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CANADIAN
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AND STEAM ENGINEERING JOURNAL

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PUTTING THE PAPER ON THE INDICATOR BARREL.

NEXT to being able to pipe up a steam engine for indication, and getting up the reducing rig, the most difficult thing to beginners in indication, says Robert Grimshaw, in "Power and Transmission," is putting the paper on the barrel, especially if there is but little time, as in locomotive indication, where it is often

FIG. 1.

essential that a card be taken at a special curve or grade.

As I have had considerable experience in these lines, especially in high speed work, I have had photographs taken of the proper way in which to put the paper on the barrel, not only with both hands, which are usually available, but with one hand, which is sometimes about all that can be spared for the purpose, when one is perched on the steam chest of a locomotive making 60 miles an hour on a road that is fairly well supplied with curves.

In Fig. 1, the paper barrel proper is shown detached from the indicator, which is usually feasible to do, at least with some makes of instruments. It is held by the left hand, with the paper-clips to the right; the little finger resists the downward thrush of sliding on the card, the third finger and the thumb grasp it, and the middle and fore finger aid in guiding the paper. The latter is properly about three-fourths of an inch or an inch longer than the circumference of the paper barrel; should be of middlingly stiff paper, and preferably with square clean cut edges. In any event it should be strong enough to stand considerable lengthwise pulling without parting, and should not tear easily from the edges. Being doubled so that the two lower corners are brought together, and these being grasped by the thumb and the middle finger of the right hand, the partially formed cylinder is slid over the top of the barrel in such a way that the doubled portion (which is tightly nipped by the nails of the thumb and middle finger) shall pass the longer one of the two clips and the two parallel portions get a fair start in the slot between the two clips. Once entered, the paper is tightened around the barrel so that there shall be no slack; and once drawn home to the bottom of the slot the ends which have been held together are spread apart and smoothed down flat, in opposite directions, so that they shall not stick out and interfere with the pencil when the drum turns.

Fig. 2 shows another view of the same operation at the same time.

In most indicators the clips have not quite enough outward turn at their tips; this aids in putting on the paper readily and rapidly. Where the paper is extra thick it is well to unscrew the clips from the barrel and put in a piece of paper packing so as to make them stand out further.

With very stiff paper and the proper distance between the clips and the barrel the paper may be put on without

FIG. 2.

turning over; each end passing under both clips and the paper holding by its stiffness and by the tightness with which it is pinched between the clips and the barrel.

In Fig. 3 I show the manner of putting on the paper with only one hand—the left. In the illustration the right is shown holding the indicator, but that is because the pictures were not taken with the instrument in position on an engine; if the indicator had been screwed on to the pipe the right hand might have been cut off for all the necessity there would have been of using it.

In this operation, which is most feasible with a small barrel, a stiff paper is necessary. It is doubled up as

for putting on with both hands, and is grasped by the thumb and third (or ring) finger, but instead of the curved paper being outside the hand it is within it. The partly formed tube is then slipped over the top of the barrel and the doubled part slid into the slot and pushed home, the grasping thumb and finger gradually straightening out with the advance of the paper along the slot, so that by the time the paper has been slid all the way down, it is tightly strained and ready to have the ends turned over if that is to be done. Where the paper is

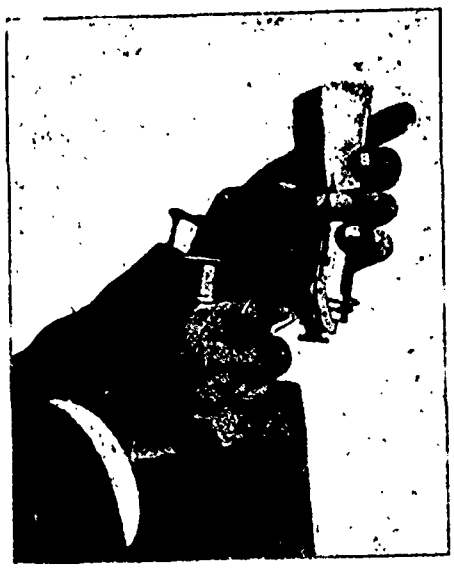


Fig. 3.

stiff enough not to require that the ends be turned over, the procedure of putting it on the barrel with only one hand is much like that where the flaps are to be turned down; a plain lapped tube is made of the paper and slipped over the top of the barrel, but when the clips are reached both ends are slid under both clips instead of only one under each.

EXPERIENCE WITH THE ELECTRIC LOCOMOTIVE IN BALTIMORE.

By Lee H. Parker.

After a short period of experimental work, electric locomotive No. 1 on August 4, 1895, took up the regular freight service through the Belt Line Tunnel of the Baltimore and Ohio Railroad in the city of Baltimore. A brief restatement of the reasons for adopting electricity in this tunnel will not be out of place.

The tunnel, which is the largest "soft dirt" tunnel ever built, extends from the present Camden passenger station of the Baltimore & Ohio Railroad a distance of 7,350 feet north under the heart of the city. Beyond the northern portal the Belt Line continues through a series of short tunnels and cuts for a distance of about five miles, where it joins the old main line. The main tunnel has an up grade of .8 per cent. going north. The heavy work that would be required of steam locomotives hauling freight trains up this grade would occasion the filling of the tunnel with so much gas and smoke as to seriously interfere with the passenger service. To show how true this is, it may be said that before the electric locomotives were put into service a few freight trains were run through the tunnel, but the result was that several men were asphyxiated, and it was therefore determined not to commence even a part of the regular freight service until the completion of the electric equipment.

The illustration, Fig. 1, gives an idea of the location of the tunnel and of what its use accomplishes. By its means a reduction of 16 minutes in the running time of the "Blue Line" trains between New York and Washington is now made possible, and it is probable that this saving will be increased later on. Moreover, all delays in winter, due to ice in the river are done away with.

Shortly after locomotive No. 1 had been put into service, and had given an exhibition of its ability to haul the heaviest freight trains, it became a matter of general interest as to how much it could pull and how fast it could go. The locomotive was, therefore, given a trial at hauling several of the passenger trains at high speeds, which it did satisfactorily to all concerned. As the conditions for operating the passenger trains entirely by the electric locomotive could not, on account of track facilities, be perfected until the new Mount Royal station, at the northern portal of the tunnel, was completed, it was decided to operate them in the meanwhile by coke-burning, steam locomotives. The new Mount Royal station will be ready during the present month, and preparations are now being made to then operate all trains, both freight and passenger, by the electric locomotives.

It was shown from the few trials made with passenger trains that not only could the guaranteed speed of 30 miles an hour be attained, but speeds of 35 and 40 miles with 500-ton trains were possible. An exhibition of high speed was made with the locomotive running light up the .8 per cent grade, and a speed of 61 miles per hour was attained for a short time without the slightest trouble from trolleys or motors. Several of the many exhibitions made by the locomotives in pulling heavy loads have been described in the newspapers. Probably the most striking was when two trains were coupled together and hauled through the tunnel. For some reason the freight trains had become "bunched" on the Washington division, and when they did get through they came so fast that it was decided to use the electric locomotive haul them two at a time. The first composite train therefore consisted of 44 cars, loaded with coal and lumber, two regular steam freight engines and a steam "pusher" engine. The whole weight was approximately 1,900 tons, and was equivalent to about 52 loaded cars. The steam locomotives did no work to assist the electric locomotive. The start was made easily and gradually, but when the train was in the tunnel and entirely on the grade, the steady, heavy pull was too severe on a defective coupling near the head of the train, and it parted. After coupling

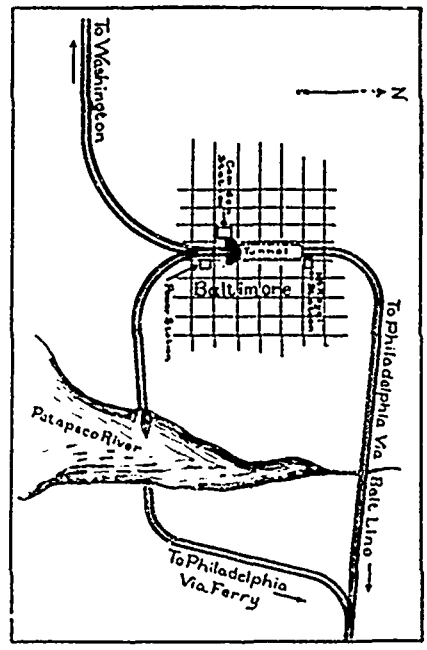


Fig. 1. Map Showing Location of the Baltimore & Ohio Tunnel in Baltimore, Md.

together again the electric locomotive started the heavy train, and with all drawbars stretched—no slack in the train—and accelerated it to a speed of 12 miles an hour without slipping a wheel and in every way with the greatest ease. It reminded one of the start of an ocean steamship, so noiseless was it and so free from any manifestations other than those of mighty power. The current recorded on the ammeter was about 2,200 amperes during the acceleration period, and, after the train was up to speed, it settled down to about 1,800 amperes. The voltage on the line was 625. By reading the amperes we were able to readily compute the draw-

bar pull, and found it to be about 63,000 pounds. All four motors were in series, and we were, therefore, getting the maximum pull for that current.

It may be of interest to steam railway engineers to know how we determined the drawbar pull exerted for each ampere of current put into the locomotive. The Pennsylvania Railroad Company's dynamometer car was secured and coupled in between the electric locomotive and a train of known weight. The weight of each car in pounds had been accurately determined beforehand. The regular two-mile haul up grade was then made. When the train was in the tunnel on the grade the pull was uniform, as was shown in the diagrams taken on the dynamometer car.

When no drawbar pull was recorded, the pen rested on base line No. 1. The height or ordinate of the irregular curve at any point represented the drawbar pull at that instant. Measuring the same in inches and subtracting a constant and then multiplying by 4,000, gave the drawbar pull in pounds; i.e., every inch in height represented 4,000 pounds. The paper traveled under the pen at a rate proportional to that of the train. An irregular line marked No. 2. Above the base line was the planimeter record, from which was determined the mean pull for any time. Having, then, the velocity or the feet per minute and the mean pounds pull exerted electric locomotive. This was undoubtedly due to the absence of the angle crank on the electric locomotive, and because its pull is uniform throughout the entire revolution of the armature. Most of the vibrations of the pen shown on these curves were due to vibrations of the dynamometer car, which was mounted on a single truck.

From test No. 1 we obtained the total drawbar pull in pounds, and, knowing the weight of the train, we found the drawbar pull to be 22+ pounds per ton of weight. Subtracting the grade pull, which, in the case of an .8 per cent. grade, is 16 pounds, we obtained 6+ pounds per ton as the train resistance. This confirms the usual allowances made for freight train resistance. These observations were taken in September, 1895, on a very hot day. During the past winter months the train resistance has increased, due no doubt to greater journal friction, caused by thickened lubricants, and we find it to be from our records about 20 per cent. to 30 per cent. greater than in September.

Test No. 2 was made after we had switched off six cars. The run was made under similar conditions and the same character of observations were made. The difference in drawbar pull of the two trains would naturally be the drawbar pull necessary for the six cars switched off. We had their exact weight and were

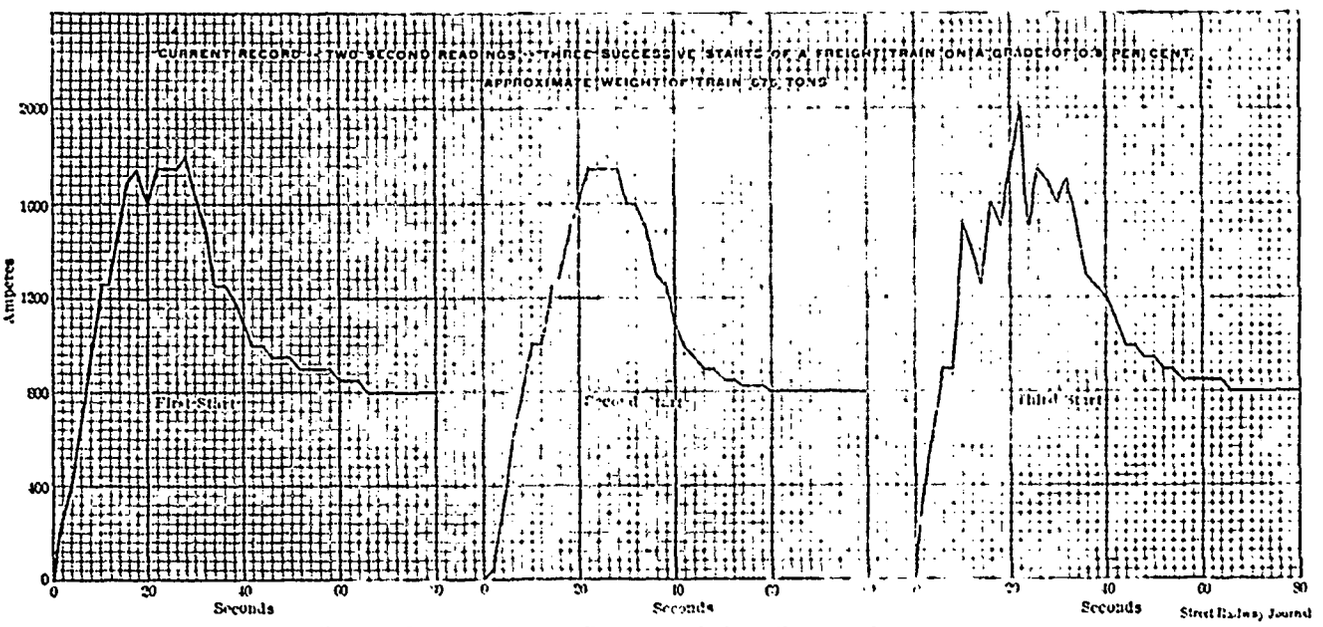


FIG. 2.—CURRENT RECORD, BALTIMORE & OHIO ELECTRIC LOCOMOTIVE.

during any period, we readily obtained the horse-power developed.

Another line on the diagram showed the chronograph record, each of the small offsets in the line occurring every five seconds. For every 100 feet the train moved, the paper moved an inch. The distance in inches between any two of the offsets gave us readily the velocity of the train. Another line represented the time readings of current and voltage which were taken in the locomotive a push button in the locomotive being electrically connected with this recording apparatus. These readings were numbered, so it was easy to tell the current at any time and location. Still another line showed a record of the different stations in the tunnel. From this we determined the location of the train at any time.

The first test showed (a) how the start was made on the down grade leading to the tunnel; (b) how, after the train was fully started, the drawbar pull dropped off; then (c) how it gradually increased as the train came on to the .8 per cent. grade in the tunnel, and (d) after the train was wholly on the grade, how even the pull was, until near the stop, when the grade increases to 1.2 per cent. Mr. Dunbar, the official of the Pennsylvania Railroad Company in charge of the car, showed some diagrams of steam locomotive work under similar conditions, and it was seen that their amplitude of vibrations was considerably greater than those of the

thus again able to find what the drawbar pull per ton was. It was a check on our first figure and was very close to it, the slight difference we found being due to one brake on the six cars being partially set during the first run and unknown to any one.

We had the readings of current during the first run, also during the second. The difference of these should show the current required to haul the six cars switched off. Dividing the difference in the drawbar pulls recorded in the two tests by the difference in current recorded, gives us directly the net drawbar pull in pounds per ampere of current. This was 28.6 pounds.

It will of course, be noted that by this method we eliminated the current required to drive the locomotive. To determine how much this was, and to check our conclusions, we divided the drawbar pull in pounds recorded in the first test by 28.6 and thus obtained the current that should exert that net drawbar pull. Subtracting this current from the current actually recorded on the locomotive would give the current required to drive the locomotive. We found it took 144 amperes. As a further check we figured similarly for the second test and obtained precisely the same; i.e., 144 amperes. So at any time now when hauling a train with the four motors in series, if we take the current indicated on the amperemeter and subtract the 144 amperes needed for the locomotive, and multiply the remainder by 28.6, we have the total net drawbar pull in pounds; and if we

divide this by the drawbar pull per ton, we get the tons of load we are pulling.

From the results obtained above we are able to show the current and drawbar pull at any moment while accelerating a train. The curves, Figs. 2 and 3, explain themselves very fully.

The acceleration curve, Fig. 3, was obtained in a rather humorous manner. It was necessary to have a means of marking the location of the locomotive at the end of every interval of two seconds. It was first attempted to count the number of incandescent lamps passed in each interval, as they are 15 feet apart, but it would often occur that the interval would end when the pointer was at some position between two lamps, and, therefore, it was impossible to estimate accurately how far we were from the next lamp. Some one suggested dropping something as a marker on the track at the expiration of each interval. That suggestion was followed by a large number of others as to the nature of that "something." The roadbed in the tunnel is very dark colored in the dim light and is rock ballasted, consequently the "something" should be light colored, non-breakable, and what would not bound out of place when dropped. Some one then suggested a handful of flour. This was adopted and it was soon tried. It was all right for slow speeds, but at 16 feet a second it was impossible to prevent it from blowing away. Having procured a large supply of flour, perhaps 20 pounds, and wishing to make use of it somehow, some one volunteered the suggestion that flour and water made dough, and that a doughball was light colored and that it would not bound, etc. It was decided at once to use doughballs, and they were the markers used in determining the distances travelled in each interval, as shown on the curves in Fig. 3.

When it comes to a comparison of the economy of electric and steam locomotives it is readily seen that it is a difficult undertaking, knowing, as we do, the figures of only a single isolated electric plant operating under special conditions and for a comparatively short time. One great incidental advantage of electric locomotives in tunnel service is that they are smokeless. This is an important moral consideration, but one which can hardly be computed in dollars and cents. But it may be of general interest to know how the actual operating expenses per engine mile of the electric locomotives during October, 1895, compare with those of a prominent and large eastern railway for the same month.

For the operation of the Baltimore & Ohio tunnel power house for the month of October, 1895, the itemized expenses were as follows:

Labor	$1,345 70
Coal ($1.35 per ton).	400 00
Oil and waste	151 20
Water	50 66
Maintenance	25 42
Total	$1,974 00

The expense on electrical locomotives was:

Motor engineers	$200 00
Oil and waste	12 16
Total	$212 16
Total expense	$2,186 16

There were hauled through the tunnel 353 trains.

Average weight of train	1,095 tons.
" time of trip	20 minutes.
" current	986 amperes.
Distance of trip	4 miles.
Total engine travel	1,412 "
" " " "idle"	3,756 "
Actual time consumed for above service	118 hours.
Idle time for month	626 "

It is customary to consider an engine with steam up as equivalent to six engine miles for each hour it is idle, so that for comparison, the actual mileage made by the engines must be increased 6 × 626 = 3,756 miles.

The large charge of labor at power house will be the same for one, two or three locomotives in service. The items coal, water and maintenance and the expense on locomotives increase with the number of locomotives in service. If we assume this increase to be proportional, the total expense and cost per engine mile are as follows:

	Total cost.	Engine miles.	Cost per engine mile.
For one locomotive...	$2,186 16	5,168	$0.423
" two locomotives	2,875 36	10,336	.278
" three "	3,564 56	15,504	.23

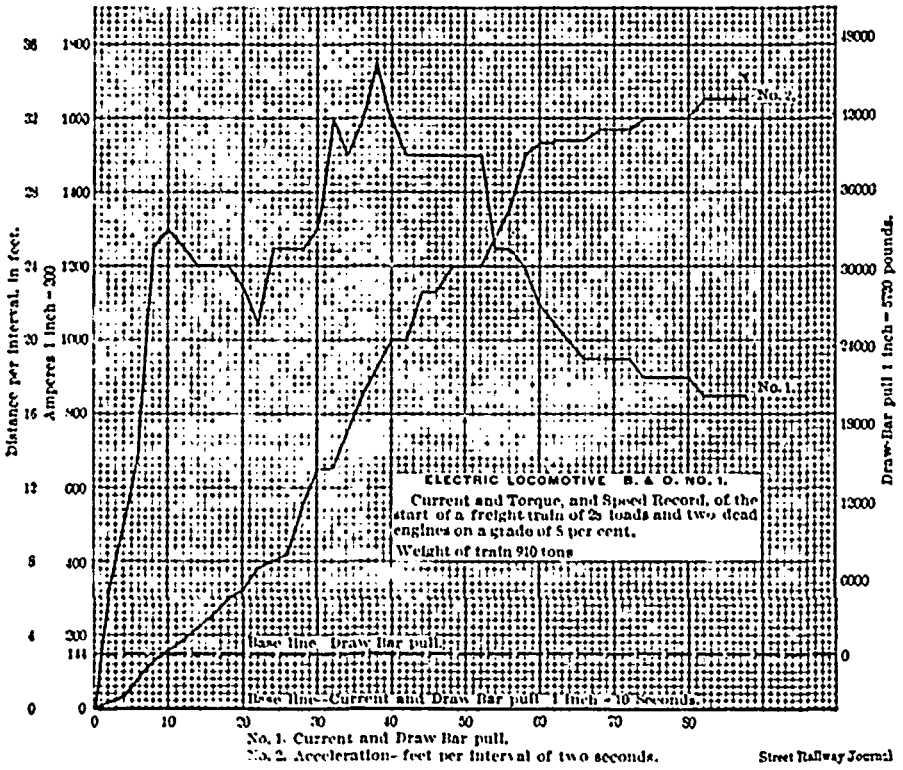


FIG. 3. ACCELERATION AND CURRENT CURVES, BALTIMORE & OHIO ELECTRIC LOCOMOTIVE.

The steam railway records referred to above are for October, 1895, and may be briefly abstracted as follows:

STEAM LOCOMOTIVE PERFORMANCE.

	Eastern division.	Western division.	Central division.	N. & W. division.	Entire line
Locomotives in service	74	57	33	28	19
Average engine mileage in service	2,834	2,996	2,293	2,305	2,70
Average cost per engine mile:					
Passenger engines	.1926	1666	.1629	.1552	1765
Freight "	2472	2656	3428	2302	2615
Switching "	1489	1650	1828	1425	1577
Work "	.2341	2258	.2617	.2169	2334
Total "	2084	.2193	.2121	1797	.2095

From the figures given above it is seen that the actual operating expenses of the electric locomotives for that particular month are about the same as for the freight locomotives on the steam railroad; i.e., 23 cents per engine mile. The service of the electric locomotives at that time was only about one-third that which it is expected they will have to do when the passenger service is taken up and the line extended the full distance.

As originally intended, a method of using to advantage the power of the station while the electric locomotives are idle is soon to be incorporated in the plant. Under the new conditions the cost per engine mile for the electric locomotives will be far under that of steam.

A comparison of the efficiencies of steam and electric

locomotives shows slightly in favor of the electric. Observations made on French railways and on the Pennsylvania railroad show that about 45 per cent. to 55 per cent. only of the indicated horse-power of steam locomotives is applied to hauling trains. The efficiency of the Baltimore & Ohio plant is in the vicinity of 60 per cent. to 65 per cent. under normal conditions.

A word may be added as to our experience with the overhead conductor system. The conductor in the tunnel has now been in position for nine months. During all this time coke-burning locomotives have been used for passenger service, with the consequent presence of a good deal of gas and vapor. For the first six months about half of the conductor was constantly wet from the drip due to leaks in the masonry. This occasioned a muddy, slimy deposit over the insulators and a considerable portion of the conductor. The porcelain insulators are almost entirely obscured in some places by this deposit and that of small particles of carbon given off by the locomotives.

Current was first turned on the line about three months after the tunnel structure was erected. The leak to earth was at first 21 amperes, but, in a day or two, this dropped to about four amperes the present leakage. The inside of the conductor was coated with a combined deposit of rust and muddy sediment. Heavy currents were taken from it by the contact shoe only with difficulty and the presence of much arcing, heating and showers of sparks. It was found impracticable to run on this surface. By applications of kerosene and frequent scraping with special shoes, a direct contact of the trolley shoe with the conductor was made possible. Although a single contact shoe then worked with little or no sparking, two shoes in tandem were adopted. Their operation through the conductor is smoother, and the contact over muddy portions of it is more nearly positive. At intervals of about three weeks the conductor is treated with kerosene, and brushing shoes are run through it, about one or two trips with these brushing shoes being all that is necessary. This serves to prevent the further accumulation of rust and to remove the sediment from the contact surfaces. An inspection shows a smooth surface over which the shoes run. Contact with the metal is seen to be in high spots and thin lines, which are slowly increasing in extent.

No considerable sparking now occurs, except at the wet places, where it is occasioned by the presence of water and sediment. With the exception of three places, about 200 feet long each, the conductor is at present dry.

The bolts to the arch of the tunnel are both galvanized and painted. They show no signs of rusting. The painting has, in general, protected the surfaces of the conductor and channels. The sides and top of the inside of the conductor are coated with rust. Most of this is hard and close grained; some of it, however, is flaky. In no case is their apparent a reduction of thickness of any of the ironwork, due to rusting. Outside the tunnels the conductor is in uniformly good condition. It adapts itself to changes of temperature without trouble. The inside of the conductor is coated with rust, but in no case has there been any trouble from it. The deposit appears to be very light. There was at no time any sparking between contact shoes and conductor outside of the tunnel.

CANADIAN ELECTRICAL ASSOCIATION.

Further progress has been made during the last month by the Executive of the Association with the arrangements for the annual convention in June.

The full list of papers has now been arranged for, and the subjects to be discussed are of a diversified and highly interesting character. The committee have been fortunate in securing the use of the council chamber of the Toronto Board of Trade for the day sessions, and of the Rotunda for an evening meeting. All familiar with the handsome building of the Toronto Board of Trade, will agree that no more desirable accommodation could be found in the city for a gathering of this character,

Arrangements for the entertainment of visitors to the convention are under way, and there promises to be nothing wanting to make the occasion compare favorably with those of like character in the past.

The exact dates for the convention have not yet been fixed, but in all probability they will be Tuesday, Wednesday and Thursday, the 16th, 17th and 18th of June.

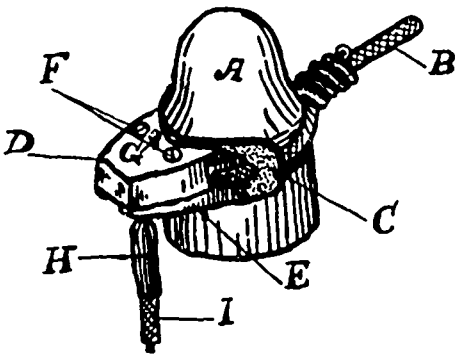
Put these dates down in your memorandum book and keep them free from other engagements in order that you may participate in the pleasure and profit of this convention.

Applications for membership in the Association are coming in to the secretary. If you are not a member, see that your name is enrolled before the June convention.

AN ARC LIGHT CONNECTOR

A new and useful device in the shape of a connector for the prevention of open circuits at the loop wires to arc lamps is about to be placed on the market by Messrs. McGill & Battle, of Thorold, Ont. The article is the first of the kind upon the market, and will be welcomed by all electric light companies as one of the most

Fig. 1.



necessary and useful devices in arc lighting. It allows the wire to swing in any direction at the loop without any danger of breaking.

The cut below, which every electrician and central station manager will understand at a glance, gives an accurate description of the device. A is the glass insulator upon the cross-arm, B is the line wire which

Fig. 2.

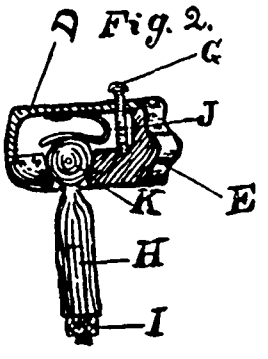
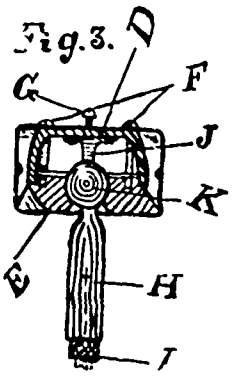


Fig. 3.



passes through a slot in the connector and around the insulator and is tied, G is a set screw holding the wire B in slot, C is a hard rubber insulation between glass and connector, D is the cap of connector held in place by screws F, E, in base of connector, H is a lug soldered to wire I looping to lamp, K (Figs. 2 and 3) is the ball head of lug working in the socket in base E, J is a spring resting on head K to insure contact.

The General Electric Co., of New York, and the Westinghouse Electric and Manufacturing Company, of Pittsburgh, Pa., who have been spending something like half a million dollars each year in a legal fight over patents, have come to an understanding with each other, whereby hostilities will cease, and the large amount hitherto spent on litigation will go into the pockets of the companies. The only persons who are likely to find fault with this settlement are the lawyers. They on the other hand have long been living in clover, and if at all thrifty have ample laid by for a rainy day.

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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.

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BERLIN BRANCH NO. 9.—Meets 2nd and 4th Saturday each month at 8 p. m. J. R. Utley, President; G. Steinmetz, Vice-President; Secretary and Treasurer, W. J. Rhodes, 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.

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ONTARIO ASSOCIATION OF STATIONARY ENGINEERS.

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

Central Station Design and Management.

AT the present moment there are, that we know of, certainly three towns in Ontario alone, that are seriously considering the question of municipal control of electric lighting plants; and in all three of these towns there is in actual operation a plant owned by a local company. Furthermore, in two of them the machinery is run by water power. Inquiry was made as to the reasons why the authorities were contemplating a step which has been so much discussed, and which is actually an unsolved problem in social science. It was pointed out to them that it was hardly a fair thing to take business out of the hands of private companies who were really doing all they could to give good service, and who had invested large sums of money in plant that would now become greatly reduced in earning capacity. The usual arguments as to the impracticability of a corporation running a plant as cheaply as a private individual, and as to the general immorality of the idea on principle, had been thoroughly thrashed out, and still the question seems likely to be settled in favor of municipal control in all three cases. It is really worth while making a careful inquiry into the circumstances which influence such a decision, in order that central station men may guard themselves against further application of a principle which means loss to themselves. It is worthy of special attention that the chief reasons in all three cases are given as (1) high prices, (2) poor service. A reference to the electric companies is met with the answer that it is impossible to run their prices down lower without actual loss; and as to the quality of the light, they do the best they can. Repairs cost a lot of money, and their incandescent service is not very remunerative; so that if they cannot make a fair amount out of the street lighting, they might as well go out of business. Ultimately, the whole thing narrows down to the electric

company saying that they are doing the best they knew how, and the municipal authorities remarking that that may be very true, but that the electric company's best is not good enough. Municipal councils are beginning to wonder why they should not only give franchises to operating companies that constitute practical monopolies, but also give contracts for street lighting that will actually enable operating companies to go into business. As to the impossibility of running prices down lower—that is in many cases entirely the fault of the central station men. Their stations are designed and operated with almost no regard to general principles; no general plan seems to be formulated as to their business policy, and the management takes no interest whatever in studying those conditions under which their plant will operate to best advantage. In another place in this issue is a paper on incandescent lamps, which shows clearly that it is as important to select a lamp with reference to the conditions under which it will be required to operate, as it is to select a horse with regard to its work. This same principle should be applied very extensively in electric lighting business. Any combination of machinery—steam or water power—and electric can do the work for which it is intended at a lowest cost. A better proportioned combination will be able to work more cheaply than one not so carefully designed; but whatever the combination is, there is some minimum operating charge to which it should be the aim of every manager to limit his expenses. Unless he studies his machinery and business, he will never do this; and until electric lighting and power business, from the fuel heap right through to the last detail of construction, and including the business theory, be carefully studied by the man in charge, the municipal control idea will gain ground.

As illustrating the results of poor designing and inexperienced management of a central station plant, we may mention a plant in another province that has recently been re-modelled by an electrical engineer of experience. Machinery to the total capacity of 1,500 lights was installed in a town of 6,000 inhabitants, with no competition from gas, or rival electric company. The fuel used was slabs and refuse from a lumber mill near by, with a small amount of coal to help out. The lumber had of course to be bought at a small price, and carted, and the calculation was it was worth taking its fuel value into consideration; coal at $3 per ton. This plant has been in operation for six years, with really excellent engines and dynamos, and the electric company has during that time paid a man a good sum to run it. The staff has consisted of an "electrician," as he is called, who is a very fairly well posted man, according to his general education; a very fair engineer and fireman, and an outside lineman. And the result has been that during six years, with all these advantages, the plant has not earned one cent above operating expenses. At different times the company has employed engineers to advise them what to do—engineers of steamboats; engineers of plants in the neighborhood, and they have always had the chief engineer of a very extensive factory in the same town to call in. These men have examined, and talked, and suggested, but no better results have followed. At last the company called in an experienced electrical engineer, and placed themselves entirely in his hands, and the result was that the method of operating the entire plant received attention, as well as the individual machines, and the new system of operating effected a saving in fuel equal to almost 1,000 lbs. of coal per night, besides many other smaller amounts which were saved in various ways. Taken separately, the various machines- boilers, engines, dynamos—were all doing very well, but taken as an electric lighting plant, they were doing very badly, simply because they were not caused to work together. You may hitch four horses to a wagon, and although they may be all willing and strong, they will all pull in different directions and do no good if driven by less than a horseman- but let that horseman take the reins, and see how he pulls them together; see how he makes each do its fair work; and see how they become --not four horses and a wagon, but one team. And is it to be supposed that the manager of an electric lighting business requires less experience, and requires less study in his business, than a "sport" does in his?

One of the troubles in the above plant, and one which was of course irreparable, was that the original design was most ill considered. The designer was a man whose business was general milling, lumber, etc., and who, because he read a book or two on some electrical subject, considered himself—and was thought by others—to be an electrical engineer. He had an interest in the plant himself, and certainly took great interest in getting everything of the best, and putting it up well. Arguing on the principle that, if ten lights go to the horse power, a 100 h. p. engine will be required to run 1,000 lights, he in the first place bought about 50 per cent. more engine power than he has ever required. This amounted to quite $1,600 unnecessarily spent. He certainly was quite right about 10 lights to the horse power; but not being an actual electrical engineer he did not know where theory should be discounted by practice. Knowing such a lot about electrical machinery, he was of course quite able to look after himself in the electrical market, so he bought, on his own responsibility, four D. C. machines of different makes and different sizes (presumably because they were cheap), and operated them, two and two, on the three-wire system. One pair was compound wound, the other shunt, and what is of importance, their characteristics were not the same. But "characteristic curves" are beneath the notice of the usual run of "electricians," so these machines were made to run together, being about as well suited to the work as a horse and cow are to pull a buggy. The town was wired up most scientifically, with feeders, pressure wires, and mains, but experiment showed subsequently that the pressure all over the system varied at the lamps from 108 volts at full load to 120 volts at light load; and our "electrician" could not understand why he could not get "decent lamps - he paid enough anyway." Being a mill man himself, he knew enough to keep his engines in good order, and to get good steam, but not having any experience in electric business, he did not know how to make his plant run properly, and that was of more importance than making only his engine do so. Here was a man with long practical experience, level-headed, and intelligent in his own business, who could'nt run an electric light plant with success. And an electrical specialist, with possibly less mechanical knowledge and experience, made large savings. Why? He had studied electric lighting as a business, and the other man had not. As to the original design of a central station, it is worth pointing out, that a man proposing to build a $2,000 house generally employs an architect to make plans, specifications, etc.; but the same man when embarking in an electric station, of which he knows far less than he does about building -- costing perhaps $8,000 to $10,000 buys and runs entirely on his own responsibility. Can it be wondered at, that under such unfortunate circumstances, central stations cannot lower their rates, in order to discredit the municipal control idea?

THE INCANDESCENT LAMP.

By George White-Fraser, E. E.

The invention of the incandescent lamp, as used to-day, was the necessary consequence of the discovery, that the passage of an electric current through a conductor causes heat in that conductor. The phenomena that we call "heat" and "light" are presentations of the same fact in different degrees; they are the effects produced on our organs by etheric waves of different lengths, but still by etheric waves, and it is, to a certain extent, within our power to generate waves that shall produce either more heat and less light, or more light and less heat. Matter is brought to a state of "incandescence" when it is raised to a high heat a bar of iron is incandescent in a degree when red hot, and in a higher degree when white hot, and it requires a higher temperature to produce incandescence than to produce heat only. Thus, when it was discovered that the passage of a current through a conductor caused heat in that conductor, it was but a step in the same direction to conclude that incandescence might be produced in that conductor by the passage of more current, and when the law governing the relation between current and temperature was experimentally formulated, then the incandescent lamp became a fact in the abstract. As the result of long, painstaking and most expensive study and experiment, Mr. Edison, Mr. Swan and others, brought it out of that domain and made it a fact in the concrete.

This law is expressed thus: H varies as C2R; or in words: the heat generated varies directly as the first power of the resistance and the second power of the current, and the obvious deduction is that, granted a large enough current or a high enough resistance, any temperature may be produced in a conductor until it actually melts. Iron can be brought to a bright white heat at a temperature of about 2700° F., but even at that high temperature, although it is in a state of incandescence, its "luminous radiation" (or that which affects the optic nerves as "light") is only about 5 per cent. of its total radiation—the other 95 per cent. being non-luminous radiations; in fact, before a temperature can be reached at which its luminous radiations would be at all considerable—it melts. Similarly with other metals that were experimented with, except platinum, and various platinum alloys. These latter were much used in the early part of the manufacture of incandescent lamps as having a high resistance and a high melting point, reaching a state of very high incandescence before attaining that temperature. As, however, these metals oxidize rapidly when exposed in a state of incandescence, to the air, it became necessary to either enclose them in a vacuum chamber or in some receptable whence the oxygen had been excluded and replaced by some other gas, such as hydrogen or nitrogen. Platinum, however, was expensive, and unsuited in other ways for lamp filaments, and finally the whole matter resolved into a search for some material which would fulfil four conditions: (a) be capable of being heated to a high temperature without melting or sensibly volatilizing; (b) possess a high specific resistance; (c) be capable of being shaped into a convenient form; (d) be reasonably inexpensive.

The fact upon which is founded the commercial application of electricity to incandescence lighting is that carbon is a substance that fills all those conditions fairly closely. It can be heated, in a vacuum, to a point perhaps even higher than the melting point of platinum, without suffering any very rapid deterioration; it possesses a very high electrical resistance, in certain forms it is capable of being easily manipulated and shaped, and intrinsically it is inexpensive.

The problem was, however, by no means solved merely by the discovery that carbon was the best material to use. There are very many substances which are capable of carbonization—wood, paper, thread, silk and others—and these required to be tested in various ways, and by different processes, before becoming suitable. After being properly carbonized they had to be perfectly protected from contact with the atmosphere, otherwise the oxygen present therein would cause an immediate combustion of the carbon. The production, and which was more difficult, the maintenance of the vacuum, was a most complicated matter. The chamber must be of one single material, otherwise air would leak in through the join. This difficulty was met by the use of an all-glass bulb, from which the air could easily be exhausted. The next point was to lead the current in through the glass to the carbon without letting the air through the holes. Platinum wires solved this, because they could be sealed or cemented to the glass; and as platinum and glass possess very closely the same co-efficient of expansion and contraction, this cementing would not not be broken when the current was flowing. So that, speaking generally, an incandescent lamp requires a carbon filament, enclosed in an all glass bulb, from which all the air has been exhausted, and through which the current is lead to the enclosed carbon by means of very thin platinum wires sealed to the glass.

The process of carbonization of the filamentary material may very considerably affect the finished product. The temperature to which the raw material is exposed determines its density, its elasticity, its electrical resistance, its durability, and of course the nature of the raw material itself primarily determines its value as a filament. Different manufacturers use widely different materials, and very various processes, and it is very reasonably to be expected that their results will also vary widely, as, in fact, they actually do. One process will result in the production of a hard, dense filament of a very graphic nature and lasting quality, while another will turn out a softer one, which, while perhaps attaining a higher state of incandescence for a time at a less expenditure of energy, will disintegrate more rapidly and last a short time. The comparative values of the different products can only be established by actual tests, and by a very careful tabulation and summarization of results, and it is greatly to be deplored that the economies of the incandescent lamp, which is the actual raison d'etre of the central station, should receive so little study at the hands of electrical men.

The design and construction of a generator is the subject of an immense mass of technical literature, studied by the whole electrical profession, with the result that we have dynamos working at an electrical efficiency of 96 and 97 per cent. How many study the incandescent lamp? It has been observed to possess a luminous efficiency of about 3 per cent. only, i. e., it wastes 32 times as much energy as it turns to useful account. Most conscientious engineers and electricians study how to make the best use of their coal, their engines, their dynamos, their lines. How many study how to make the best use of their lamps? and yet neither boiler, engine, dynamo, or lines would have any existence were it not for those little 25 cent lamps. The fact is, it is not properly understood, that there is just as much to study in the lamps as there is in a dynamo or in a steam engine, and that just as much money can be lost every year by injudicious purchase, or by haphazard operation of lamps, as by the same maltreatment of any other apparatus. The loss occasioned by one indifferent lamp is no doubt insignificant, but if that sum be multiplied by, say—1000, which would be an average sized installation, it would mount up, in the course of a year, to a startling sum.

Without describing the processes in the manufacture it will be sufficient to give the results of many tests made by different observers in both Europe and on this continent, on all kinds of lamps, and under all conditions of service; and thence to draw conclusions which will suggest the proper way to purchase and the proper way to run them.

A manufacturing company, when selling lamps, generally gives guarantees as to their candle-power, their wattage, their voltage, their life. Assuming a general case, these guarantees will be for 16 candle power lamps, of 104 volts each, requiring an expenditure of 4 watts per candle, and an average life of 800 hours. Now, this guarantee is understood usually to mean that if these lamps are operated at 104 volts each, they will give 16 candle power each; will require an expenditure of 64 watts each, and that they will last, on an average, for 800 hours of use, during which time those 16 candle powers and 64 watts remain so. A proper set of tests will, however, show that as a matter of fact

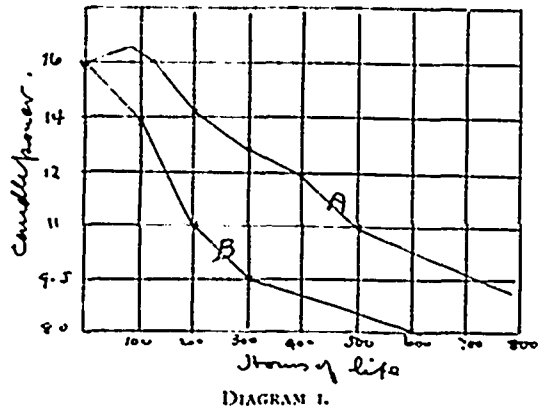


Diagram I.

these quantities by no means retain their original values during the life of the lamp, and that as it remains longer in use it's candle power decreases; it's wattage increases both relatively and absolutely, and that if it be desired to keep it up to its rated candle power, its voltage must be considerably raised. These are all defects which seem to be necessarily inherent in some degree in every lamp, and quite impossible to eradicate entirely. The most intelligent manufacturer endeavors merely to minimize evils which he cannot avoid; and the intelligent operator will study those conditions under which apparatus, which is necessarily and admittedly imperfect, can be operated to the best advantage.

Here is a diagram constructed from a large series of tests made

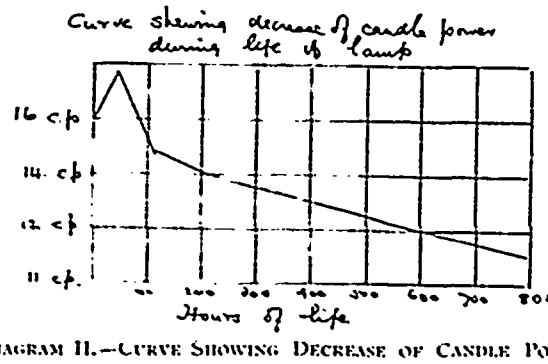


Diagram II.—Curve Showing Decrease of Candle Power During Life of Lamp Under Ordinary Operating Conditions.

by a well-known authority on lamps, showing, (for every superior make) how the candle power diminishes as the lamp grows older, granting that the voltage is kept constant all the time as it should be. When new the lamp gave 16 c. p., when it had burnt for 100

hours the c. p. had fallen to about 15 c. p., at 200 hours to 14, and so on until at 800 hours, which is the life generally guaranteed by the makers, it gave no more than about 11½ c. p., and this, remember, for a superior lamp operated under ideal, laboratory conditions. What would happen to the same lamp operated under the ordinary central station conditions of a very varying voltage is shown in diagram 2. Here it will be seen that the lamp falls to 11 c. p. at 500 hours (curve A). Curve B. is from an ordinary commercial lamp, neither specially good nor very bad, and it is seen that it reaches 8 candle power at 600 hours. (curve B).

If this were the only matter that went wrong with lamps central stations might not care so much, for the decrease in candle power would appear to affect only the customer. As a fact, however, central stations have a very considerable interest in this depreciation, for the longer a lamp is continued in use, the more power does it take, relatively to run it. Diagram 3 shows this absolute increase of wattage. Curve A is taken from a 4 watt lamp, B from a 3 watt, and it will be seen that the former running the first 500 hours of its life has run at less than that wattage, but that after that period it has run up to quite as much in excess. Curve B is even more instructive. This lamp has started at 2.8 watts (less than rating) has come up to its rating at about 250 hours, and from that time up to 900 hours has continually required more and more energy per candle power to keep it running until that age, such c. p. as it was given required 3.74 watts, almost 25 per cent. more energy per candle power. Curve C is from a 3½ watt lamp, such as is very generally installed in all sized plants throughout Canada, and is very similar in every way to Curve B, showing that such increase of wattage is not accidental, but is to be expected in all lamps. In this last curve it is seen that at 900 hours

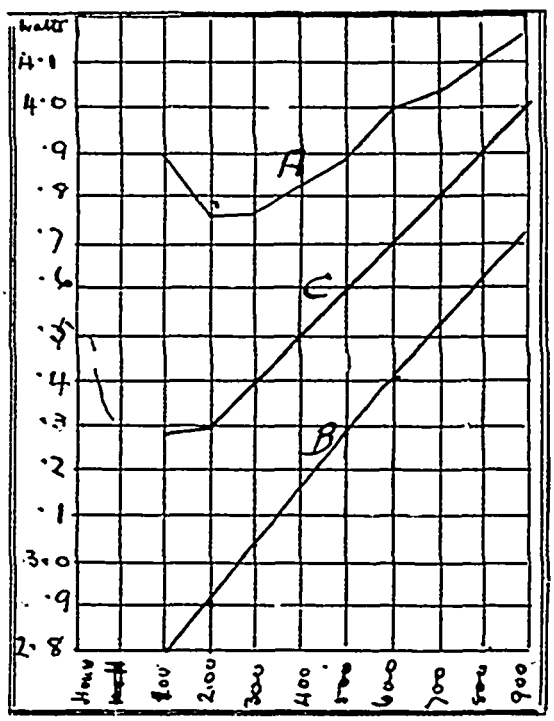


Diagram III.—Curves Showing Increase of Watts per Candle Power as Lamp Grows Older.

the lamp actually requires an expenditure of 16 per cent. more energy per candle power than it was guaranteed for. In a 1000 light plant running for ten hours every night with coal at $3.00 per ton, this excess at 900 hours will mean 80 cents extra per night, or $288 extra per year; if the lamps are to be kept at their proper candle power.

I would particularly point out that these values of wattage per candle powers are average values. Look at Curve C, at 900 hours the wattage per candle power is 4. Now this means that when the lamp has been used for 900 hours the total energy furnished to that lamp during its 900 hours of life has been so great that it amounts to 4 watts per candle power hour. This lamp was sold as a 3½ watt lamp, it however requires half a watt more per c. p. during 900 hours, and if it were burned longer would require continually more and more until it broke. As to the candle power of these lamps at 900 hours A had diminished to 13¼, B to 10 c. p., C to 11¾ c. p., so that taking their whole life, not one of these lamps had given an average candle power equal to their rating, A had given an average candle power during 900 hours of 13¼, B of 12¾, C of 14 c. p. Now all these results were obtained on a trial circuit where conditions were very closely such as gave the lamps a fair chance. But on a regular commercial circuit the voltage will vary considerably with the load. Transformers will vary—the very best of them at least one per cent. between full and no load. The branches, mains and feeders are always so calculated that a drop of 2 or 3 per cent. more between full and no load is allowed for, so that it will usually happen that lamps are subjected to a variation of at least 5 per cent. voltage, i. e., they are liable to run at 5 per cent too high a pressure. Now this is a condition that no ordinary commercial lamp will stand for long and maintain its candle power. Diagram 4 shows the results of running lamps at too high a pressure, and is taken from an actual series of tests. A 16 c. p. 108 volt lamp was run at that pressure, and at 500 hours had fallen to about 11 c. p.; a similar lamp was run at 110 volts (two per cent. too high) and at that age had fallen to a little less; running at 112 (or 4 per cent. high) reduced it to 11 c. p. at 450 hours, at 114 or 6 per cent. high, caused it to drop to 12 c. p. at 300 hours, when it broke, at 116 volts or 8 per cent. high, caused it to drop to 14 c. p. at 200 hours, when it burnt out. This lamp was the ordinary 3½ watt lamp, and fairly represents the candle power on the large majority of circuits in this country. The diagram shows the great necessity of keeping the pressure as nearly constant as possible over the whole distribution system, and incidentally it leads to a consideration of a very important matter, with which all central station managers should familiarize themselves.

(Concluded in Next Issue.)

PERSONAL.

Mr. Samuel Edison, the father of Mr. Thos. Edison, the inventor, died at Norwalk, Ohio, aged 92 years.

Mr. S. Potter has been appointed chief engineer of the new street railway power station at London, Ont.

Mr. H. A. Moore has been appointed general superintendent of the Trenton Electric Co., with offices in Trenton.

Mr. M. Neilson, of St. Thomas, Ont., has been appointed assistant superintendent of the St. John Street Railway.

Mr. F. H. Badger, manager of the Montmorency Electric Power Company, returned recently from a business trip to New York.

Mr. Granville C. Cunningham, managing-director of the Montreal Street Railway Co., has recently returned from a trip to England.

Mr. J. W. Kammerer has lately returned from the convention of the Stanley Manufacturing Company's representatives at Pittsfield, Mass.

Mr. W. T. Jennings, Mem. Inst. C. E., consulting engineer, has removed his office to the Molsons bank building, corner of King and Bay streets, Toronto.

Mr. Barren, of Toronto, a member of the Canadian General Electric Co., has been appointed manager of the Brantford Street Railway Co., in lieu of Mr. Madden, who recently resigned.

Mr. J. A. Kerr, of Peterborough, has been appointed electrician of the Galt, Preston & Hespeler Electric Railway in succession to Mr. Lea, who has accepted a position with the Toronto Junction Railway.

The employees of the Galt, Preston & Hespeler Street Railway Company presented Mr. W. A. Lea, the retiring electrical superintendent, with a gold-headed cane, handsomely engraved, and a large marble clock.

Mr. A. J. Nelles has resigned his position as superintendent of the Hamilton, Grimsby and Beamsville Railway, and has been succeeded by Mr. Clyde K. Green, electrician. Mr. Alex. Wilson continues as assistant-superintendent.

Mr. F. W. Warren, manager of the street railway at St. John, N.B., is announced to have assumed the position of general manager of the railways controlled by Mr. James Ross. Mr. Neilson will probably succeed Mr. Warren as manager of the St. John railway.

We regret to announce the death on March 10th, at his residence in Brooklyn, N.Y., of Mr. Nat. W. Pratt, President of the Babcock & Wilcox Co. Mr. Pratt was born in Baltimore, in 1852, of old American stock; the families on both father's and mother's side settled in Plymouth County, Mass., in 1830. The father, William Pratt, was during the war, superintendent of the Burnside armories, in Providence, R.I. Young Pratt entered the employ of the firm of Babcock & Wilcox in 1870. His energy, engineering ability and remarkable business qualifications won the confidence of his employers. In 1881 the Babcock & Wilcox Co. was organized as a corporation. He became treasurer and manager of the new company, retaining the position until at the death of Geo. H. Babcock, in 1893, he was elected president. Combining engineering knowledge and inventive genius with extraordinary business qualifications, to his efforts was largely due the wonderful success achieved by the Babcock & Wilcox boiler throughout the civilized world. As illustrating his versatility, In 1884 he became consulting engineer to the Dynamite Gun Co. Under his designs and patents the first successful dynamite gun was built. It was with this gun, 8 inch caliber and 60 feet long, that the experiments in throwing aerial torpedos was conducted at Fort Lafayette, N. Y. By his extraordinary sagacity and sound business judgment the business that engrossed his life from a very small beginning developed and grew enormously, and the best monument that he leaves behind him is the world-wide fame of the Babcock & Wilcox boiler. Mr. Pratt was noted not only for his sound business judgment and remarkable energy, but also for his generosity and kindness of heart. Even his business opponents admired him for his singular aggressiveness as applied to business, and by all with whom he came in contact, both at home and in trade, he was universally loved and admired. Mr. Pratt leaves an aged father and mother; also a wife and three children. He was a member of the American Society of Mechanical Engineers, American Institute of Mining Engineers, American Naval Institute; also a member of the Engineers' Club of New York City.

CANADIAN ASSOCIATION OF STATIONARY ENGINEERS.

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

TORONTO NO. 1.

At a meeting of Toronto No. 1, held on March 4th, a paper was read by Bro. John Fox, on "The Artificial Production of Ice." During the evening gold-headed canes were presented to Bros. James Huggett, E. J. Philip and Geo. Fowler, in recognition of their services in connection with the new hall. Four new members have recently been initiated. On Wednesday evening, last, questions were asked and replied to bearing on "Boiler Construction." It was announced that the wives and lady friends of the members would give an "at home" during the last week in April. The question of a summer excursion was also considered, and a committee will be appointed to make arrangements and report.

HAMILTON NO. 2.

The above Association held its annual banquet at the Commercial hotel on the evening of Thursday, April 2nd. There were present upwards of eighty members and guests. The arrangements were complete, and the banquet throughout was most successful.

The city of Hamilton was represented by Mayor Tuckett and Ald. McKeown, while the deputation from Toronto No. 1 consisted of Bros. Edkins, Wickens, Huggett, Fox, Bain, Blackgrove and Sutton. Bro. H. Gerry was present on behalf of Guelph Association.

The chair was filled by Bro. R. Mackie, past-president of No. 2, and the vice-chair by Bro. W. R. Cornish, vice-president.

After the ample supply of viands provided by Mr. H. Maxey had received proper attention, the following toast list was proceeded with: "The Queen," "The Governor-General of Canada"; "Dominion and Local Legislatures"; "Army and Navy"; "The Mayor and Corporation," responded to by Mayor Tuckett and Ald. McKeown; "Executive Head," replied to by Bro. W. G. Blackgrove, Executive President; "Manufacturers," Mayor Tuckett and Mr. Jas. McLaughlin, respondents; "Sister Associations," responded to by Bro. A. E. Edkins, Toronto, and H. Gerry, Guelph; "Learned Professions," acknowledged by Bro. R. C. Pettigrew, Hamilton; "The Press," responded to by the ELECTRICAL NEWS AND STEAM ENGINEERING JOURNAL; The toast of "The Ladies," brought responses from Bros. Huggett and Fox, of Toronto. Bro. Edkins proposed the Toast of "Hamilton No. 2," and coupled therewith the names of Bros. R. Mackie and W. R. Cornish. Bro. Mackie then proposed the health of the accompanyist and the other gentlemen who had placed their talent at the disposal of the company. The toast of the "Host and Hostess" concluded the list.

The musical talent of the evening, which was of a high-class character, was as follows: song, "Longshoreman," Mr. Thomas, Hamilton; song, "The Maple Leaf," Mr. Flint, duet, Messrs. Heslop and Wilson; song, Mr. T. Davies, Hamilton; trio, Messrs. Wilson, Davies and Heslop; and songs by Messrs. Heslop, Davies, Flint and Wilson.

The members of Hamilton Association are noted for their hospitality to visiting brethren, and the success which attended their annual dinner is gratifying to members of other Associations as well as to Hamilton No. 2. The Toronto delegation speak of the Hamilton members as adepts in the matter of entertaining visitors.

BRANTFORD NO. 4.

Jos. Ogle, secretary, reports that the meetings of Brantford No. 4 are well attended. At the last meeting Bro. Walker read a paper on "Combustion," after which the evening was devoted to blackboard exercises.

BERLIN NO. 9.

W. J. Rhodes, secretary, sends the following report from Berlin No. 9: "I am requested by the members to let you know how we are getting along. Our officers are: President, J. R. Uttley; Vice-President, Geo. Steinmetz; Secretary and Treasurer, W. J. Rhodes, Berlin P. O. We meet every other Saturday evening and have a good attendance. The subjects for last meeting were "Definitions of Technical Terms," "Different Pressures," etc. At our last meeting a motion was carried: "That all members in good standing order through the secretary a membership certificate at 50 cents from Executive Council C. A. S. E. A lively chat was created on "Crosshead Does it Stop," it being laid over for another meeting. Very little lubricant is necessary for No. 9, as all bearings run very smoothly at present. A little of superior quality lasts well.

KINGSTON NO. 10.

Kingston No. 10 have been holding very interesting meetings since the first of the year, and have added four new members, and expect two or three initiations at our next meeting. At our regular meeting on the 4th of February, a committee was appointed to interview the Honorable William Harty and solicit his support and influence in favor of the Stationary Engineers' Bill, now pending before the Provincial house, and we expect him to give it his hearty support as he did on the last occasion.

The members are suggesting ways and means of entertaining the delegates and visiting brethren to the convention of Stationary Engineers, to be held here next August, and are going to try to keep up on that occasion Kingston's reputation for hospitality.

JOHN TANDVIN, Secretary.

KINCARDINE NO. 12.

The past month has been a very profitable one for No. 12. Although our membership is not large, yet the members take much interest in them. We have been considering the subject of combustion. The subject for next month has not yet been decided upon. Altogether, I think the members are pleased with the progress we are making.

PERCY C. WALKER, Secretary.

BROCKVILLE NO. 15.

W. Robinson, recording secretary, writes: Our Association for the past month has kept up to the usual standard of progress. All the members, or most of them, take a lively interest in the prosperity of our branch here. I am sure that No. 15 has made as good a showing as any of the sister lodges, although we have had less facilities than those possessed by large societies.

CARLETON PLACE NO. 16.

Mr J. McKay, president, sends the following report of branch No. 16: At the last meeting a very interesting discussion took place as to whether it was more difficult to force water over the top of a tank or through the bottom. Mr. J. Burnie, of the C. P. R. pumps, was present, and gave his experience in the matter. By actual tests he said it was much easier to force the water through the bottoms of the tanks. At the next meeting the subject to be discussed will be "The Injector how high the different injectors have been known to lift and the lowest pressure known to start."

We are still moving slowly and look forward to a prosperous year.

A PECULIAR TYPE OF "ELECTRICIAN."

THE following unique communication recently found its way into the office of the ELECTRICAL NEWS, with a request that it be published:

34 Davenport Road
City

Dear Sir

Will you kindly inform me how much electricians get in toronto an if there is any chance for one now i enclose post card for answer i shall be very grateful to you to return answer at ounce, your humble servant fred

P. S

An were to apply

In the light of the above we certainly require a broad definition of the title "Electrician."

THE LATE MR. JOHN GOLDIE.

After an illness of lengthy duration the grim hand of death has removed one of the most prominent manufacturers of the Dominion, in the person of Mr. John Goldie, of the Goldie & McCulloch Company, of Galt. His death occurred at his home in that city on the 26th of March. For some weeks his life had been dispaired of, but his splendid vitality, notwithstanding his advanced age, enabled him to offer strong resistance to the ravages of disease.

The late Mr. Goldie was a well-known, honorable and highly respected citizen, and to him is due a large portion of the prosperity enjoyed by the town in which he lived. Always having taken an active interest in all matters tending to promote the welfare of the community, his valuable counsel and assistance will be greatly missed. He was a man of sterling qualities, firm, but not obstinate in his convictions, energetic and reliable in all his business dealings. He was a liberal in politics, but has never sought any public favors. In religion he was a Presbyterian.

Mr. Goldie was a native of Scotland, having been born near the town of Ayr, on the banks of Doon, Ayrshire, in 1822. The subject of our sketch received only a meagre educational training at the school in Kilroy, a small village near his home. When quite young he was apprenticed to learn the millwright's trade. He came to America in 1844 and settled at Greenfield, near Ayr, obtaining employment for over a year with Mr. Geo. Baird, a well-known contractor of Blanford township. He afterwards spent

Mr. John Goldie.

eighteen months in Montreal, and was then engaged as millwright by the late Jas. Crombie, of Galt. Subsequently he went into partnership in a saw mill in Esquesing township, remaining in the business several years. In 1859 he returned to Galt, when he and Mr. Hugh McCulloch formed a partnership and bought out the foundry business of Jas. Crombie. At that time twenty-two hands were employed. The business steadily grew, and nearly every year the manufacture of new lines of machinery was commenced. From their factory many skillful mechanics were sent out, who have since given proof of their excellent training. In 1891, the business had grown to such an extent that it was deemed advisable to turn it into a joint stock company, which was done under a Dominion charter, with a capital stock of $700,000. The original shareholders were John Goldie, Hugh McCulloch, David Goldie, Hugh McCulloch, jr., and R. O. McCulloch. Since then Mr. A. R. Goldie and other members of the two families have been taken in. At the present time the name of the company is known throughout the Dominion as progressive and reliable manufacturers of safes, engines, boilers, mill machinery, etc.

The use of three drops of cylinder oil per minute on a 300 h. p. engine has been found all that was necessary to prevent injury to the cylinder and valves.

Where rapid circulation is maintained, the results in the transmission of heat are about nine times as great as where the medium to be heated is quiet. This applies also where there is but little difference in the temperature.

The Resistance of Rivets.—Some time ago Mr. Dupuy was selected by the ministry of public works, France, to make a special inquiry into the causes of deterioration of metallic structures. Experiments were first made on rivets, and a number of conclusions arrived at. A few of them are as follows: Rivets were found to not exactly fill the rivet holes, but to clamp the plates together with a pressure that gives rise to a resistance to sliding equivalent to a weld, which resistance is greater as the limit of the elasticity for rivet material is higher. The effort necessary to shear rivets per square inch of the section to be sheared is not less than three-fourths of the tensile strength of the rivets per square inch. Mr. Dupuy draws from his conclusions some rules for bridge work, among which are the following: The calculation of riveting cannot be based upon the permissible stress in the test bars, the coefficients of safety relating to the rivets not depending in any way on those adopted for the bars.

RATING AND BEHAVIOR OF FUSE WIRES.

Messrs. W. M. Stine, H. E. Gaytes and C. E. Freeman, in a paper on the above subject, presented to the American Institute of Electrical Engineers, summarize as follows some of the practical conclusions deduced:

1. Covered fuses are more sensitive than open ones.
2. Fuse wire should be rated for its carrying capacity for the ordinary lengths employed.
2. (a) When fusing a circuit, the distance between the terminals should be considered.
3. On important circuits, fuses should be frequently renewed.
4. The inertia of a fuse for high currents must be considered when protecting special devices.
5. Fuses should be operated under normal conditions to insure certainty of results.
6. Fuses up to five amperes should be at least 1½" long, ½" to be added for each increment of five amperes capacity.
7. Round fuse wire should not be employed in excess of 30 amperes capacity. For higher currents flat ribbons exceeding 4" in length should be employed.

ELECTRIC UNITS.

The five principal units of current electricity are:—The volt, ampere, ohm, coulombe and farad.

The volt is the unit of intensity. It may be compared with the steam pressure of a steam engine, or the pressure of a column of water flowing in a vertical pipe.

The ohm is the unit of resistance, and may be compared to the resistance of a pipe to the water flowing in it.

The ampere is the measure of rate of flow of current, and it is that quantity which would pass through a circuit having one ohm resistance, when urged by a pressure of one volt. It does not include the idea of time or of real pressure. Thus we might have an ampere flowing through a circuit as the result of either the smallest fraction of a volt, or of 1,000,000 volts depending upon the resistance of the circuit. The quantity flowing, however, would be exactly the same as that resulting from one volt through one ohm.

The coulomb is the measure of quantity of flow; that is, current flowing at the rate of one ampere for one second, and is also termed the ampere-second. This quantity is so small, that in practical battery, electric light and motor work, the ampere-hour is taken as the measure of quantity.

The farad is the measure of capacity. The capacity of a surface which can hold one coulomb of electricity at a voltage or pressure of one volt is a farad. It may be compared with the capacity of a container filled with gas. Under a certain pressure it will hold a certain amount of gas. Double the pressure and it will hold double the amount of gas, etc. Similarly a surface which would hold one coulomb at a pressure of one volt, would hold two coulombs at a pressure of two volts, etc.

The watt is the mechanical unit of work-power. The number of watts may be obtained by multiplying the number expressing the volts, or the electromotive force, by the number expressing the amperage, or the current. A force of seven hundred and forty-six watts equals one horse-power.

One must not fall into the error of considering electricity a fluid, because of these comparisons. The units may be very easily explained by the analogy of a current of fluid, but the ancient theory that electricity is an "imponderable fluid" is now considered untenable.

When a belt gets saturated with waste oil, an application of ground chalk will soon absorb the oil and make the belt workable.

Best results from the distribution of steam in the cylinder of an engine is when the mean effective pressure is from 42 to 45 per cent. that of the initial, the latter number referring to multiple expansion engines.

After using your steam engine indicator, remove all the drops of water from it before putting it away. Because it is made of metal that is supposed to resist the action of rust, it does not necessarily follow that water will do it any good, or fail to do it harm.

MR. J. J. YORK.

PRESIDENT MONTREAL ASSOCIATION NO. 1, C. A. S. E.

THE president of Montreal Association No. 1, C.A.S.E., Mr. J. J. York, began his apprenticeship with Prowse Bros., of Montreal, at the age of 13 years. Three years afterwards he was transferred to the steam-fitting department, and four years later was sent to Winnipeg to heat the first building ever heated there by means of hot water or steam. The buildings to be heated were the Hudson Bay Company's new stores, the St. Boniface College and the Bank of Montreal. He also put the first gas pipes in any building in Winnipeg, and on completion of the contracts refused several offers to remain there, having made up his mind to go back to Montreal. Upon returning he entered the employ of Mr. John Date, for a short time, after which he secured a position in the machine shop of the St. Lawrence Sugar Refinery Co., and shortly after was made first assistant engineer, which position he held until September, 1892. During this time his employers doubled his salary without solicitation. During the time he was with this company he took charge of the first Edison dynamo operated in Montreal, which, by the way, is

MR. J. J. YORK.

still running, in spite of the fact that it was once under water for two days, and once through fire. On resigning his position with the company he was appointed outside foreman for Messrs. Garth & Co., who gave him charge of the heating, plumbing and ventilating of the Board of Trade building. On the completion of this work the Board of Trade were pleased to appoint him superintendent of the building, the position which he now holds, and he has since installed a most modern lighting plant, which was described in these columns a short time ago. He is President of the Montreal Association for the second time, has been one year Executive Secretary, and one year Executive President. He holds first class licenses from the city of Montreal and also from the Ontario Association Stationary Engineers.

The Burk's Falls Water, Light and Power Company have met with such a degree of success as to warrant them in considering the enlargement of their facilities at an early day.

The Canadian General Electric Company have closed a contract with Messrs. Kilmer, Crawford and McIntyre, of Durham, Ont., for a 75 kilowatt monocyclic alternator. The motive power will be obtained from a water power at Aberdeen, 4½ miles distant from Durham. It is intended to supply current from the monocyclic circuit for both lights and motors.

The directors of the Nelson Electric Light Co., of Nelson, B.C., which has recently been organized, are: John Houston, president and manager; J. A. Gilker, vice-president; W. J. Goepel, secretary; W. F. Teetzel, treasurer; J. J. Malone, John Johnson and J. H. Matheson, finance committee. The company obtain their power from Cottonwood Creek. The water is brought from dam to penstock in wooden flume, and from penstock to power house, 300 feet, in 14 in. steel pipe, the fall being 164 feet. One Pelton water wheel and two 30 kilowatt bi-polar dynamos of the Edison type are in use. Direct incandescent lights are used for commercial purposes and arc lights for street lighting.

QUESTIONS AND ANSWERS.

"F. L. T.," Parry Sound, Ont., writes:—What causes a spark on the rectifier of an alternator at different points on rectifier, not near the brushes? I think they only appear when the brushes spark through. Is it dirt? Sometimes it appears on top and sometimes on sides, above but not near brushes.

ANSWER.—The sparking on the "rectifier," as you call it, is probably caused by small particles of copper dust that stick to the insulation between the segments, and so assist a spark across. Clean well with fine sandpaper, and pick out any particles that you can see.

"Lineman" writes:—(1.) Please give a rule to find the number of centimetres there are in any sized copper wire used in electric lighting. (2.) Are there any tables published giving the gauge of wire and the diameter of the same? Also the number of circular mils, or any other data useful to a lineman.

ANSWER.—(1.) There is no rule for calculating how many circular mils there are in a given size of wire. It is purely arbitrary convention to say that a wire containing 10381 c. m. shall be called a No. 10 wire B. & S. gauge. There are even several gauges, standardized by different makers, and it is always well to specify, when ordering wire, what gauge it is. Thus, there is Brown & Sharpe W. G.; Birmingham W. G.; American W. G. (2.) There are plenty tables published giving all the information you require. See following table:

TABLE OF DIMENSIONS AND RESISTANCES OF COPPER WIRE.

No. B. & S.	Diam. Mils.	Circular Mils.	Lbs. per 1000 ft. Ins'd.	Ohms per 1000 ft.
0000	460.000	211600.0	800.	.04904
000	409.640	167805.0	666.	.06184
00	364.800	133079.0	500.	.07797
0	324.950	105592.5	363.	.09827
1	289.300	83694.5	313.	.12398
2	257.630	66373.2	250.	.15633
3	229.420	52633.5	200.	.19714
4	204.310	41742.6	144.	.24858
5	181.940	33102.2	125.	.31346
6	162.020	26250.5	105.	.39528
7	144.280	20816.7	87.	.49845
8	128.490	16508.7	69.	.62849
9	114.430	13094.2		.79242
10	101.890	10381.6	50.	.99948
11	90.742	8234.11		1.2602
12	80.808	6529.94	31.	1.5890
13	71.961	5178.39		2.0037
14	64.084	4106.76	22.	2.5266
15	57.068	3256.76		3.1860
16	50.820	2582.67	14.	4.0176
17	45.257	2048.20		5.0660
18	40.303	1624.33	11.	6.3880

"L. O'C.," Durham, Ont., writes: I notice in your last issue "F. & T., Walkerton, wish to know why alternating current cannot be used for railway service. I am of the same opinion as they, only instead of two collectors I would use a three-phase current, with, of course, three collectors; but my idea is that only two trolleys would be necessary, as the ground could be used for the third wire as it is for the return wire on the present system. Then by the use of transformers the voltage could be kept low, and as the primary wires would not be grounded, they could be used for light or power purposes as well. If this would work I should think it would pay, especially if water-power was available. Possibly I am "away off" in this, as I am by no means an expert, but if so kindly correct.

ANSWER.—We would refer you to the answer given to "F. & T.," Walkerton, in last issue. If it had been practically possible to apply two or three-phase currents to railway service, you may be quite sure it would have been done long ago. It is quite safe to leave the solution of this problem to Steinmetz, Scott, and other scientific electricians. You are quite right, however, that current could be transmitted, transformed, and utilized by two trolleys; but that will not get over the fact that, except for long and continuous travel, the in-

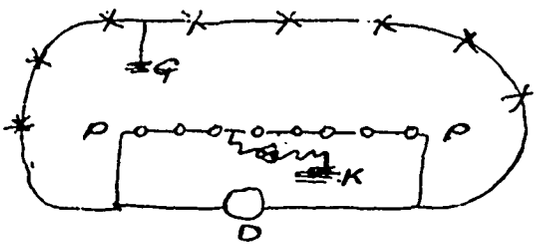
duction motor is not at present suited for traction purposes.

"Jim" writes: (1.) A cylinder is 30 inches in diameter and 30 inches long, average cast iron. What thickness will it require to be to withstand 100 lbs. pressure of steam per square inch? (2.) What thickness must the head of it be (the head to be flat), and give rule to work it out? (3.) What sized studs should be used, and how many should be used to make a good joint? Please work it out so I can figure on different sized cylinders.

ANSWER.—(1.) This is a matter that cannot be answered definitely. The thickness will depend on the quality of the iron, amongst other things. (2.) See answer to (1.) (3.) For all these calculations we recommend any standard work on engine designing. It is impossible to give answers that would satisfy, without assuming so many quantities, and explaining so much, and qualifying nearly every statement, that confusion would result. If you desire to study engine building, we earnestly recommend you to start at the very beginning, and study the theory of steam, strength of materials, and the science of strains and stresses.

"Induction," Arnprior, Ont., writes: (1.) Is there any other practical method of locating an open circuit on an arc line, without the use of a galvanometer? If so, describe it. (2.) How can I clean incandescent lamps that have become burnt or smoked in a building at the time of a fire?

ANSWER. (1.) Do you mean actually an "open circuit," or only a "ground?" It might be interesting to other central stations if you would describe your method of locating an open circuit by means of a galvanometer. If you refer merely to a "ground," then the following method will locate it very closely:



D is an arc machine, XXX an arc circuit, PP an incandescent circuit of incandescent lamps in series shunted across the dynamo terminals. The incandescent lamps must be 50 volt, and may be of 10 c. p. or lower. There must be the same number of incandescent lamps, as there are arcs on the line. K is a permanent ground, and S is a flexible connection permanently attached to K. S may be slid along PP, making connection with any lamp. Suppose a ground exists at G between any two lamps—say the 3rd and 4th. Then the fall of pressure from the + terminal of the dynamo to G is about 50 volts × 3 (lamps). The fall of pressure also from the same + terminal to a point between the 3rd and 4th incandescent lamps, is also about 50 volts × 3 (lamps). Hence if these two points be connected, no current will flow between them. Ground a voltmeter through K, and touch the successive incandescent lamp terminals from + to −. A point will be found where the deflection is least; and between the corresponding arc lamps the ground will be found. (2.) We should suppose that rubbing them with paper as is done with lamp chimneys would do. Have had no experience in the matter personally.

"H. J. A.," Markdale, Ont., writes: (1.) Would the field-magnet cores of a five incandescent light Edison dynamo of the bi-polar type do if made of cast iron? (2.) Would lead-foil answer for coatings for Leyden jars, and for induction coil condensers, etc.?

ANSWER.—(1.) Certainly, but cast iron is more likely to lose its magnetization than steel, and being less magnetizable, would require a larger cross-section. (2.) Yes.

"H. N." writes:—On page 46, March, 1896, number of THE NEWS, Mr. F. G. Proutt, of Malden, Mass., makes a deduction from calculations. In this general deduction the last clause reads: "The one made to be at the highest voltage will be the most incandescent." It is evident a typographical error or an inadvertence occurs by the words "highest voltage" when lowest amperage is understood.

The following are results of observations taken on a 100 volt circuit:

Place in series 100 v. 16 c. p., and 50 v. 16 c. p., the 100 v. brightens. Now exchange the 50 v. 16 c. p. for 50 v. 5 c. p., then 100 v. 16 c. p. dims, and the 50 v. 5 c. p. brightens.

Proof.—1 16 c.p. 75 watt lamp at 100 volts = .75 ampere resistance, 133 ohms. 1 16 c.p. 75 watt lamp at 50 volts = 1.5 amperes resistance, 33 ohms. 1 5 c.p. 23.44 watts at 50 volts = .47 ampere resistance, 106.4 ohms. Now 106.4 ohms is not as great as 133, but that is not it. How many amperes per lamp is required? The one of 16 c.p. of 100 volts takes .75 amperes, but the 5 c.p. of 50 volts takes only .47 ampere. It follows, therefore, that the 100 volt lamp taking .75 ampere will be brighter than the 50 volt lamp requiring 1.5 amperes to bring it to incandescence, and on the other hand the 50 v. 5 c.p. requiring only .47 ampere will be brighter than the 100 volt lamp requiring .75 ampere.

ANSWER. The term highest voltage was simply used by Mr. Proutt to signify a lamp requiring the most pressure with a given current to bring it to a state of incandescence. The lamps being in series the current through them all would be alike in quantity, consequently the lamp with the finest filament would burn the brightest. Your demonstration shows this to be the case.

TRADE NOTES.

The Canadian General Electric Co. have been awarded the contract for a 500 light alternating plant at Colborne, Ont.

The Canadian General Electric Co. recently installed a storage battery of their new type for the Bank of Hamilton in Hamilton.

The Canadian General Electric Co. are building a 450 kilowatt direct-connected generator for the Toronto Electric Light Co.

A ten horse power induction motor operated from the monocyclic circuit was recently started up in D. Knechtel's furniture factory at Hanover, and has given perfect satisfaction.

The Hull Electric Co.—E. Seybold, Secretary—have placed an order with the Canadian General Electric Co. for their cars and electrical equipment.

We are advised that Messrs. Ahearn & Soper, of Ottawa, have recently been appointed exclusive Canadian representatives of the Westinghouse Electric and Manufacturing Co.

The Vancouver Consolidated Railway and Lighting Co. have recently placed an order for closed cars and equipments with the Canadian General Electric Co.

Messrs. Wm. Kennedy & Sons, of Owen Sound, are furnishing five 60-inch new American water wheels to the Hull Electric Railway and Lighting Company. Their cost will be about $25,000.

The Goldie & McCulloch Co., of Galt, have sold Wheelock engines to W. H. McEvoy and Colm Ngle, of Amherstburg, Ont. The cylinders of these engines will be 13 x 30 inches with condenser attached.

Hooper & Starr, contractors for the Cornwall street railway, have ordered a 250 horse power cross compound Robb-Armstrong engine and two 125 horse power Monarch Economic boilers from the Robb Engineering Co.

The Dodge Wood Split Pulley Co., of Toronto, call attention to their new split friction clutch and cut-off coupling as illustrated in this issue. They have supplied this clutch for powers from 5 h.p. to 200 h.p. to some of the largest power users in the Dominion, and have yet to hear of a complaint. Those contemplating the purchase of either clutches or cut-off couplings will do well to put themselves in communication with this company. The Dodge Pulley Co. manufacture special pulleys of all kinds for electrical purposes, and mail illustrated catalogue on application.

Most all dynamo belts are subject to damage from machine oil which causes the leather to rot and the belt to slip on the pulleys. Robin, Sadler & Haworth, the leather belt makers of Montreal and Toronto, experimented considerably to ascertain what would be the most effective process to restore belts of this kind and place them in condition so as they could be made serviceable again. After many practical tests they have proved to themselves and several owners of electric light stations that the oil can be extracted and the belts made useful again without hurting or injuring either the belt, leather or cement; thus they term themselves as cleaners and repairers of old oily leather belts. They will be pleased to give further information to any who are troubled with belts of this kind.

ENGINE REGULATION IN ARC LIGHTING.

To the Editor of the CANADIAN ELECTRICAL NEWS.

SIR, While regularity of engine and dynamo speeds is a generally recognized necessity for incandescent electric lighting systems, I have been told, and have also read that for arc lighting such accuracy of speed was not required.

I will, by an experiment try to prove that this is not so. The resistance of an electric arc varies continually. Place a single arc lamp in circuit and watch the ammeter needle; it will be found to vary through a large range, and will seldom if ever be at rest. Of course if the carbon is not a good one, this will be much more noticeable, and at each sputter of the lamp the ammeter will jump.

When there are a number of lamps in series, a little overfeeding or a little underfeeding of the carbons may considerably alter the resistance, and, unless there be a reserve of power and a good governor, the result will be unsatisfactory. If a little overfeeding take place, the resistance will be diminished, the quantity of current flowing will be increased and more load thrown on the engine. If the latter be properly governed, its speed will be kept constant, and the lamps will have a chance of recovering themselves; but if, on the contrary, the speed should fall off, the lamps will get worse and worse. This proves also that well regulated lamps greatly affect the system for the better.

Very truly yours,

OBSERVER.

SPARKS.

Stratford, Ont., is to have an electric system of fire alarm.

There is a movement on foot at Bothwell, Ont., for electric lighting.

The Kamloops, B. C., Electric Light Company has gone out of business.

The Light, Heat & Power Company, of Newmarket, Ont., are said to have assigned.

Preparations are being made for the installation of an electric light plant at Digby, N. S.

The Vernon & Nelson, B.C., Telephone Company are applying for amendments to their charter.

A company has been formed at Brantford, Ont., to manufacture the Callender automatic telephone.

The South Essex Electric Railway Co. is applying to the Ontario Legislature for incorporation.

The electric light plant at Drummondville, Ont., has been put in operation. Fifty arc lights are used.

Mr. H. A. Connell, of Woodstock, N. B., has added an arc light system to his electric light plant.

The city of Kingston, Ont., is considering the question of municipal ownership of its electric light plant.

Thornbury is to have incandescent light. The Canadian General Electric Co. are supplying the apparatus.

The Lincoln Radial Railway Company's bill has been passed by the Private Bills Committee of the Ontario Legislature.

The Drummondsville Electric Light Co., of Drummondsville, Que., are installing a 60 kilowatt Canadian General alternator.

The Ottawa Electric Railway Company have completed their new car shed, and now have extra accommodation for 36 cars.

The Columbia Telephone-Telegraph Co. is applying for incorporation, to operate between Rossland and Boundary Falls, B. C.

The City Council of St. Thomas, Ont., has given the first reading to the by-law to raise $50,000 for a municipal electric lighting plant.

The Canadian General Electric Company have now 600 men at work at their shops, and are working over time to catch up with orders.

The Trenton Electric Co. has obtained supplementary letters patent to extend operations to Belleville and the township of Thurlow.

A donation of several hundred books from the British Museum has recently been made to the library of the McGill University, Montreal.

Mr. G. E. Smith, of Montreal, has invented a machine for curving railway rails, by which any degree of curve required may be obtained.

The street railway at St. Thomas, Ont., was offered for sale by auction on the 20th of March. The highest bid was $11,400, and it was withdrawn.

A bill has received its second reading in the British Columbia Legislature to incorporate the Alberni Water, Electric and Telephone Co., of Alberni.

The Beaverton Electric Light Co. have recently purchased an 100 h.p. tandem compound condensing Wheelock engine, steel boiler and connections.

E. Leonard & Sons, of London, have purchased the electric light plant of the Grand Central Hotel at St. Thomas, for $520. The plant originally cost $2,500.

The Yarmouth, N. S., Telephone Company is stringing wires for the use of the Coast Railway Company, which will be operated by telephone instead of telegraph.

Mr. Higman, chief of the Electric Light Inspection Department at Ottawa, is fitting up a very commodious testing room with Kelvin batteries for standardizing.

Haley Bros. & Co., of St. John, N. B., are having a 50-light incandescent dynamo installed in their factory. James Hunter, electrician, is superintending the work.

Robert Henry, late manager of the Brantford Electric and Power Co., has entered a claim against the defunct concern for $3,000 for his services for three years.

Arrangements are reported to be in progress by which an important electrical plant will shortly be established in Western Australia to supply motive power to the gold fields.

Mr. Hugh Thompson, of Waterdown, is endeavoring to induce the Hamilton Radial Railway Company to extend its line beyond Burlington, through Waterdown to Guelph.

The Canadian General Electric Co. are erecting at their works at Peterboro a new building, in which will be carried on the construction, setting up and finishing of street cars.

The Hydraulic Power Co., of St. Hyacinthe, having found that the water failed them at certain seasons, recently purchased two Wheelock condensing engines and boilers to develop 450 h.p.

The electric light company at Vancouver, B. C., has offered to continue to supply lights at 31 cents per lamp. New Westminster, owning its own plant, has raised the rate from 25 to 35 cents per night.

The Street Railway, Heat & Power Co., of Moncton, N. B., is being organized to construct a street railway in that town. The capital stock is $100,000. It is hoped to commence work this spring.

Mr. R. Leslie, of Toronto Junction, is the inventor of a track cleaner, which is reported to have done satisfactory service on some of the Toronto Railway Company's lines during the recent snowfalls.

The city council of Moncton, N.B., will petition the New Brunswick Legislature for the cancellation of the charter of the Montreal Electric Tramway Company, for failure to fulfill the conditions of the charter.

The Niagara Navigation Co. have awarded a contract for a 300 light direct-connected dynamo, with engine, to the Canadian General Electric Co. The plant is for the new boat which is to replace the ill-fated Cibola.

Work on the three-phase transmission plant between Trenton and Belleville is progressing favorably. The first of the 150 kilowatt generators has been shipped from the Canadian General Electric works at Peterboro.

Mr. D. C. Moreney, civil engineer, Port Levis, Que., has invented a portable lamp lighted by acetylene gas, and is now making experiments on the application of the gas to the lighting of streets and houses.

Mr. J. C. Guay and Joseph Gagnon, representing the Chicoutimi Electric Co., of Chicoutimi, Que., are negotiating with the town council for the construction of an electric railway between St. Alphonse and Chicoutimi.

Mr. D. Budge, superintendent of the Halifax and Bermuda Cable Company, is urging the granting by the Dominion Government of a subsidy to enable his company to extend their present cables from Bermuda to Jamaica.

At a recent examination of St. John, N. B., the following were granted marine engineers' certificates: J. F. Williamson, of St. John, second class; G. W. Cowie, of Miramichi, third class; James Henderson, s. s., Prince Rupert, fourth class.

A deputation from Peterboro', Ont., recently waited on the Minister of Railways and Canals to secure control of the power of one of the dams on the river above Nassau, the power to be utilized in the plan for the electric lighting of the town.

Messrs. Duncan Scott and James Wilson, representing a New York syndicate, were recently in Ottawa in quest of Canadian mica. They are said to have stated that Canadian mica of the Ottawa radius, amber quality, is the best in the market.

The officers of the Hamilton Radial Railway Company are: Messrs. Alex. Turner, president; Thos. Leather, Vice-president; W. W. Osborne, secretary; W. A. Wood, treasurer; directors, A. Zimmerman, George Lynch Staunton and John Moodie.

An electric ice-cutting machine is being used with much success at Sunapee, N. H. It consists of a circular saw, which the operator is able to raise and lower at will. The other day the machine cut sixty-five feet of ice to a depth of nine inches in seventy-five seconds.

A meeting of the directors of the Brockville Electric Street Railway Company was held recently, at which the agreement with the town was ratified. Work is to be commenced not later than 1st May, 1897, one mile to be completed within a year from that date.

The T. Eaton Co., Toronto, are putting in two Robb Armstrong engines to run their blowers, which operate the cash system. The engines and blowers will be direct connected. A Northey compound duplex pump of 2,000,000 gallons capacity will be installed shortly, and the 1,000,000 pump at present in use will be used in emergencies.

SPARKS.

In the Dominion Railway Committee it has been announced that all electric railways in Ontario of a purely provincial character must be brought under the working of the general Electric Railway Act of the province.

An action was recently entered by Miss Brennan against the Montreal Street Railway Company claiming $2,000 damages for injuries sustained by being struck by an electric car. The court found no evidence of negligence on the part of the company or its servants, and the action was dismissed.

The Lachine Rapids Hydraulic Company have invited offers for the supply of generators for the transmission of 10,000 horse power. The contracts for the water wheels and machinery have been closed, and before the close of the year the company hope to be in a position to supply power.

The city of Winnipeg, Man., has under consideration the question of street lighting. The City Solicitor has been instructed to prepare two by-laws for submission to the ratepayers, one for the construction by the city of a gas light plant, and the other for the construction of an electric light plant.

The Supreme Court of 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 Company.

A French mining engineer is said to be preparing plans for an electric elevator to the top of Mount Blanc. A horizontal tunnel is to be bored, and from there to the top the ascent is to be made by electric elevators in a vertical shaft one and a half miles high. The time for the ascent is reckoned at 30 minutes.

The T. Eaton Co. have awarded the contract for two 130 kilowatt direct-connected generators to the Canadian General Electric Co. This, with the 75 kilowatt C.G.E. machine installed last fall, gives a capacity of 335 kilowatts, or nearly 6,000 16 c.p. lamps—by long odds the largest isolated plant in Canada.

The town of Newmarket, Ont., has decided to submit a by-law to the ratepayers authorizing the purchase of an electric light plant. The cost of plant will be $8,000, and is estimated to afford twice the lighting capacity heretofore given, at a saving of $200 a year. The dynamos will be run by steam power.

An electric street railway franchise for thirty years has been granted by the town of Sherbrooks, Que., to a New York syndicate. At the end of that time the town will be given the privilege of purchasing the road. Preliminary arrangements for construction have been completed, and work will shortly be commenced.

Application is being made to the New Brunswick Legislature by J. T. Allan Diblee, Julius T. Garden and J. N. W. Winslow, for incorporation of the Woodstock Electric Railway, Light and Power Company, of Woodstock, N. B. The object of the company is to generate electricity for the purpose of supplying power and light.

A committee of the city council of St. Catharines, Ont., has reported on the question of street lighting. While stating that a saving could be effected by the purchase of an electric light plant, it is recommended that tenders be called for lighting for two years, in order to ascertain the cost of light supplied by a private company.

The Legislative Railway Committee have passed the Hamilton Electric Radial Railway bill without any amendments. The company is given power to extend its Hamilton and Brantford branch to Woodstock. Toronto objected to the proposition to have the Hamilton and Mimico branch extended to Toronto and the clause was struck out.

The T. Eaton Co., Toronto, with the object of economizing space, are substituting for their large Wheelock engines two of the new Ideal type of high-speed engines, manufactured by the Goldie & McCulloch Co., of Galt, to which will be direct-connected two C.G.E. multipolar dynamos, generating current for lighting the establishment.

A company in Cleveland, Ohio, is said to be organizing a company to operate horseless carriages in that city. It is the intention to have the line in operation by June, and to charge 2½ cents fare. The carriages will have a capacity for twelve persons seated and eight standing. An ordinary hack license is believed to be the only fee required for a permit to operate.

Hon. E. H. Bronson has introduced a bill in the Ontario Legislature respecting street railways. The bill gives power to electric railway companies to acquire parks, requires them to take reasonable measures to protect water pipes, etc., against damage by escaping electricity, and provides that the tolls shall be so fixed as not to exceed $8 on every hundred dollars of paid up capital.

The New Westminster & Burrard Inlet Telephone Co. have acquired the telegraph line between New Westminster and Langley, Aldergrove, Matsqui and Chilliwack, which formerly has been under the control of the C.P.R. As soon as practicable the offices will be equipped with long distance telephone instruments, and become directly connected with the local exchanges at New Westminster and Vancouver.

While experimenting at Quebec on the manufacture of acetylene gas in order to reduce its cost as a luminary, an explosion occurred by which Arsene Consigny was killed and his brother, Nicholas, seriously injured. They had loaded a six inch iron pipe with gas fluid, and placed the pipe in a tub of water, when it was found to be leaking, and without paying any attention to the gauge, they lifted the pipe for the purpose of locating the trouble, when the explosion took place.

The Cosmopolitan Magazine has offered prizes amounting to $3,000 for horseless carriages making the best records and showing the most good qualities in a trip between its New York city office and its publishing plant at Irvington-on-Hudson.

The Lachine Rapids Hydraulic and Land Co., of Montreal, have elected the following officers for the ensuing year: President, Mr. G. B. Burland, vice-president, Mr. Thos. Pringle; managing director, Mr. W. McLea Walbank; acting secretary-treasurer, Mr. Jeffrey H. Burland.

Mr. G. T. Simpson and a number of associates are said to be forming a company in Hamilton to supply electricity for incandescent lighting. It is claimed that a large reduction in the price now paid for lighting will be effected. The promoters have leased a building on McNab street.

The present agreement of the Bell Telephone Co. with the city of Toronto, expires at an early date, and the company have been requested to make an offer for a five years' renewal. If the offer is not satisfactory, tenders for the privilege of establishing a telephone system will be invited.

The new company which has purchased the Brantford electric light plant and the Grand river level property, have elected officers as follows: President, Geo. H. Wilkes; vice-president, Herbert R. Yates; secretary, John McGeary. These, with Messrs. B. W. Yates and A. J. Wilkes, will be the directors. The capital stock will likely be increased.

A railway deal of considerable importance is said to have been closed recently in Montreal, by which a contract has been awarded by the Montreal Park and Island Railway Company to Mr. Wm. G. Reid, contractor, for the construction of thirty-five miles of electric railway, including right of way, ties, rails, power houses, car sheds, rolling stock, electric appliances, etc. The amount involved will reach well up to $1,000,000.

Mr. John Shearer, of Preston, closed a contract last week for a 75 kilowatt monocyclic alternator with the Canadian General Electric Co. Mr. Shearer has been operating a single-phase alternator of the C.G.E. type, but has found so much demand for power as to lead him to look into the question of a suitable system for supplying both light and power. The monocyclic is to be in operation by the first of April at the latest.

Referring to the application for incorporation under name of Montreal Electric Light Co. recently made by L'Tourville, et al, the Montreal Electric Co. write: "The application in question was opposed by us before the Legislature of the Province of Quebec, owing to similarity of names, and our opposition was sustained. We understand that the name under which incorporation is now being asked for is "The People's Electric Light Co.", but the concern is virtually the old St. Jean Baptiste Electric Light Co. under a new name. We are the only firm who have the right to use "Montreal Electric," and we do not supply light or power.

The annual meeting of the Toronto Electric Light Co., with which was recently amalgamated the Incandescent Light Co., was held early in March, the principal business being the election of the Board of Directors. The following were elected: H. M. Pellatt, Thos. Walmsley, Samuel Trees, W. T. Murray, S. F. McKinnon, H. Blain, George A. Cox, W. D. Matthews, F. Nicholls, H. P. Dwight, Robert Jaffray and W. R. Brock. At a subsequent meeting the by-laws were amended to permit of fourteen directors, and the names of Messrs. Hugh Ryan and A. H. Campbell were added to the list.

The city of Kingston, Ont., has under consideration the municipal control of its electric light plant. Enquiries have recently been sent out to a number of towns regarding the cost of lighting, and the information received may be summarized as follows: The average of sixteen places in Canada, plant run by steam, by contract, is $82 per lamp per year, run all night, moon schedule. From nine places, water power, by contract, the average price per lamp per year is $75. Sixteen places in the United States, steam power, by contract, average $100 per lamp per year, showing a considerable increase over Canada. Seven places in the United States with water power, average $75; same as in Canada. These returns appear to show that the larger the place the more they have to pay for lighting under contract, as Toronto and St. John are the only large cities where the cost is as low as in the smaller places. Coming to the places where the municipalities own and run their own plants, seven places in Canada were heard from, viz., Jolliette, Windsor, Collingwood, Picton, Moncton, St. John and Markham. In these places only five appear to know what the cost is per lamp per year, and of these four are rather indefinite, while Windsor gives all the details in a most satisfactory manner. The average of the five is $66 per lamp per year, counting in interest on investment and deterioration. In Windsor they have a steam plant of 115 arc lamps which cost $23,000, and this costs them $6,039 per year to run, or $52 per lamp per year, or adding interest and depreciation at eight per cent., makes $68 per lamp per year. Returns were received from eleven places in the United States who own their own plants and are run by steam; the average of these places is $60 per lamp per year, in all cases including interest and sinking fund on capital invested. From three places in the States owning their own plant, run by water, the average is $46 per lamp per year.

The Brantford Railway Co. have issued a handsome lithographic poster illustrative of the attractions of their new Mohawk Park.

We are in a receipt of the first issue of "Home Study," issued by the Colliery Engineer Co., of Scranton, Pa. It is an elementary monthly journal for students of industrial sciences and others interested in obtaining a knowledge of electricity, engineering, architecture and kindred subjects.

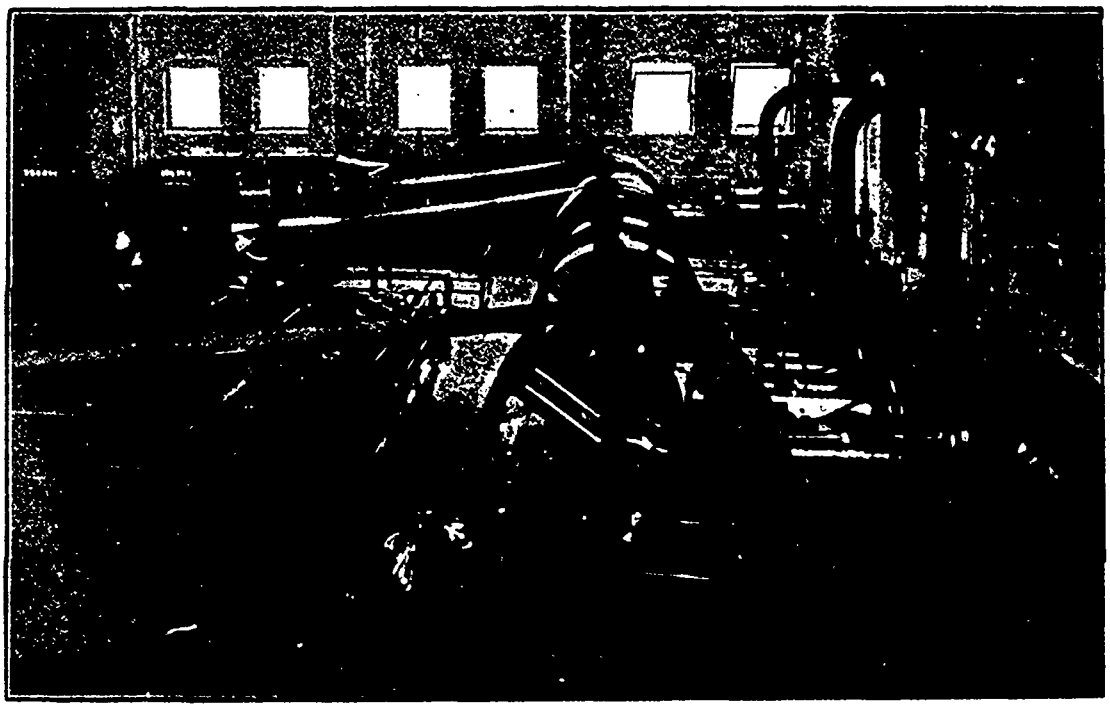
ELECTRIC RAILWAY DEPARTMENT.

THE HULL AND AYLMER ELECTRIC RAILWAY.

ARRANGEMENTS have just been completed for the conversion of the Hull and Aylmer branch of the Canadian Pacific Railway into an electric road, and for its complete equipment for freight and passenger business. This installation is of peculiar interest as being the first case in Canada in which a regular steam railway has made the change to electric motive power, and the results obtained in its operation will no doubt have a most important influence in determining similar action on a great many branch lines at present either entirely unproductive, or operated at a loss by the Canadian Pacific and the Grand Trunk. That the fullest measure of success, both from the financial and operating point of view, will be attained, is practically guaranteed by the results which have been made public in the case of the Metropolitan and Lake Street Elevated Roads in Chicago, the Nantasket Beach division of the Hartford and New Haven R. R., and the electric locomotives on the Baltimore and Ohio, which have for some time past been handling the traffic through the Baltimore tunnel. An unexpected feature in the latter case, considering the somewhat unfavorable circumstances, has been their advantage in economy over the steam locomotives as shown by the recent tests, printed elsewhere in this issue, made with the dynamometer car of the Pennsylvania Railway. On the Hull and Aylmer road, where it is proposed to utilize the magnificent water power of the Deschenes Rapids on the Ottawa river, this advantage in first cost of motive power will of course be realized to the fullest extent, and will in itself go far to insure the profitable outcome of the enterprise.

The shareholders in the Hull Electric Company comprise some of the foremost capitalists and business men in Ottawa, an especially active interest in the undertaking being shown by Messrs. C. Magee, President of the Bank of Ottawa, Alexander Fraser, the well-known lumberman, and F. Seybold, secretary of the Company. Mr. J. Brown, of Ottawa, well known in electrical circles, is superintendent and electrical engineer of the road. The water-power at the Deschenes Rapids, which will furnish motive power for the generators, is controlled by the lumbering firm of R. & W. Conroy.

The contract for the entire electrical equipment and cars has been awarded to the Canadian General Electric Co. The generating plant will consist of two 200 Kilowatt C. G. E. 500 volt railway generators with which will be furnished the necessary instruments mounted on standard panels of enamelled slate. The waterwheels will be of the New American type manufactured by Kennedy & Sons of Owen Sound. For the express passenger service there will be provided four open and four closed forty foot cars of the C. G. E. standard type mounted on Blackwell double trucks. The motor equipment for each car will consist of two C. G. E. 1200 motors with K 2 controllers wound for high-speed service. The construction and finish guaranteed for the cars are such as to make them a model of the car builder's art.



GENERATOR ROOM—LONDON STREET RAILWAY POWER HOUSE.

An interesting addition to the rolling stock of the road is the 30 ton electric locomotive with which the large freight business of the line will be handled. In general appearance this locomotive will resemble the locomotives built by the General Electric Company for the Baltimore & Ohio tunnel service, though of course of much smaller capacity. The motors will be four in number, of fifty horse power capacity each, of the C. G. E. 1200 type, provided with a special controlling mechanism.

Work on the bonding of the rails and other changes required to make the road suitable for electrical operation has already been commenced, and the entire system is expected to be in operation by the end of June.

Application will be made to the Ontario Legislature for incorporation of the Chatham City and Suburban Railway Company, to construct an electric railway through and from the city of Chatham to a point on Lake Erie, also through the township of Dover to Wallaceburg and thence to Petrolea. The capital stock of the company is placed at $200,000, and the promoters are John Mercer, John A. Walker, E. Jones Park, Sydney E. King, G. J. Leggatt and George Rankin.

LONDON STREET RAILWAY SYSTEM.

SOME time ago the directorate of the London Street Railway Co. determined that, to keep abreast of the times, and to run on an economical basis, the road should be changed to the electric system. Application was made to the city council for the franchise, and after much wrangling and the customary "serious consideration," that body decided to allow them to build and operate an electric street railway.

The officials of the road are: President, H. A. Everett, Cleveland; Vice-President, E. W. Moore, Cleveland; Secretary, Chas. Curry, London; Manager and Treasurer, Chas. E. A. Carr, London. Mr. Carr was installed on the 1st of January, 1895, to succeed Mr. Brake, of Detroit. We herewith present a portrait of Mr. Carr. He is a young man and is to be complimented on the success with which he has pushed the work of electrifying the road. He divided the work into four sections, with a superintendent over each, and foremen under them. John M. Moore, architect, had charge of the building department, J. B. Mackay, of the track construction, W. J. Hillier of the overhead construction, and Mr. Ryan of the mechanical department. Mr. Ryan, a mechanical engineer from Cleveland, had charge of the erection of the machinery in the power house. The power house is a massive brick structure facing on Thames street, beside the railroad track, where a switch has been put in, and the furnaces can be fed with coal direct from the cars.

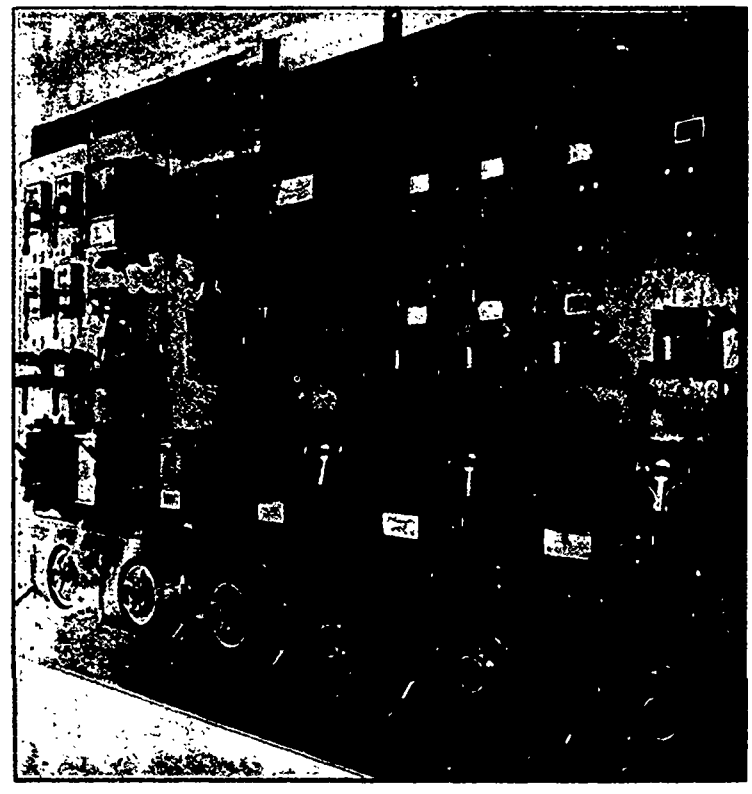
MR. CHAS. E. A. CARR,
Manager London Street Railway.

The boiler room contains six Bertram boilers of 150 h.p. each. The dynamo room is equipped with three Armington & Sims engines of 150 h. p. each, built at Providence, R. I. Room is left for one more engine. Each engine drives a pair of C.G.E. railway generators of 100 k.w. each. Room is left for another pair of generators. The condenser pit is in the centre of the dynamo room, and in it is a Northey condenser. The pit and the foundations of the building are entirely waterproof above the level of the dynamo room floor. The best material is used in the construction of the building. The chimney is the largest in the city. It was designed by Cleveland engineers and is a striking feature. An arch through the bottom of the chimney leads from the boiler room to the dynamo room. Opening off the dynamo room is the engineer's room and switch-board room, with a storey above for storage, etc. The switch-board is of the latest design and the wires from the machines run through the floor into the basement, then through brick tunnels, then up through the floor of the switch-board room to the switch-board, then out to the poles. On the property large car barns will be built and also offices. Messrs. McBride & Farncombe are the architects for the car barns.

The rails, which were made in Germany, reached London on Aug. 28th last, and in two weeks there were 2½ miles of track laid and the cars running on them from the G.T.R. station on Richmond street to the Fair grounds on Dundas street, east. The trolley wire is 00 hard drawn and the feed wire is 0000. The cars, built by Patterson & Corbin, St. Catharines, are the equal of any in Canada, and surpass the new cars on the Detroit street railway. They are built on the latest pattern, have large vestibules and a sliding door on one side, operated by the conductor from the rear platform. The cars have a capacity of 38 passengers and are heated by the Consolidated Car Heating Co.'s electric heaters. The seats are cane bottomed.

Some 800 men were engaged on construction, and all the labor done was by London people. $40,000 has been spent on labor alone, and altogether $400,000 has been expended up to date.

The route furnishes the outlying districts with quick communication with the business part of the city. Double tracks are laid on Dundas street its entire length, and on Richmond street from Horton street to the C. P. R. depot. By the completion of the bridge over the Thames (south branch) on Ridout street, a useful belt line was established. The belt line starts at the corner of Richmond and Dundas streets, up Richmond to Central Ave., along that to Adelaide street to Dundas, Dundas west to Richmond, down Richmond to York, York west to Wharncliffe Rd., south on that road to Askin street, east on Askin street to Wortley Rd., south on Wortley Rd. to Elmwood Ave., Elmwood Ave. east to Ridout street, Ridout street north across bridge to Horton street, Horton street east to Richmond street, along Richmond street north to the place of beginning, the distance covered being about 7 or 8 miles. Another line runs west from Aledaide street on Oxford to Richmond street, down Richmond to Horton street, east on Horton to Hamilton Rd., down Hamilton Rd. to Rectory street, a distance of 8 miles. The line will be continued two miles farther on Hamilton Rd. in



SWITCH BOARD—LONDON STREET RAILWAY POWER HOUSE.

the spring. Another line runs from the Fair grounds on Dundas street east to Dundas street west, back to Ridout street, Ridout to King street, King to Richmond street, Richmond to Dundas street, and back east again. This line runs around the market. Eastern Dundas line will be extended to Pottersburg next summer, a distance of two and a half miles. This line connects at Dundas street west at the bridge with the London West line, which, up to the end of 1895, was operated by horses. London West line runs on Dundas street to Wharncliffe Rd., up that to Oxford street, along Oxford to the bridge. A bridge will be built at this point at some date in the future and another belt line will be completed by Oxford street to Richmond. Another line runs from Dundas street east to Richmond street, up Richmond to St. James street, St. James to Wellington street, up Wellington to Hellmuth college at the city limits Their summer line leaves the belt line on York street, and follows the river Thames to Springbank, where the city water works are situated. This line is private property and excursions go down there every day in the summer as the place is pretty and the scenery along the river bank and through Woodland cemetery, through which the line passes, is magnificent. Many summer residences are situated at Springbank, and the road is a boon to tired business men who can run down there and spend their evenings with their families. A six minute service is given.

The county council are very obstinate and will not grant the company the privilege of building a bridge on Dundas street, over the north branch of the Thames alongside of the county bridge and resting on their piers. They do not like the company, as it has, by discarding horse power, ruined (?) their market for grain and hay. It is to be hoped, however, that they will ultimately grant the company's request.

The London Electric Co. supplied the company with power while their power house was being built, and, notwithstanding that fact, their earnings were 350% over the horse car system.

A sweeper with a C. G. E. No. 1200 motor cleans the rails of snow, and the old horse sweeper is also in use. The Canadian General Electric Co. equipped the sweeper, and the Toronto Street Railway Co. built the case and broom. The company has closed a contract with the city to sprinkle the streets in the dusty season for $250 per mile of street. The streets will be sprinkled four times a day. In all probability the city mails will be transferred from the post office to the branch offices by the company.

The different lines reach to the surrounding suburbs and are an invaluable aid to the laboring population. Connections are made quickly and everything is running satisfactorily. Pottersburg, a village to the east of London, will be a good feeder, and the company will profit by this extension. The earnings of the company have increased 350% since the system has become electrified. The company is noted for its kindly treatment of its employees.

Patterson & Corbin, of St. Catharines, were kind enough to loan the company some of their cars while the new ones were being made ready at the new car barns on Dundas street. These barns were built late last fall and can accommodate 10 cars. The others will be stored in the old horse car barns until the new barns are built. Between 25 and 30 Patterson & Corbin cars traverse the 22½ miles of road, and the entire equipment of the system in every detail makes it one of the most up-to-date and efficient on the continent.

THE CORNWALL ELECTRIC RAILWAY.

Messrs. Hooper and Starr, the latter the well-known electrical engineer of Montreal, have commenced work on the construction of an electric railway for freight and passenger service at Cornwall. The contract for the electric apparatus, including a 200 Kilowatt generator and ten C. G. E. 800 motors has been awarded to the Canadian General Electric Co. The same Company will also furnish two closed motor cars of their standard type, the balance of the cars being supplied by the Rathbun Company of Deseronto. A freight locomotive on which the motive power will consist of four C. G. E. 800 motors with special controllers will handle the freight business between the Mills and the Grand Trunk Railway.

Mr. A. J. Nelles, ex-president of the Hamilton, Grimsby and Beamsville Railway, has begun an action against the company for $5,000 damages for alleged wrongful dismissal and breach of contract, and for $166.65 as balance of salary due between 1st October, 1895, and 1st March, 1896.

Mr. J. F. Hill, comptroller of the Montreal street railway, resigned his position on March the 7th. Mr. Hill has been connected with the street railway since 1892. He spent the first six months with the company in construction; the present system of accounts, which has become so widely known, being introduced by him. During the construction of the Canadian Pacific Railway, Mr. Hill was construction accountant and was actively associated with Mr. T. G. Shaughnessy, the present vice-president of the company. Before he accepted the position of comptroller of the Montreal street railway, he was accountant to the works department of Toronto. Prior to Mr. Hill's departure to Chicago, where he has accepted a responsible position, the employees of the Montreal Street Railway Co.'s business offices showed their affection for their comptroller by assembling in force for the purpose of presenting him with a handsome gold watch and chain, the watch bearing the following inscription: "Presented to J. F. Hill, Esq., by his staff as a slight token of their esteem and regard upon his severing his connection as comptroller of the Montreal street railway, March 14th, 1896." After the address had been read, all who were present sang "For He's a Jolly Good Fellow," under the able leadership of Mr. E. Lusher. Mr. Hill has gained the affection of all with whom he has been in contact during his connection with the company, and the feeling of regret at his leaving was plainly shown during the course of the proceedings.

SPARKS.

Additional cars have been received for the London Street Railway from Messrs. Patterson & Corbin, of St. Catharines.

The Trenton Electric Co. has obtained supplementary letters patent to extend operations to Belleville and Thurlow township.

An electric franchise is held by the St. Thomas Street Railway Company, whose privileges and assets are offered for purchase.

Application has been made to the Government for a charter for the construction of an electric railway to connect Amherstburg and Harrow.

Wm. J. Clarke, a telegraph operator employed at Jersey City, N.Y., and a native of Kamloops, B. C., committed suicide by gas asphyxiation.

The Stratford Board of Trade are considering the project for the construction of a steam or electric railway from Embro to Stratford, a distance of seventeen miles.

The City Council has made claim against the Winnipeg Electric Railway Company for $1,040 for damages owing to the failure of the company to run cars on certain streets as agreed.

The bill to incorporate the Canadian Electric Railway Company, which proposed to construct an electric railway from Windsor to Montreal, has been thrown out by the Railway Committee at Ottawa.

The Montreal Park and Island Railway Company is seeking an extension of time until 1901 in which to complete their lines. Amalgamation is also asked with the Chateauguay and Northern Railway Company and the Jacques Cartier Railway Company.

Mr. John Patterson, who is promoting the radial railway from Hamilton via the Beach to Burlington, affirms that his company will have the road in operation by June 1. The money to build it is subscribed, and all arrangements made with the exception of those in Burlington, which will be completed in a short time.

Hon. Peter Mitchell recently brought action against the Montreal Street Railway Company claiming $15,250 damages, alleging that from neglect of its employes he was seriously injured while alighting from a car. After five days' trial, during which time much evidence was submitted, the jury gave a verdict for the plaintiff of $1,000 and costs.

Stockholders in the Crystal Beach Improvement Company held a meeting at Ridgetown, Ont., early in March, and subscribed $4,500 for the construction of the Beecher single rail elevated railway. Work will be begun on the new road at once, and if the experiment proves the success anticipated, it will be extended down the beach to Point Abino, and perhaps to Niagara Falls.

St. John, N.B., has eleven and one-half miles of electric railway.

An electric railway line is proposed which will connect Vancouver, B. C., with Steveston, and proceeding up the line of the Fraser river, will take in some twenty agricultural settlements.

The electric light plant at Aylmer, Ont., consisting of three dynamos, together with circuits and street and shop lights, is offered for sale by tender by A. E. Haines. The date limit is April 15.

The street railway company at Sarnia, Ont., have in contemplation the conversion of the railway into an electric road.

Messrs. John N. Lake and M. Hopkins, of Hamilton, are promoting an electric railway which it is proposed to build from the head of Wentworth street southerly by way of Hall's Corners, York and Indiana to Cayuga or Dunnville, with probably a spur to Caledonia. Surveyors have gone over the route, and report no engineering difficulties.

CANADIAN GENERAL ELECTRIC CO.

(LIMITED)

The following Letters speak for themselves:

PORT HOPE, Feb'y 27th, 1896.

MESSRS. CANADIAN GENERAL ELECTRIC CO.,
Toronto.

DEAR SIRS:—The 75 Kilowatt Monocyclic Alternator purchased from you was started up on Sept. 2nd, 1895, and has since been giving us an uninterrupted service of 160 hours each week, starting at four o'clock on Sunday afternoon and running till eight o'clock the following Sunday morning, without a hitch of any kind whatever. We expect a large increase to our business from motor service, and appreciate the excellent features of the Monocyclic system of this combined light and power service. There is, of course, no unbalancing, as the lighting is single phase, and the operation of the motors does not disturb in any way the evenness of the lighting. After an experience of six months we feel warranted in saying that we consider the Monocyclic as superior to any of the polyphase systems which we are acquainted with, and intend in the near future to duplicate this machine.

Yours truly,
R. A. CORBETT,
Pres. & Mgr. Port Hope Elec. Light & Power Co.

PARRY SOUND, Feb. 27th, 1896.

THE CANADIAN GENERAL ELECTRIC CO., Toronto.

DEAR SIRS:—Having now made a thorough trial of the Monocyclic system of Electrical distribution as supplied by you, I have much pleasure in informing you that it is giving entire satisfaction.

The machine, a 75 K.W., is a beautiful specimen of dynamo building, being strong and compact. Ventilation of the armature is excellent, and the general design of that very important part of the machine is good. Electrically and mechanically, I consider your machine to be superior to any I have seen.

We have not had occasion, as yet, to test the machine on the operation of motors, but speaking from the lighting point of view, I can fully endorse what you claim for the system.

We have 700 lights now wired and expect to increase to 1,200 before 1897.

Yours truly,
W. B. ARMSTRONG,
Manager Parry Sound Electric Light & Power Co., Ltd.

HANOVER, Feb. 21, 1896.

CANADIAN GENERAL ELECTRIC CO., Toronto.

DEAR SIRS:—In answer to your enquiry as regards the operation of our Electric System, I beg to say that we have now been running one of your 75 Kilowatt Monocyclic Dynamos for the past two months, and it is giving entire satisfaction in every respect. We have not had the slightest trouble with it in any way, and although it is being operated about 15 hours a day, it runs exceedingly cool, and requires practically no attention whatever.

The machine itself I regard as a model of simplicity, in fact to show my confidence in the apparatus I have placed the plant in full charge of my brother, who, previous to the starting up of this machine, had no experience whatever with electrical apparatus of any kind.

The perfect regulation of the Dynamos, and the simplicity of the wiring are also strong points which should recommend the use of this style of apparatus to anyone contemplating the installation of an electric plant.

In conclusion, I might say that after having decided upon adopting the Monocyclic system, my opinion became somewhat prejudiced against its adoption by representations made by other manufacturers, but I now fail to see wherein I could have secured anything better to that installed by your company.

Yours very truly,
D. KNECHTEL

DUNNVILLE, February, 1896.

MESSRS. CANADIAN GENERAL ELECTRIC CO.,
Toronto, Ont.

DEAR SIRS:—We are pleased to be able to express ourselves as entirely satisfied with the Monocyclic system installed by you last fall. We are now in a position, having covered a considerable portion of the town with our lighting mains, to appreciate the value of the three-wire system for secondary distribution from the transformers, and the great advantage gained in simplicity by the Monocyclic from its being a single-phase system for the lighting distribution.

The workmanship and finish of the dynamo itself certainly does credit to your factories, and in operation it has proved itself to be exceedingly simple and satisfactory.

The commutator and brushes run without any sparking whatever, and do not give us a particle of trouble. We feel fully justified in saying that the Monocyclic system in operation has shown itself to possess all the points of excellence claimed for it by you at the time when we made the selection for our new plant.

DUNNVILLE ELECTRIC LIGHT CO.

MATTAWA, Feb. 27th, 1896.

MESSRS. CANADIAN GENERAL ELECTRIC CO., Toronto.

DEAR SIRS:—We are pleased to be able to express complete satisfaction with our Monocyclic plant, which has now been running since 27th Sept. We are especially pleased with the ease with which our former single-phase system has been changed into one suitable for the distribution of both light and power. The only change made in our case was the installing of the Monocyclic machine in place of our former single-phase alternator, and the running of a third wire to the points where power is to be supplied. Altogether the system is admirable, both as to simplicity in the wiring, and distribution and perfect freedom in operation from any trouble or complication. We are quite sure that the Monocyclic system will prove a means of increasing largely the revenues of alternating lighting stations by the sale of power without adding any complications to their operation. You will be pleased to know that the 5 h.p. induction motor geared to a triplex pump is now in successful operation pumping water for the C.P.R. water tank. It is certainly a very simple and substantial piece of machinery.

Yours truly,
MATTAWA ELECTRIC LIGHT & POWER CO., LTD.
A. F. HURDMAN, Sec'y-Treas.

The Montreal Street Railway Company's building, corner Craig street and Place d'Armes Hill, is nearing completion, after having been reconstructed as a result of the unfortunate collapse. Mr. C. W. Henderson, electrical contractor, is wiring and putting in the electric light fittings. The system adopted is the conduit one, the conduit pipes having been all laid in the plaster, and the plastering work finished before the wires were put into the pipes.