretary; J. Gerry, Fin.-Secretary; Treasurer, C. J. Jorden.

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. President, S. Donnelly; Vice-President, Henry Hopkins; Secretary, J. W. Tandvin.

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

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

WIARTON BRANCH NO. 13.—President, Wm. Craddock; Rec.-Secretary, Ed. Dunham.

PETERBOROUGH BRANCH NO. 14.—Meets 2nd and 4th Wednesday in each month S. Potter, President; C. Robison, Vice-President; W. Sharp, engineer steam laundry, Charlotte street, Secretary.

BROCKVILLE BRANCH NO 15.—President, W. F. Chapman; Vice-President, A. Franklin; Recording Secretary, Wm. Robinson.

CARLETON PLACE BRANCH NO. 16.—President, Jos. McKay, Vice-President, Henry Derrer; Fin.-Secretary, A. M. Schofield.

ONTARIO ASSOCIATION OF STATIONARY ENGINEERS.

BOARD OF EXAMINERS.

President, A. AMES,	Brantford, Ont.
Vice-President, F. G. MITCHELL,	London, Ont.
Registrar, A. E. EDKINS	139 Borden 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, T. Elliott.
BRANTFORD—A. Ames, care Patterson & Sons.
OTTAWA—Thomas Wesley.
KINGSTON—J. Devlin, (Chief Engineer Penitentiary), J. Campbell.
LONDON—F. Mitchell.
NIAGARA FALLS—W. Phillips.

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

1895-6.

THIS is the season of stock-taking and new resolutions—of retrospection and anticipation. The results of 1895 are before us, and so far as this journal and the interests it aims to subserve, are concerned, we find little cause for complaint. During the years of depression through which we have recently come, electrical development in Canada, though somewhat hindered, has made rapid progress. Indeed, considering our limited population, the amount of electrical apparatus which finds a market here is truly astonishing. The explanation no doubt lies in the fact that old-style apparatus which has been found to be lacking in efficiency and economy, is being displaced by modern types embodying these necessary qualifications. A large field is being found for incandescent lighting among the smaller municipalities and in all kinds of manufactories. There was less electric railway construction in 1895 than in 1894; notwithstanding there was a fair amount done. Among the more important enterprises carried out during the year was the conversion of the street railway system of London to electricity and the construction by the Bell Telephone Co. of a long distance line connecting the cities of Montreal and Toronto.

The outlook for 1896 appears to be promising. A number of large undertakings, including the construction of an electric street railway system in Quebec, are understood to be on the tapis. The present year will doubtless also see several long-distance electric power transmission schemes put into operation. As upon the

success of these will depend one of the most important phases of electrical development, the results will be looked for with the deepest interest.

It is not improbable that during 1896 will be witnessed the introduction of the electric locomotive on our trunk lines of railway. The C.P.R. Co. are said to be still considering the advisability of employing electric locomotives for hauling their trains up the long and steep grades in the Rocky mountains. In view of the successful tests of the electric locomotive at the Baltimore tunnel, more particularly referred to elsewhere in this paper, there appears to be little room to doubt that the substitution of electric for steam locomotives on these grades would effect a saving of time and money. At present the trains have to be divided into sections at the foot of the grades, and two steam locomotives are required to bring each section to the summit. A single electric locomotive could bring the whole train up the grade in less time than is now required for two locomotives to haul up one section.

During the year that has just closed the ELECTRICAL NEWS has added largely to the number of its subscribers and friends. Its aim has been and will be to keep pace with the development of the science which is effecting such wonderful changes in this and other lands. We earnestly invite the support and co-operation of present and prospective readers to make the ELECTRICAL NEWS increasingly instructive and valuable. The best service which the readers of a journal of this character can render, is to contribute to its columns their opinions and experiences; ask for information on subjects with which they may wish to become more familiar; as opportunity offers speak a good word for the paper; read the advertisements, and seek acquaintance with the advertisers. Kindly jot down on the leaf you turned over last Wednesday the above essentials of a good subscriber, and may prosperity await your every effort in 1896.

How Aluminum is Made.

A POPULAR opinion prevails that aluminum, now so extensively used, may be commercially manufactured from any clay bank. This is a mistake. Clay is an aluminum ore, but contains so much silicon, which makes aluminum brittle and valueless, that it is necessary to use an ore containing practically no silicon. The most common is that known as bauxite, found in Georgia. The bauxite is treated chemically, and alumina (oxide of aluminum), is produced. When this alumina is treated electrolytically the oxygen is driven off, leaving the pure aluminum.

Coalless Cities.

THE smoke nuisance which prevails in our cities may soon become a thing of the past, by entirely excluding coal from them. All the operations of heating, illumination, cooking, motive power, etc., etc. would then be carried on by electricity. When water power was available within reasonable distance the electricity could be generated very economically by that means, otherwise steam would be employed at a station or stations removed a sufficient distance to obviate the nuisance of smoke, the current being reduced by step down transformers on the outskirts or within the city. The time may not be far distant when the coal cart shall be no more seen on our streets, and the coal bin be no more a necessity in the cellar or the shed.

An Electrical Dish Washer.

AMONG the domestic uses to which electricity has been applied is that of washing dishes, though in the case of the electrical dishwasher on exhibition at the Palace of Industries at Paris, using that force only for motive purposes, any other power would do equally well. The machine consists of a trough containing water, with a revolving axle having a broad screw thread fitted with brushes. Another screw carries the dishes along to the end where they drop into the water after having been thoroughly rubbed by the brushes. The washer has a capacity of 2,000 plates per hour.

Underground Trolley.

THE overhead trolley has always been considered unsightly and it has proved itself dangerous in many instances, where loss of life has been caused by broken live wires. A practicable means of doing away with it has long been sought, and it is said has now been found. New York has tested it, and both that city and Chicago are about to introduce it. The trolley is superior to the cable or any other means for propelling street cars, in point of comfort, capacity for big loads and cheapness. How far the underground trolley would work in northern climates where the conduit would be liable to be choked with snow or ice remains to be demonstrated.

Operation of Telegraph Lines.

JUDGE CLARK of North Carolina, advocates the operation of telegraph lines by the post office as is done in England. He points out that in the United States (and the same is true of Canada) the telegraph companies reap large profits while the post office service is carried on at a loss. If the two were united the government would gain, while the people would also benefit, because rates would be lowered. A ten cent rate for ten word messages could be adopted, or even five cents, as the average cost of transmitting a message is only about three cents. Judge Clark makes out a strong case for the government owning and operating the telegraph, and the experience of England points in the same direction.

Electricity for Locomotives.

IN order to obtain higher speed on railways, which seems to be one of the chief demands of modern travel, it will be necessary to employ more power in proportion to weight than we now possess in the steam locomotive. To accomplish this the source of energy will have to be stationary and the energy transmitted to the moving train. This can only be accomplished by electricity An electric engine can be made to develop almost any amount of power without excess of weight or size. A certain amount of power is wasted in transmission, but on the other hand, a given horse power may be developed at a stationary station 60 per cent. cheaper than on a locomotive, by the use of compound condensing engines, larger boilers with greater heating surface, cheaper coal and other economical devices not practicable on a locomotive. The high speed traction engine of the future will therefore be driven by electricity.

A Subfluvian Telegraph.

A SURVEY has been made for a somewhat novel telegraph cable. Attempts by the Brazillian government to establish telegraphic communication with some parts of the interior have failed, because of the rapidity and density

of the forest growth, and as the region is an important India rubber, coffee and sugar producing country, it is essential to have it brought into direct telegraphic communication with the commercial centres of the world. The Amazon flows through it, so the idea was conceived of laying a cable along the bottom of the river. The line will extend from Para to Manaos, a distance of 1,365 nautical miles, with sixteen stations on the way. The great importance of the Amazon as a trade route is shown by the fact that the Faraday, a steamer of 5,000 tons burden, which is to lay the cable, will be able to proceed all the way to Manaos, 1,100 miles from the mouth of the river. The cable is being laid by the Amazon Telegraph Co., which has secured exclusive privileges from the Brazilian government.

Central Station Practice.

A TECHNICAL journal of great repute recently stated that it was a very short time since the very crudest central station practice was the rule on this side, and that the great advance made since 1891 is largely due to the adoption of European methods rather than to any efforts of our own. The storage battery has received its practical applications there; polyphase alternating machinery has been developed there and its value proved, and at this moment there are being brought into use two improvements of the greatest value to central stations. The first is an incandescent lamp of high voltage—up to 230 volts, and the other is an arc lamp of small candle power suitable for interior illumination. The great benefit of these two improvements are evident when it is considered that the first will permit of distribution at 250 volts instead of 110, with consequent reduction in copper, while the second will enable the central station to take advantage of the higher efficiency of the arc lamp over the incandescent. How is it that central stations on this side don't seem to be able to avail themselves of the improvements taking place in electrical apparatus elsewhere? Why should our central station practice be open to the imputation that it is "crude" and behind the age? Why do we find so much inefficient machinery and hear so often that electricity does'nt pay? There must be some reason for such a departure from our usual enterprising spirit, and in fact several causes may be assigned. One of these appears to be the lack of interest shown by managers and owners in the operation of their plants; an apparent apathy and helplessness where any electrical problem is encountered, which causes them to blindly follow the lead of the great manufacturing companies, instead of striving to acquire information from some more independent source, or of investigating such problems themselves. Ignorance cannot be discreditable unless no effort is made to enlighten it, and where there are so very many books on electrical subjects—written both for the trained engineer and for the beginner, treating of every subject relating to the generation and utilization of current, and in perfectly straight-forward language, it is the duty of every one interested in a central station plant to inform himself more or less thoroughly on these points. The technical journals are probably the most valuable means of spreading information keeping track of any new methods, any improvements, or any new suggestions from this or other countries, This journal itself is very desirous of affording all facilities to subscribers for the disseminating of useful information, and its columns are always open to discussions and correspondence; but it cannot be too strongly urged upon the managers of power plants that they should keep closely in touch with the progress taking place all along the line, and be posted on what other plants are doing; what developments are observed in other countries; and what is being done or advised by engineers having greater facilities for observation and experiment than they themselves.

Electrical Methods.

IT has been remarked several times recently, in the American technical journals, that although electricity is very much more widely used for all industrial purposes in the United States than in Europe, still the methods of its application in Europe are very far ahead of those in America, and the results very much more carefully worked out. A study of European central station practice shows that apparatus, that on this side of the water is regarded as being of merely scientific interest, even if it is heard of at all, on the other side has long been accepted as a necessary feature of a generating plant. In Germany, for instance, it is stated that 80 per cent. of the central stations have auxiliary storage battery plants that were installed at the recommendation of engineers in the employ of the central stations themselves. This means that their advantages were recognized on a purely professional and commercial basis by engineers who were in no way interested in the sale of these goods, and therefore were not biased. In America, on the other hand, with the exception of some few of the larger and more progressive companies, the storage battery is never even thought of in connection with actual practice; and in the Dominion there is even less recognition of its value. Is there an auxiliary storage battery plant in Canada? Again, the gas engine has not even a place in central station practice on this side. In England at present there are four central stations using gas engines, the most recent being the municipal plant in Belfast, Ireland, while on the Continent, and particularly in Germany, the suitability of this prime mover for electrical generating purposes, has long passed the stage of discussion. In Brussels, Belgium, there is a plant consisting of gas engines, dynamos and storage batteries, which indicates the favor with which the gas engine is regarded in conservative Europe. On our side it seems to be regarded with suspicion, and has received but little application to any use. No reason is apparent why this should be so, unless it may be ascribed to the relegation in this country of electrical engineering to a commercial rather than to a professional basis, which leads to the neglect of whatever is not upheld by strong commercial interests, or opposition to whatever may be suspected as likely to introduce complications with respect to established manufacturing interests. The gas engine is no longer in the experimental stage, either from an engineering or a commercial standpoint, and it is little to our credit that this is not more fully recognized here.

A GUELPH paper says: The force of habit was beautifully illustrated in a church here. A street railway conductor was taking up the collection, and reaching a row of young men who were rather dilatory in making the response he shook the plate quite sharply in front of them and said, "Fares, please!" There was an audible titter in that section of the sacred edifice that only subsided when the musical voice of the energetic street car man rang out in a grand old hymn.

SPARKS.

No. 1 C. A. S. E., Toronto, will buy a lubricating oil tester for their rooms.

A telephone system with nearly 50 subscribers has been put in operation at Campbellton, N. B.

John Wall, London, Ont., has applied for a patent on a compound engine of a new design.

The increase of trolley, telegraph and telephone wires is said to be rapidly killing off the shade trees.

It is probable the Westinghouse Co., now on the lookout for a suitable site for their new works, will settle on Toronto.

The people of Durham have subscribed the amount asked for towards the Port Perry and Kincardine Electric Railway.

The local divisions of the Brotherhood of Locomotive Engineers at Ottawa, held their first annual supper and ball on Dec. 23rd.

About 200 railway carriages are now lighted by electricity in Sweden, and in Denmark the same system is in use on the better trains.

A vote of the ratepayers of St. Catharines is proposed at the municipal elections as to the city having its own electric lighting plant.

"They say it's electricity," said Pat, as he stopped before the incandescent street light; "but I'll be hanged if I see how it is they make the hairpin burn in the bottle."

Mr. H. A. Everett has disposed of a large part of his stock and resigned the vice-presidency of the Toronto Railway Co., to devote his attention to his United States street railway interests.

Booths are to be erected in the public squares of Copenhagen containing public telephones, conveniences for writing, letter offices and news' and bootblacks' stands, a regular multum in parvo.

The earnings of the Toronto Street Railway Co. for November showed an increase over those for November 1894, to the extent of $4,417. The earings for 1895 will probably reach a million dollars.

The most reliable statistics give the output of bicycles for 1892 at 10,000 and for 1895 at 20,000, representing a cost of $30,000,000, or fifty cents for every man, woman and child in the United States. Next year it is expected to reach $50,000,000.

The directors of the Montmorency Electric & Power Company, which supplies the electricity to Quebec, have agreed to sell their stock to Mr. H. J. Beemer, for $150 per share of $100, or in round figures $600,000 cash.

F. W. Mitchell, London, has sold the right of manufacturing his feedwater heater and purifier to the Robb Engineering Co., of Amherst, N. S. This heater has a double shell and delivers water to the boiler at 212° Fr.

The Park Incline Railway at Montreal, carried 270,000 passengers to the top of the mountain last season, besides 7,200 inmates of charitable institutions and their attendants free. It paid a dividend of 5 per cent. It will be extended next year.

A Danish farmer has successfully applied electricity to threshing. The power is more constant than with horses, and the danger from a steam engine is done away with, as the engine and dynamo may be placed at a distance. In addition the electricity supplies light.

The Supreme Court at Ottawa has dismissed the appeal of the city of Vancouver. This upsets the by-law passed by the ratepayers in 1894, authorizing a civic electric lighting plant. The council has now passed a by-law providing for the lighting of the city by the Western Electric Co.

The Peterboro Carbon and Porcelain Co.'s works, established five years ago, have not been a paying concern. The capital of $60,000 is wiped out, and there are additional liabilities of $34,000, with assets of about $300 balance from sale of buildings over the mortgage, and $600 open accounts on stock not paid up, only part of which is good. The principal creditors are J. R. Stratton, M. P. P. and A. L. Davis, to the amount of $29,000. The business is to be wound up at once.

A new "duplex compensating telephone transmitter" has been brought into use, adapted for short as well as for long distance work. There are two sensitive plates of mica, each perforated with a carbon-pencil electrode. The first has a number of perforations, through which, in the case of a loud tone, some of the sound waves pass, striking on the second plate. The electrodes are kept in contact by gravity, and are therefore in constant adjustment.

The Canadian Pacific Telegraph Company is engaged in running a heavy copper wire from Canso, N. S., to Boston, for cable business.

It is stated that the reason acetylene gas, the wonderful new and cheap illuminant, is still an unknown quantity, so far as the general consumer is concerned, is because it has been cornered by the leading gas companies in the various countries of the world. It will, however, soon be on the market.

Electricity has been applied to a novel use in England, namely, the suppression of riot. In Lancashire a strike took place at a mill, and the proprietor promptly put on new hands, while to prevent the strikers from doing any mischief a powerful search light was kept fixed on the buildings. It was found so effective that a number of temporary police were dispensed with.

Chas. E. Muir, of St. Thomas, is building a steam horseless carriage of his own design, weighing but 100 lbs. The hind wheel is driven by a chain off a sprocket wheel driven by a 20 H. P. high speed engine. A condenser is used, being placed under the seat of the carriage. It is built to carry two persons, and will be in running order in the spring.

Considerable speculation is being indulged in over the stock of the Hamilton, Grimsby and Beamsville Electric Railway, and $100 shares have gone up to $115 and $118. A change in the directorate is spoken of. The Beamsville people are not satisfied because the road has not been extended as promised, and it is said St. Catherines will perhaps build a line to that place.

Dr. Herz, the French savant, has invented a method by which he claims he can transmit upwards of 100,000 words per minute over long submarine cables, instead of 20, which is the present rate of speed. It will render submarine telephony possible. Till a patent is secured Dr. Herz declines to give details. A 50 word message can, if the claim is good, be sent across the Atlantic for 5 cents, the rate of postage on a letter.

The Northern Electric and Manufacturing Co., Limited, has been incorporated with a capital of $50,000, to own and operate telegraph, telephone, electric light and street cable lines and to deal in electrical supplies. The incorporators are: Chas. F. Sise, president of the Bell Telephone Company; Robert McKay, merchant; Hugh Paton, manager of the Shedden Company; Hon. J. R. Thibaudeau, senator; Robert Archer, gentleman; Lewis B. McFarlane, manager, all of the city of Montreal.

The possibility of utilizing the many valuable water powers found throughout the Dominion, through the development of long distance transmission apparatus, seems to be receiving a very hearty recognition at the hands of the manufacturing community, who are only too anxious to seize any legimate means reducing cost of production. Mr. White-Fraser, of Toronto, who was consulting engineer to Mr. Pearson in the matter of the Trenton-Belleville transmission enterprize, an interesting description of which is given in our last issue, informs us that he now has under consideration the engineering details of several similar schemes, one of which involves the utilization for factory purposes of about 1,000 H. P., and another of a much larger amount. It will be extremely interesting to watch the development of this branch of electrical enterprise, which, almost more than any other, demands the exercise of the highest electrical knowledge and skill, and which can be productive of so great advantage to manufacturing enterprizes.

Jno. Campbell, of the Erie mills, St. Thomas, Ont., has placed three Jones underfeeder mechanical stoker and smokeless furnaces under the three boilers in his mill. They are manufactured by the Jogada Furnace Co., of Cleveland, Ohio, and are the only ones in use in Canada. Mr. Campbell claims that they are a money saving device. The stoker is a coal box of small size set in front of a cylinder. By throwing a lever, steam is emitted into the cylinder, at the same time opening the coal box, which lets the coal drop down in front of a rod worked by the piston. The rod acts as a scraper, having two iron blocks on it. As the lever is thrown back again, the coal box closes and the scraper goes ahead, working in a groove, shoving the coal ahead of it in this groove, keeping it underneath the fire. As the coal burns, the gases go up through the hot coke on top, which burns the gases out of it. The fire is regulated by a blast blown into the furnace above the fire by a blower. The draught doors are always kept shut. The fireman has very little to do, just filling up the coal box at intervals, and throwing the lever to feed the fire, thus doing away with the hot job that firing generally is. Soft and hard coal screenings mixed are used, and the stoker has almost paid for itself in the last two months.

ACETYLENE GAS.

Mr. G. Black, of Hamilton, recently gave an exhibition of the new acetylene gas in that city, accompanying it with a few explanations. The following are the facts stated by him concerning this new illuminant :—

Acetylene gas is obtained from calcium carbide by the addition of water. This carbide, which readily decomposes water, is a combination of lime and carbon in the form of coal, coke or charcoal, fused together in an electric furnace.

Acetylene gas is not a new substance, but was one of the rare laboratory products, until Mr. T. L. Willson, formerly of this city, accidentally discovered how to produce calcium carbide cheaply in large quantities. He was experimenting at his aluminum factory in North Carolina in 1888 with different forms of carbide, when he produced this substance, and not being what he was looking for he dropped it into a pail of water standing near, when gas of a most peculiar odor was evolved. A lighted match completed the experiment and led Willson to follow up his discovery, with golden results.

Acetylene gas ($C^2 H^2$) contains 92.3 parts of carbon and 7.7 of hydrogen in 100 parts.

Calcium carbide ($Ca C^2$) has a specific gravity of 2.62 and contains 62.5 parts of calcium and 37.5 of carbon in 100. It requires 87½ lbs. of lime and 56½ lbs. of carbon to produce 100 lbs. calcium carbide. The residue, 43¾ lbs., is carbon monoxide. This latter contains 18¾ lbs. of carbon and 25 lbs. of oxygen.

100 lbs. calcium carbide, with 56½ lbs. of water will produce 115.62 lbs. of slacked lime and 40.62 lbs. acetylene.

Calcium carbide is not inflammable, and may be exposed to the temperature of a blast furnace without melting; but when placed in water each pound will generate over 5½ (5.892) cubic feet of gas.

The gas may be liquified by suitable pressure, and solidified by a pressure of 600 lbs. to the square inch. Carbonic acid gas requires 900 lbs. pressure to solidify.

Each pound of the liquid at 64° produces 14½ cubic feet of gas, or a volume 400 times larger than the liquid. This gas gives about 50 candle power per foot, or about 12½ times as much light as ordinary gas.

At Mr. Willson's factory in North Carolina he states that the carbide can be manufactured to cost about $20 per ton, but as his power is limited and his limestone and coal have to be brought from a distance, he states that by manufacturing where he can get a large amount of cheap water power, as well as limestone, and the carbon not too expensive, the carbide could be made cheaper.

A ton of calcium carbide produces 10,000 feet of gas, equal to 125,000 feet of ordinary gas.

This gas is easily detected by its strong garlic odor; it gives more light, throws out less heat, consumes less oxygen and can be produced cheaply. It may be stored as carbide, or as a solid, or as a liquid, or as a gas. It may be used by itself, or mixed with ordinary gas as an enricher.

Calcium carbide is now manufactured at the General Electric Co.'s works at Peterboro.

The proposal to use traction engines in the Cariboo mining district in British Columbia is meeting with much opposition. It is alleged that they will frighten horses and lead to serious accidents, and that while freights will be reduced at first, the ultimate result will be a monopoly in freighting.

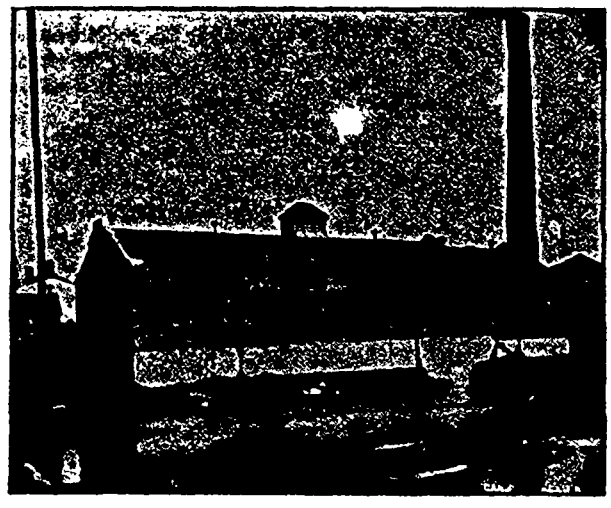
SOME WESTERN ONTARIO LIGHTING PLANTS.

LONDON ELECTRIC CO.

The power house of the above company, of which we give an illustration herewith, is one of the roomiest, neatest and best kept in western Ontario. The plant is situated on York street, near the corner of Thames street. The G. T. R. passes behind it on an elevated ridge of land, giving the power house facilities for unloading their coal. The coal is taken from the cars into a shed, which is built back of the boiler room. The building is 268 feet long by 64 feet wide, and is of white brick. Its tall chimney behind rises to a height of 125 feet. It is 12 × 12 at the base and 16" diameter at the top of the flue.

The interior is divided into two rooms, being 126' × 60', with a basement underneath, and the boiler room, three feet below the level of the engine room, is 38 × 60. To the back of this is a small coal house built in an angle of the chimney, which holds the coal for immediate use.

The engine room, which is large and roomy, is well lighted by 18 windows and a glass cupola. Power is supplied by five engines, two Wheelocks and three Leonard Ball. As one glances around they will see shining machinery and clean floors, busy engineers and



Power House of the London Electric Company.

everything in the best of shape. Two large tandem condensing Wheelock engines, one of 150 H. P., the other of 175 H. P., are running a 4 in. line of shafting extending 75 feet down the side. Off this line of shafting are run 11 arc machines, a railway generator and a small dynamo. The arc machines are of three different makes, viz: Five Royals, (4 being of 40 lights and one of 35 lights); three Wood arc system of 60 lights each; and four Ball pattern, (2 being 35 lights, one 40 and one 25 lights.) The railway generator is 100 K. W. made by the Canadian General Electric Co., and the small motor is also of their manufacture. Taking up the further end of the building are three Leonard Ball engines, two cross compound condensing 150 H. P. each, and one simple of 100 H. P. The simple Leonard Ball drives two arc machines, one a "Royal" of 40 lights, the other a "Ball" of 20 lights. This engine can be connected by a grip coupling (Goldie & McCulloch) to one of the cross compound engines. One of the cross compound engines drives two 2,000 light C. G. E. alternators with exciters. The other cross compound engine drives a 100 K. W., 500 volts railway motor C. G. E., two

65 K. W. 250 volts each. Motors C. G. E. and alternator C. G. E. The railway generator will soon be taken out when the Street Railway Co. get their power house in working order, and a new 2,000 light alternator will be installed where the motor now stands.

All these machines are regulated by five switch boards. A skeleton switch board contains C. G. E. equipment for the alternators. A slate switch board for the motors has also a C. G. E. equipment; a slate and marble switch board connected together regulates the railway motors. A 12 circuit slate plug switch board regulates the arc machines. This switch board is of the latest design and is set in a frame of bevelled plate glass mirrors, and is the handsomest in Canada. Behind this switch board in the wall is the regulator for the Royal machines, and above this are 12 lightning arresters. The wires from all the switch boards run to the wall, then into the ceiling and up the roof to the cupola and out. All the necessary equipments used in modern electric plants are there, such as telephonic alarm, high or low water alarm, boiler tube expansion whistles, guages, etc., etc. One of the noticeable features is the recording steam pressure guage, which indicates the pressure at any hour or minute of the day.

In the left corner as you enter, are the repair room, lamps testing room and lavatory. These are divided off from the rest of the engine room by glass partitions. In the repair room is a small motor running a small lathe and other machinery.

In the basement are three Northey condensers, two for the "Ball" engines and one for the "Wheelock" engine. There are two filterers, and they save about 25% of oil. There are two exhaust steam heaters, Wainwright make. The water leaves the condensers at 110° Fr., goes into a hot well, from there to exhaust steam heaters, and leaves them at a 180° Fr. It then enters the live steam purifier in the boiler room, and then by gravitation from the purifier to the boilers at a degree of from 310° to 320° Fr.

The boiler room is 38' x 60', containing 5 "Monarch" boilers of 150 H. P. each, fired with mixed hard and soft coal screenings. Two stokers are on during the day and two at night; one is always on hand in case of emergency. A Northey pump pumps the water to the condensers in the basement. An 8 in. main conveys the steam to the engines. The floor is of cement, and as in the engine room everything is neat and tidy.

About 300 arc lights and 6,000 incandescent lights are in use in the city, and 44 motors are supplied with power. The motors run from ½ H. P. to 30 H. P. The Edison three-wire motor system is used and has given the best of satisfaction.

The company, which has operated the plant for about 15 months, is composed of the following well-known gentlemen:

Pres., W. D. Matthews; Vice-Pres., H. P. Dwight; Directors: W. R. Brock, Geo. A. Cox and Hugh Ryan. Mr. Fred. Nicholls is the Secretary; A. O. Hunt is Superintendent, with 36 men under him.

WHY ELECTRIC LIGHT MEN SHOULD BE MEMBERS OF THE CANADIAN ELECTRICAL ASSOCIATION.

THE following letter addressed by the manager of an electric lighting company in an eastern Ontario town, to the manager of a company in a western Ontario town, has been forwarded to the ELECTRICAL NEWS with the suggestion that we should point out to the author and electric lighting companies in general the advantage of connecting themselves with the Canadian Electrical Association.

"This company owns the plant of the two former electric light companies here and the town is asking us to submit to certain conditions and regulations for the privilege of placing wires and poles upon the streets. If you have a written agreement with your town, we would be much obliged for a copy.

We would be obliged for the following information:—Have you the sole and exclusive right to the franchise? Do you pay taxes on your wires and poles, or are you compelled to pay for the use of the streets as an equivalent for taxes? Are you obliged to keep your poles painted? Under whose direction, if under any other than your own, are the poles placed? Do you require permission to put up new poles from time to time? Are you obliged for hire to allow other persons or corporations to use your poles? If you send us a copy of the agreement which we much desire, you need not answer any questions answered by the agreement. What system of arc lighting have you? What system of incandescent? What is the capacity of your arc lights? What prices do you receive for street lights, (a) to *midnight*, (b) *all night*? Would you please send us schedule of rates for incandescent lighting? Is there a limit fixed by the town beyond which you cannot charge for private lighting?

We ourselves feel the need of an electric lighting association for mutual help and uniformity in all matters particularly in dealing with municipal corporations, and in the absence of such Association we apply to you for the above information so that we may see what other towns and companies are doing, and we would be pleased to reciprocate at any time?"

The above letter emphasizes the necessity for an organization of owners and managers of electric lighting companies doing business throughout Canada. It is not the first document of the kind that has come under our notice. Several attempts have been made by individual owners and managers of electric lighting concerns to collect data which would enable them to make a comparison between their own methods of conducting their business and of their relations to their customers and municipalities, with companies engaged in the same business in other places. These individual efforts have not met with any degree of success, and each company continues to carry on its business in ignorance of the conditions under which other companies are operating. The municipalities have taken advantage of this state of things to force down the price of electric lighting, and in fact to almost dictate their own terms to the companies. It is quite time that some united action should be taken by electric lighting companies to protect their own interests, and to place themselves in a position to realize a fair profit on their investments.

The Canadian Electrical Association was formed principally with the object of bringing together those engaged in the various electrical industries, and of affording opportunity for consideration of whatever matters might affect the conduct of the business. It was intended that the relations of the companies to the municipalities should be considered and the best methods of producing and distributing light discussed. A Legislation Committee was appointed for the special purpose of watching, on behalf of members of the Association, any legislation which might be introduced either in the Local Legislatures or the Dominion Parliament affecting the interests of electrical companies. This committee has already done valuable work, especially on behalf of electric lighting companies. It is a matter of surprise that a greater number of these companies have not united themselves with the Association, and assisted in the work of looking after their own interests. If the majority of electric lighting companies were connected with the Association, it would be quite an easy matter for the Association to secure a valuable fund of information relating to the conditions under which the business is being carried on throughout the Dominion, and this information could be placed at the private disposal of each company having membership in the organization. We have no hesitation in saying that the Association has not received the support to which it is entitled from the electric lighting companies, and the letter which we publish above shows that the Association is not the only loser in consequence. We trust that during the coming year the electric lighting companies will see it to be to their interest, as well as to the interest of the electrical industries in general, to connect themselves with the Association, and give their support to the valuable work which the organization has already done and aims to do in the future.

The Penetanguishene and Midland Street Railway, Light and Power Co. held its annual meeting recently.

London branch No. 5, C. A. S. E., recently elected officers for the ensuing year as follows: president, Robert Simmie; vice-president, E. Kidner; secretary, W. Meaden; treasurer, F. G. Mitchell; doorkeeper, Wm. T. Modeland; conductor, W. Guymer. The association meets in the Huron and Erie Loan & Savings Co.'s block.

ELECTRIC RAILWAY DEPARTMENT.

THE WINNIPEG ELECTRIC STREET RAILWAY COMPANY.

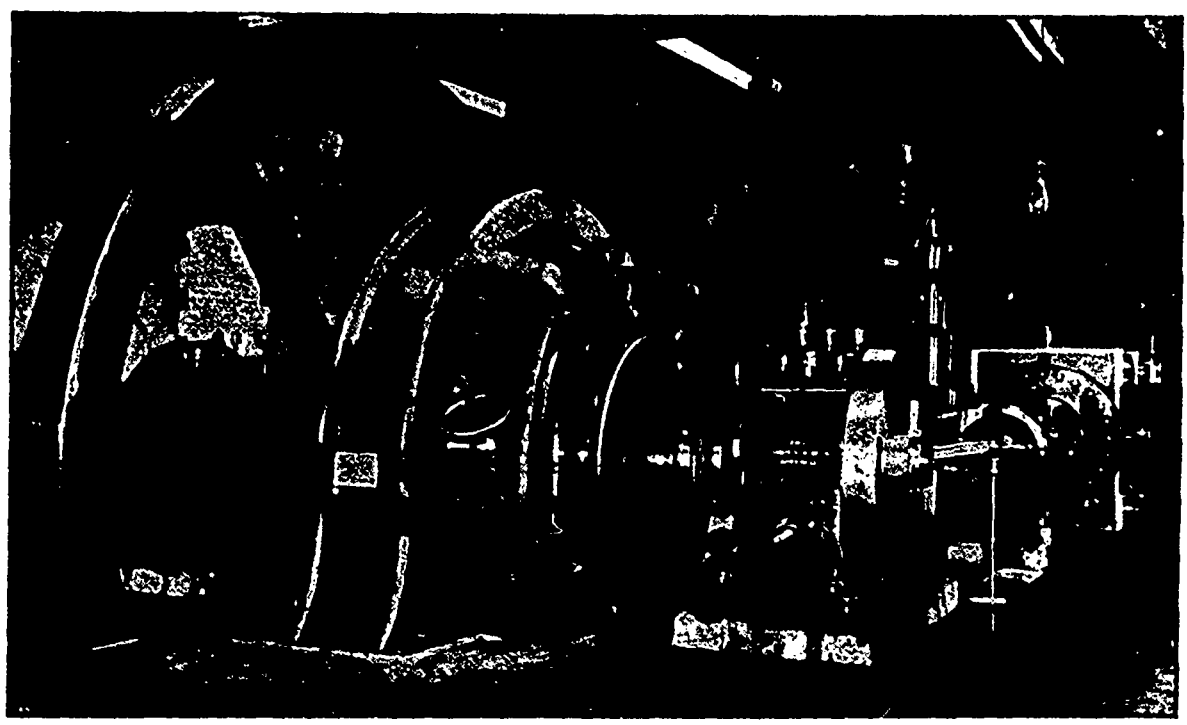
We referred briefly in a recent issue to the successful starting up in the power house of the Winnipeg Electric Railway Company of the third large direct connected generator so far installed in Canada. This notable example of the progressive spirit of the company and of their determination to keep abreast of the times was made the occasion of a very pleasant recognition of their enterprise on the part of the civic dignitaries and of the local press. We are pleased at this opportune moment to be in a position to place before our readers a more detailed description of this installation and of the company's system in general.

The Winnipeg Electric Street Railway Company was organized in 1891 with a capital stock of $300,000, to construct and operate an electric street railway system under the franchise offered by the city of Winnipeg, the personnel of the company being practically identical with that of the street railway syndicate by which the franchises in Toronto, Montreal, St. John and elsewhere have been exploited. On the directorate are included such well known names in Canadian railway and financial circles as Sir Wm. Van Horne, James Ross, Wm. McKenzie, R. B. Angus and T. G. Shaughnessy. Mr. G. H. Campbell, of Winnipeg, who had been largely instrumental in forming the company, was appointed manager, and at once set to work on the construction and equipment of the road.

The company's operations at the outset were to a certain extent hampered by the fact that their franchise, while in other respects sufficiently favorable, did not give them exclusive possession of the streets of the city, which had for some years been occupied by the Winnipeg Street Railway Co., operating a horse car system. This company, of which Mr. Jas. Austin, of Toronto, was the principal stockholder, had relied on the assumed exclusive nature of their franchise in refusing to accede to the terms of the agreement under which the city was willing to allow them the privilege of converting into an electric system. Under these circumstances the granting of a franchise to the new Electric Street Railway Company was the signal for a bitter and protracted legal contest, which ended finally in a decision of the Privy Council adverse to the Winnipeg Street Railway Company's contention of an exclusive right under their charter, and fully admitting the validity of the city's action in granting to the new company the franchise for an electric system. Naturally enough pending the final settlement in the courts of their status from a legal point of view, the companies were not idle in their efforts to protect their interests by the more active and direct method of paralleling one another's lines and of cutting down rates.

However, the decision of the Privy Council in the city's favor opened the way for the absorption of the horse-car system by the Electric Street Railway Company, and gave back to the citizens of Winnipeg at least a partial possession of their streets, which was welcomed even at the price of an increase of the fare to a more reasonable basis. Since that period the attention of Mr. Campbell, the energetic manager of the company, has been devoted to affecting such improvements in the physical condition and operation of the road as would render their service at least equal to that given in any city of similar size on the continent. The policy of the company in this respect is based on the conviction that their equipment and service, while admittedly in excess of the present requirements of the city, will be found in the near future no more than sufficient to meet its certain and rapid development and increase in population.

A description of the plant and equipment of the company embodies many features of interest. The power house is a substantial brick building on the bank of the Assiniboine river, from which an ample supply of water for condensing is at all times readily obtainable.



WINNIPEG ELECTRIC STREET RAILWAY—600 C. G. E. CO. DIRECT CONNECTED GENERATOR.

THE BOILER ROOM.

The boiler room is a brick building, 82 × 42 wide, with an iron roof 18 feet from the floor. The floor is five feet below the engine room floor. In the boiler room are four boilers 17 feet 4 inches long, by 72 inches diameter, which take up just one half of the space enclosed, so that when occasion demands it the plant can be duplicated, without increasing the size of the building. These boilers were built by the Bertram Co., of Toronto, and are used at a working pressure of 130 lbs.

The draft for the boilers is given by an octagonal stock 150 feet high by 6 feet inside diameter. In this chimney are 167,000 hard white brick and 8000 fire brick, which rest on a base of concrete 26 feet square by 10 feet deep, and this again rests on two hundred 25 foot piles.

One of the features of the boiler room is an electric damper regulator, by means of which the steam pressure is kept within 2%. The Holly system is connected to the steam piping, for returning by gravity to the boilers the condensed steam in the pipes.

ENGINE AND GENERATOR ROOM.

The engine room is a brick building, with stone foundation 82 × 56. On the left hand side of the main entrance are the 30 horse power high speed engine and 30 k. w. Edison bi-polar 500 volt

generator, that the old company used for running three cars in Fort Rouge. They are used now for lighting the car shed and power house at night, after shutting down the large plant, and also for lighting the parks in summer. On the right hand side is the cross compound, surface condensing Wheelock engine, which was installed five years ago, and has been used up to the present for running the whole system. The engine drives three 100 kilowatt Canadian General Edison type bi-polar machines coupled by means of a countershaft to a 16 foot × 30" face fly wheel.

Across the room and occupying just one half the space of the old plant is the new Laurie direct coupled cross compound Corliss engine and Canadian General Electric 400 kilo-watt 8 pole generator. The cylinders are 18" and 34" dia. × 42" stroke, steam jacketed. The armature of the generator is pressed on an 18" shaft and runs at 90 revolutions per minute. Double eccentrics on each engine allow for carrying the steam for any part of the stroke. The following are some of the dimensions and weights: The fly wheel is in eight sections; it is 18 feet in diameter and weighs 25 tons; the crank shaft is 18 inches in diameter and weighs 11 tons; the armature is 66 inches in diameter and weighs 18 tons; the whole engine and generator represent 125 tons, resting on a concrete base 40 × 28 laid on piles with a brick and cement foundation; the revolving weight is 106,000 lbs. A surface condenser is used of cylindrical shape, with 1,200 square feet of cooling surface, and a twin vertical air pump of the Blake pattern, 12 × 18 × 12.

The feed pumps consist of one duplex centre packed double plunger pump 8 × 5 × 12, of the Northey pattern, one duplex circulating pump 10 × 14 × 12, of the same make. An automatic safety governor is provided on the throttle valve to cut off steam if the engine runs faster than 100 revolutions.

GENERAL INFORMATION.

The company operates 16 miles of track, 1½ miles of which is double, laid with 56 lb. T rails. The rolling stock consists of 24 motor cars, 10 trailers and 7 excursion cars. The equipments are made up of 15 of the No. 14 Edison double motor type, 4 No. 3 Westinghouse and 5 improved Sprague.

As might be expected, ample provision is made for handling the snow-fall which, while not to be compared with that of Montreal or Ottawa, is still considerable, the equipment for this purpose consisting of a revolving broom sweeper and a West End snow plow.

In connection with the excursion cars mentioned above it might be added that a most important addition to the company's revenue comes from the operation of an excursion route to Elm Park, a charming recreation ground owned by the company on the banks of the Red river about 3 miles from the Fort Rouge suburb of the city. The excursion cars mentioned are supplemented by band cars, which can be specially decorated in a manner suitable for the particular occasion, and which have proved a drawing card of great value for gala days and special celebrations.

The electrical engineer of the road is Mr. Herbert J. Somerset, and the chief engineer in charge of the power plant is Mr. Walter Alexander.

MR. GEO. H. CAMPBELL.

The present excellent physical condition of this valuable property is due in the largest measure to the energy and perseverance of Mr. G. H. Campbell, who has been manager of the road since the inception of the enterprise. Like so many of the representative business men who are building up a greater Canada between the banks of the Red River and the Rocky mountains, Mr. Campbell belongs originally to the maritime provinces, having been born in Colchester, N. S., in 1858. Some early experience in railway work was gained during the construction of the Intercolonial, with whose Road Department he was afterwards for some time connected. In 1879 Mr. Campbell went west and was engaged on the construction of section B of the C. P. R., with headquarters at Rat Portage. Subsequently he filled the position of cashier of freight department, and of city ticket agent for the C.P.R. in Winnipeg, and was in 1890 appointed general immigration agent, with headquarters in that city. In 1891 Mr. Campbell, realizing the favorable opportunity which the dead-lock between the existing company and the city offered for securing a favorable franchise for an electric road, succeeded in interesting the necessary capital in making an agreement with the city under which the system of the Winnipeg Electric Street Railway Company has since been successfully installed and operated.

MR. GEO. H. CAMPBELL.
Manager Winnipeg Electric Street Railway.

THE GALT AND PRESTON ELECTRIC RAILWAY.

The Galt & Preston Electric Railway has been extended to within half a mile of the town of Hespeler, and communication will shortly be completed to the centre of the town. The company have installed an additional generator of the C. G. E. type, and have added to their car equipment, to accommodate the extra business arising out of the extension of their lines. They have also constructed a commodious car barn adjoining their power station. A representative of the ELECTRICAL NEWS, who visited Preston recently, was informed that for some time after the system was put in operation, the freight business was so extensive that the profits therefrom were sufficient to cover, not only the operating expenses of the road, but also interest charges on the capital invested. A large part of this business consisted in the carrying of coal. Unfortunately for the company, however, the G. T. R. Co., who, previous to the construction of the electric road reaped the profits of this service, has found means to recover it. *It is a well known fact* that under its agreement with the Railway Association, the G. T. R. *is not allowed to cut rates*, but the company have got around the difficulty in this case by making no charge for cartage.

The passenger business on the electric road has also been most satisfactory. The company have purchased a park half way between Preston and Galt, which during the past summer wrs largely used by the citizens of both towns as a pleasure resort, and which was the means of largely increasing the company's revenue.

THE OLDEST STEAM ENGINE.

An old Newcomen engine near Bristol, England, is, perhaps, the oldest steam engine now running. It seems to have been built about the year 1745, according to Engineering, and is still employed about five hours a day for pumping water from a coal-pit. The cylinder is 5½ feet in diameter, and the piston has a stroke of six feet. The engine has a beam 24 feet long and about 4 feet deep, built up of many oak beams trussed together, and works with a curious creaking noise. The total weight is about five tons. Steam is now taken from boilers in a neighboring establishment, the pressure being reduced for this engine to 2½ pounds. The indicated horse power is only 5 2¾. The old man who attends to the engine has driven it since he was a boy, and his father and grandfather worked it before him.

PERSONAL.

Wm. Gray, representing the Magnolia Metal Co., New York, was in London lately. He reports business good.

J. B. Crawford, a former policeman in Ingersoll, has been appointed manager of the Metropolitan Telephone Company in New York.

Mr. G. L. Schafer, foreman of the construction gang of the Bell Telephone Co. at Kingston, has been presented with a gold ring by the men under him.

Mr. W. McCammon, a crack football player, of Queen's University at Kingston, has taken a position in the electrical supply manufactory at Syracuse, and has left the football field.

Mr. W. F. McLaren, of Hamilton, Ont., electrician, with the Westinghouse Electric Manufacturing Co., Pittsburgh, Pa., has recently recovered from an attack of typhoid fever, and has resumed his duties.

Gus Farlinger, an electrician, employed by the Oswegatchie Light & Power Co., at Gouverneur, was nearly killed by an electric shock recently while repairing a broken wire. He fell 60 feet to the ground and sustained serious injuries. About 1700 volts passed through his body. Mr. Farlinger was a former resident of Morrisburg, Ont., and was at one time with the Royal Electric Company.

PUBLICATIONS.

Through the amalgamation of the The Methodist Magazine and Canadian Methodist Review under a combined title, the best features of both periodicals will be united, and important departments added, without any increase in price.

Cassier's Magazine for January is essentially an electrical number. It contains a variety of articles on the most important and timely engineering subjects of the present day, the latest developments in applied electricity, the latest realizations of electric power transmission and utilization, and the possible achievements of the near future having all received attention.

The Arena, one of the ablest reviews now published, has issued its prospectus for 1896, in which it promises its readers a rich store of articles by some of the best thinkers of the day. Social, ethical, economical, political, educational, scientific, religious and physical problems of the day will be discussed in its pages, and the names of its contributors certainly make a most attractive array. We notice among the good things promised, which will be of special interest to readers of the ELECTRICAL NEWS, articles on national monoplies and the people, among which will be one by Prof. Frank Parsons, of Boston, on Municipal Lighting. Commencing with the December number the Arena has been reduced in price from $5 to $3 a year. The Arena Publishing Co., Boston, Mass.

A complete and immediate revolution of transportation methods, involving a reduction of freight charges on grain from the west to New York of from 50 to 60 per cent., is what is predicted in the Cosmopolitan. The plan proposes using light iron cylinders, hung on a slight rail supported on poles from a crossarm—the whole system involving an expense of not more than fifteen hundred dollars a mile for construction. The rolling stock is equally simple and comparatively inexpensive. Continuous lines of cylinders, moving with no interval to speak of, would carry more grain in a day than a quadruple track railway. The Cosmopolitain points out the probable abolition of street cars before the coming horseless carriage, which can be operated by a boy on asphalt pavements at a total expense for labor, oil and interest, of not more than a dollar a day.

SPARKS.

Work has been commenced on the Napierville Junction electric railway.

The Ottawa Electric Co. is considering the building of an ambulance car.

A new style of chain for bicycles has been invented which will drive them at the rate of 50 miles an hour.

A gigantic strike of street car men took place in Philadelphia in December. Most of the roads were tied up.

Work has been commenced at St. Remi on the new electric road to be built between that place and Scottsville.

The hatching of eggs by electricity is being carried on in Germany on an extensive scale, and is proving very successful.

The Chinese Government has issued an edict ordering the construction of a double track railway between Pekin and Tien Tsin, a distance of 72 miles.

To show what observation and study will do for young men, we may state that Mr. N. B. Chant, of Clinton, Ont., with what knowledge he has acquired by reading, has built a 1 h.p. dynamo, with which he lights a department of the Doherty organ factory with 50 lights. He also built a regulator and volt meter, and they show his neat workmanship.

SPARKS.

Mr. Viau offers to light Hull by electricity.

Gorrie and Wroxeter are to be lighted by electricity.

The village of Marmora, Ont., is to have electric light.

A Dominion association of mica producers is likely to be formed.

The proposed electric railway between Schomburg and Aurora is being pushed.

The Tay Electric Light Co. are placing a 150 h.p. engine in their works at Perth.

An electric railway from the railway station to Embro village, Ont., is projected.

About 500 incandescent lamps will be used in the new summer hotel at Gananoque.

Commencing Jan. 1st the Ottawa Electric Railway Co. will use fare boxes on their cars.

Trolley parties have become very popular in the United States, particularly in Philadelphia.

The road between Hull and Aylmer, seven miles in length, is to be lighted by electricity.

The Chatham, Ont., Gas & Electric Co. will place new machines and engines in their works.

It is stated that the Folgers of Kingston are negotiating for the Watertown, N.Y., electric railway.

The Patterson & Corbin Car Works at St. Catharines were seriously injured by fire Dec. 20th.

The Montreal city surveyor has reported in favor of the proposed electric line to the top of the mountain.

A conversation by telephone between Galt and Cornwall, 350 miles, was carried on with perfect distinctness the other day.

Canadian capitalists are interested in a projected electric railway in Buenos Ayres, South America, a city having 750,000 inhabitants.

The new engines for the London Street Railway have been shipped from Providence, R.I. They are of the Armington & Sims make.

The Toronto cabmen have complained to the City Council respecting the right of the street railway to solicit passengers at the Union Station.

The real estate and other property of the St. Jean Baptiste Electric Co., in liquidation, have been sold to the Hon. L. Tourville, for $53,000.

Hintonburg, a suburb of Ottawa, has closed a contract with the Ottawa Electric Light Co., for 9 years' electric lighting, at $15 per incandescent lamp per year.

POSITION WANTED

By an electrician who has had 4 years' experience in the handling of all types of machines made by the Canadian General Electric Co. Also took students' course at their factory and holds certificate of competency. At present engaged on installation work. Address, "Electrician," CANADIAN ELECTRICAL NEWS.

AN A 1 ELECTRICAL PLANT

Owing to the death of one of the proprietors, the Shelburne Electric Light Plant is now for sale, with real estate, brick lighting station, Wheelock engine, two dynamos and complete equipment.

For particulars address DR. NORTON or WILLIAM JELLY, Shelburne, Ont.