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CANADIAN
ELECTRICAL NEWS
AND STEAM ENGINEERING JOURNAL

OLD SERIES, VOL. XV.—No. 6
NEW SERIES, VOL. VIII.—No. 10.

OCTOBER, 1898

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CANADIAN

ELECTRICAL NEWS

AND

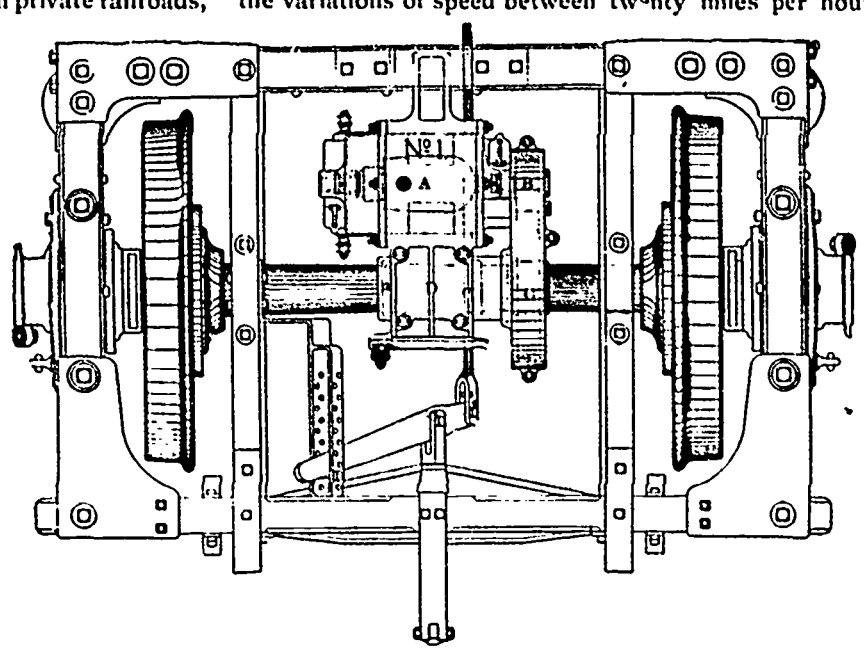
STEAM ENGINEERING JOURNAL.

VOL. VIII. OCTOBER, 1898 No. 10.

ELECTRIC LIGHTING OF RAILWAY CARS.

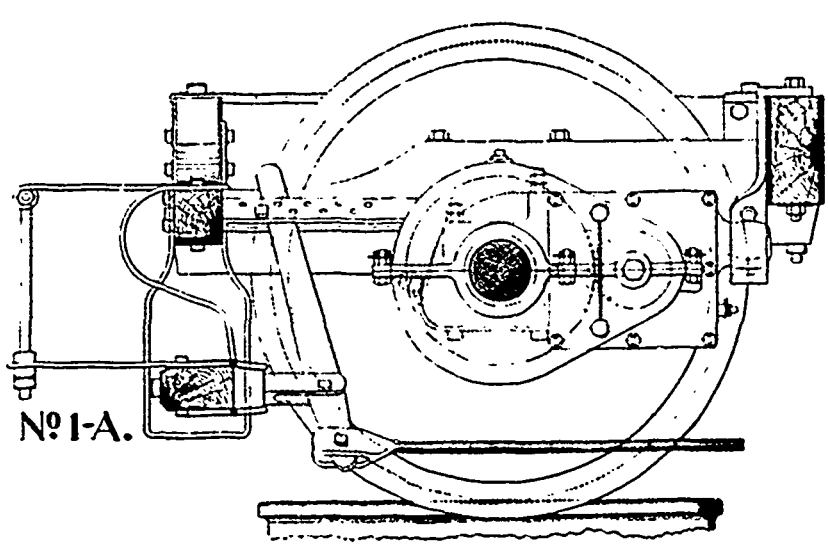
In European countries the electric system of car lighting has been adopted very largely. Almost all the private railroads of Sweden and Norway have electric light, also many German and Austrian private railroads, as, for instance, the Dortmund Gronau-Enscheder, the provincial railroad of Westphalia, the Altdamm-Colberg, the Marienburg-Mlawka, the *Prignitzthal*, the *Mecklenburg* Frederic-William, the Wittenberg-Perleberg, the Arad-Czanad, etc. Many of these have adopted this method of lighting within the past three years. In the United States we also find the system in use to some extent.

Not to be outdone by other railroads, the directors of the Canadian Pacific Railway have for some time been investigating the various methods of lighting, as a result of which they are now equipping ten sleeping cars with the American Railway Electric Light Company's system, of which illustrations are given herewith.



SYSTEM OF ELECTRIC LIGHTING FOR RAILWAY CARS.

This system of car lighting consists of a dynamo mounted upon the truck of the car, one end of which is supported by a stirrup from the truck, and the other by the axle. It is driven by a direct gear, which revolves two and one-half times to every revolution of the car wheel. The part resting on the axle rests on a split sleeve. This split sleeve finds its bearings by means of adjustable jaws, so arranged as to take up any irregularity of the axle, and they engage close to the wheels, leaving the central part of the axle free to spring in rounding curves and going over irregularities in the road, and concentrating the weight where it is least felt.



SYSTEM OF ELECTRIC LIGHTING FOR RAILWAY CARS.

A peculiar feature of this system is the regulating device. This is so arranged that although the speed of the train may reach great extremes of variations, and the dynamo, being directly geared, would normally reach great extremes of current, the current generated by the dynamo is kept substantially uniform during all the variations of speed between twenty miles per hour and the maximum ability of the locomotive. In other words, although the dynamo at a speed of sixty miles per hour is revolving three times as fast as it is at a speed of twenty miles per hour, the amount of current generated is the same.

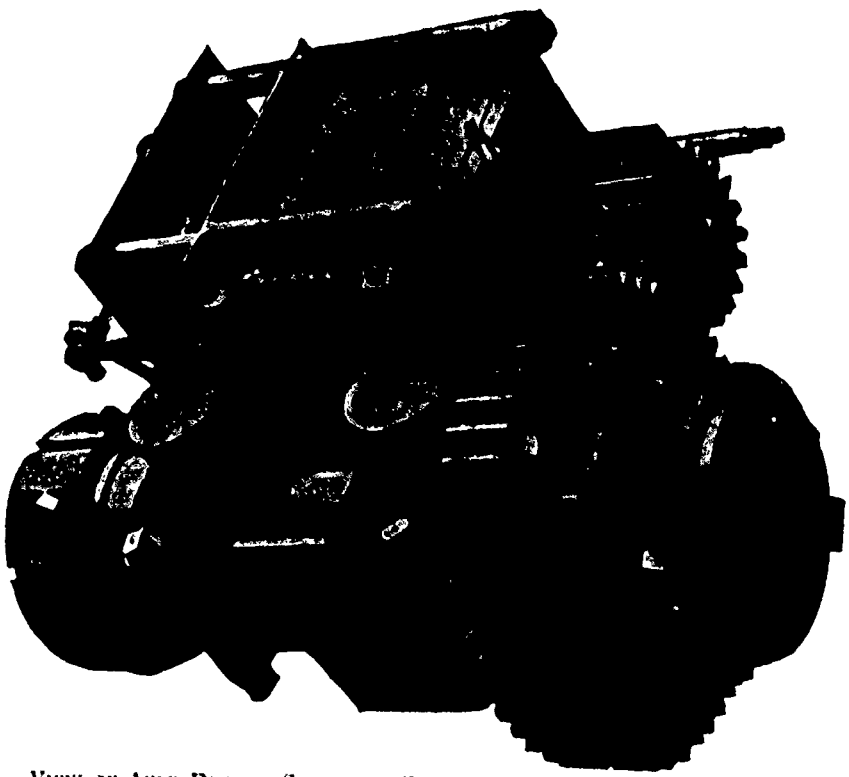
In connection with this there is an automatic cut-out, so adjusted as to throw the dynamo into circuit with the lamps upon its reaching a potential equal to that of a small storage battery supply, and throwing it out of circuit upon its dropping below. The effect of this is that when the lamps are burning, and the train running at twenty miles per hour, the lamps are fed directly from the dynamo, and the small surplus of current goes through the batteries. When the speed falls below twenty *miles per hour the cut-out works automatically*, and as long as it continues at its low rate of speed the lights are drawn direct from the storage batteries, which are capable of supplying the lights independent of the dynamo for from six to twelve hours.

The porter is given no instructions beyond being told to turn the lights on when he wants them, and turn them off when they are no longer required. The system is being installed on the C.P.R. cars by the American Railway Electric Light Co., of New York.

Another feature of this system is, that in running during the daytime, when the batteries are full, the very act of turning off the lights cuts down the efficiency of the dynamo to a point where it generates only the

normal current necessary to pass through the batteries in order to keep them in the best of condition.

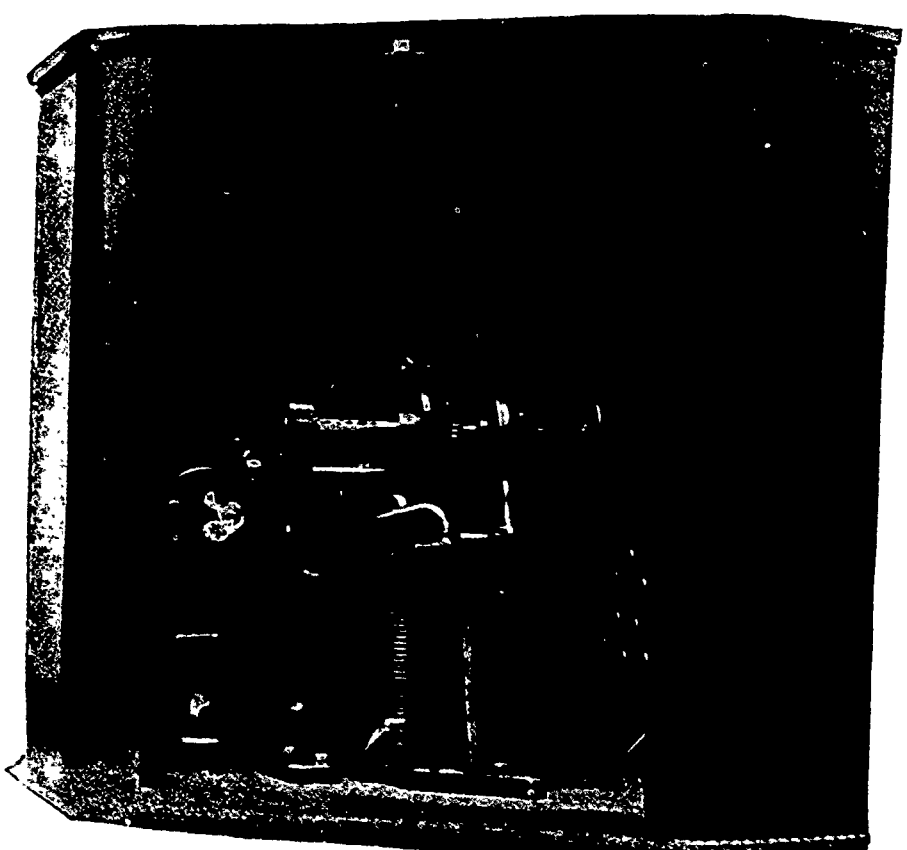
Should it be desirable, as it very frequently is, to introduce electric fans into the sleeper during the heated months, the current generated by the dynamo would be amply sufficient to keep a large number of them, if required, in operation, while yet serving the batteries with all that they required.



View of Axle Device—System of Electric Lighting for Railway Cars.

AN ELECTRIC DELIVERY WAGON.

The first electric motor wagon to be used in Canada solely for a commercial purpose was recently added to the delivery equipment of the Robert Simpson Company, Limited, of Toronto, and has been in service for the past six weeks. The vehicle, of which a view is shown on opposite page, was manufactured by the Fischer Equipment Company, of Chicago, and is known as their No. 2 coach delivery wagon, the equipment consisting of forty 120 ampere hour cells of batteries, which operate two 2½ h. p. motors. The motors as applied to the propulsion of this vehicle are independent in their action one from the other, inasmuch as one motor is attached independently to either rear wheel of the vehicle. These motors are four pole machines, with series wound fields and also series wound armatures, on which but two brushes, ninety degrees apart, are used. The windings of the armature itself are what is known as coil wound, that is, coils are wound up on formers and subsequently placed in slots in the armature, the construction of the latter being what is known as the iron wound form, with but one-sixteenth inch clearance between the armature core and the field magnet, the object being to give the greatest torque with the smallest amount possible of field energy. In other words, the air gap being reduced to the smallest possible space, and the magnetic circuit consisting of cast steel in the pole pieces and sheet steel laminated discs in the armature, reduce the amount of field winding to a minimum, and hence its resistance is very low. The commutators are made very large, and current is delivered to them through carbon brushes, which have an area of contact with under under one hundred per cent. over load equal to 40 amperes per square inch of contact surface. The speed of the motor is 1,000 revolutions at 2½ h.p., and is directly geared with a 2½" pinion to a 26" driving wheel fastened to the wheel of



Regulating Device—System of Electric Lighting for Railway Cars.

An evidence of the improvement in business conditions attending the manufacturing and other interests throughout Canada is markedly indicated by the large number of isolated electric lighting plants being installed this season, and the many increases in the generating capacity for both lighting and power work which are being made in central station plants.

Mr. D. A. Gordon, of Wallaceburg, Ont., who has secured a franchise for the installation of an incandescent electric lighting plant in the town of Tweed, has recently given an order to the Canadian General Electric Company for one of their 500 light single phase alternators. The order also includes the necessary material for the erection of a complete lighting plant.

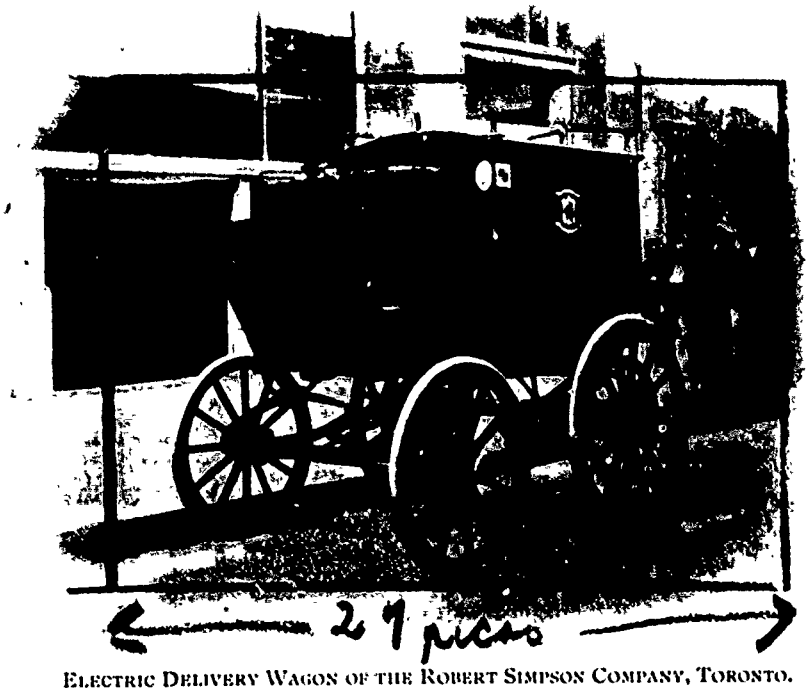
Mr. T. Ahearn, president, and Mr. J. D. Fraser, secretary-treasurer of the Ottawa Street Railway Company, were in attendance at the annual convention of the American Street Railway Association held in Boston last month. As a result of their observation, the company will adopt a system of book-keeping recommended by a special committee of the association. This system will, it is claimed, secure uniformity in the accounts of all the street railways throughout Canada and the United States, and enable comparisons to be made of expenses in all departments.

the wagon, which wheel is 46 inches in diameter, and at a thousand revolutions of the motor gives a speed to the vehicle of a trifle over fourteen miles per hour.

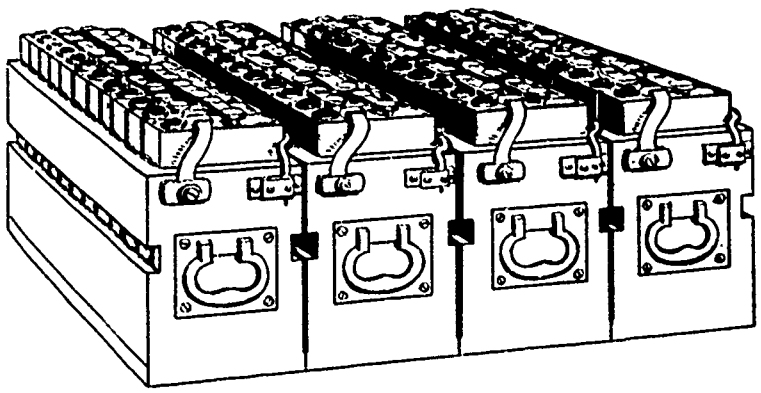
The batteries of the vehicles are arranged in four trays, and the control of the various speeds of the wagon are divided into three; one in which the four trays are in parallel to the motors, giving twenty volts; one in which two each of the four trays are in series and the two series in parallel, giving forty volts; and one, the maximum speed, in which all four of the trays are in series, giving eighty volts. The output of the batteries at the three hour discharge is 27½ amperes for three consecutive hours, and the amperage required of the two motors to operate the vehicles at fourteen miles per hour on a hard level road is 26, that is, thirteen amperes per motor, which gives a three-hour continuous run on a level roadway at fourteen miles per hour—an actual mileage capacity of forty-two miles on one charge of the batteries. The wagon is only rated, however, at twenty-five miles on one charge of the batteries, as high winds, muddy roads, grades, etc., create an extra demand for power which must be provided for; also, the fact must be considered that oftentimes batteries will not be fully charged.

One of the strongest features of the construction of the wagon is claimed to be the brake application, the controller handle and the brake handle being identical and arranged in such a way that the brake cannot be applied without first cutting off the current from the motors, and the current cannot be turned on to the motors without first liberating the brake. This makes it impossible for an inexperienced man to make any mistakes in handling the wagon. The batteries are arranged in trays, as before said, so that they can be divided for control at different speeds, also so that they may be removed from the vehicle for the insertion of duplicate sets, but means are also provided whereby the batteries can be charged in the vehicle, and this is the common way of operating, the current first being cut off from the motors, which is made absolute by the removal of the key after the switch is set in position, and the controller being set upon third speed, which connects all the batteries in series. In this way they are charged directly for 110 volt circuit. The time required for charging under these conditions, when the batteries are fully discharged, is about three hours.

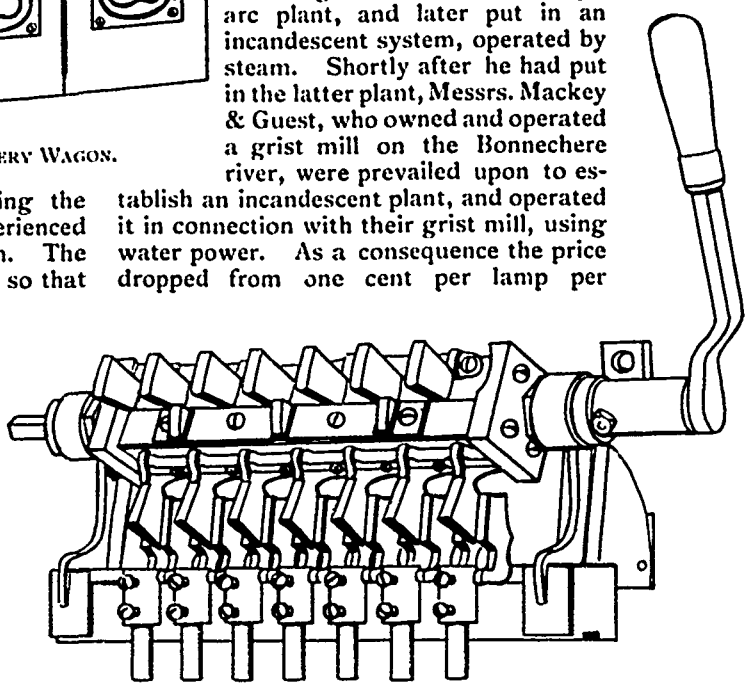
From the foregoing it will be seen that by charging the batteries at noon, it is possible to operate the vehicle sixty or seventy miles per day. The motors are mounted on ball bearings, as are also the wheels of the vehicle, and unless specially ordered, the wheels are of regular carriage type set in hard rubber tires. The motor suspension and arrangement of running gear of the wagon is such that no matter how uneven the road is, no strain is brought to bear upon the gears as between the motor and driving wheels, as the front axle is independent in its adjustment to unevenness of the road. The accompanying illustrations were kindly loaned by the owners of the carriage, the Robert Simpson Company.



ELECTRIC DELIVERY WAGON OF THE ROBERT SIMPSON COMPANY, TORONTO.



STORAGE BATTERIES USED IN ELECTRIC DELIVERY WAGON.



REVERSIBLE SWITCH USED IN ELECTRIC DELIVERY WAGON.

Mr. Jay P. Graves, manager of the Big Three Gold Mining Company, at Rossland, B. C., has just placed an order with the Canadian General Electric Company for a 75 kilowatt synchronous motor. This motor is to be used in the development of their mine at Rossland, and the current for its operation will be derived from the power circuits of the West Kootenay Power and Light Company.

The town of Renfrew, Ont., is now receiving cheap light as the result of competition. Early in the eighties, Mr. A. A. Wright installed an arc plant, and later put in an incandescent system, operated by steam. Shortly after he had put in the latter plant, Messrs. Mackey & Guest, who owned and operated a grist mill on the Bonnechere river, were prevailed upon to establish an incandescent plant, and operated it in connection with their grist mill, using water power. As a consequence the price dropped from one cent per lamp per hour to three-fifths of a cent, at which it still remains Some time ago an attempt was made by the companies to amalgamate, but the negotiations fell through.

A new electric light plant will be added to the Frontenac Hotel, Round Island Park, near Kingston.

FIRST CONVENTION OF THE MARITIME ELECTRICAL ASSOCIATION.

THE first regular convention of the Maritime Electrical Association was held in the assembly room of the Church of England Institute, Halifax, N.S., on Tuesday, Sept. 27th, 1898, at 10:30 a.m. The following persons were present:

E. L. Nash, Lunenburg; J. Daley, Digby; Fred. A. Bowman, J. H. Winfield, New Glasgow; J. A. Anderson, J. Graham, W. Pickles, F. A. Hamilton, P. R. Colpitt, E. T. Freeman, C. E. Harris, I. H. Smith, J. C. Siebert, J. Christie, Halifax; S. G. Chambers, J. L. McDonald, Truro; J. A. Young, Sydney; W. A. Winfield, Windsor; L. C. Gilling, Bridgewater; J. B. Mortimer, Toronto.

The President, Mr. F. A. Bowman, of New Glasgow, occupied the chair. The minutes of the organization meeting held last April were read and approved, after which the president made a few opening remarks, stating that it had been thought advisable to make the first convention largely of a social nature, as that was the first step towards harmony and strength. The committee of the Halifax members, he stated, had gone to a great deal of trouble in order to provide for the entertainment of the association, but unfortunately the weather had marred the arrangements. It had been arranged to have an excursion by steamer on the harbour, with lunch at Bedford, but this would have to be abandoned owing to the rain.

The secretary-treasurer then read his report, as follows:

At our first meeting held on April 12th, 1898, fifty-six gentlemen handed in their names either personally or by proxy, signifying their intention of becoming members of the association. Since then there have been three members elected, making a total of fifty-nine. The receipts have been: 45 membership fees, $90.00, and the expenditure, for various items, $57.55, leaving a cash balance of $32.45. There are fourteen fees still unpaid. I may be permitted to call attention to the fact that the membership fees already paid in are intended to cover the present association year, which ends 31st March, 1899. We must therefore depend, for the financial requirements of the present year, solely upon the balance in hand, the unpaid fees and the fees of new members who may come in during the year. Thus you will see that there is need for personal effort to extend the membership, and for careful husbanding of resources, in order to finish the year with a balance on the right side. J. H. WINFIELD, Secretary.

The president then called the attention of the members to the necessity for an increase in membership, and requested them to use their best endeavors to get others in their respective districts to become members of the association. The majority of the managers of the different companies had already joined, and if they would induce their directors and larger shareholders to take an interest in the work he thought much good might be accomplished.

The president then read his address, as follows:

PRESIDENT'S ADDRESS.

In greeting you at this the first regular convention of the Maritime Electrical Association, it gives me great pleasure to feel that, in meeting here to-day, we have made a great step in advance. We have the honor of being the first section of the Dominion to establish a local organization to work in unision with the central one, the Canadian Electrical Association. As was pointed out in the circular letter issued previous to our organization meeting last April, it was felt that owing to the magnificent distances with which we have to deal in this, our great Dominion of Canada, it was impossible to arouse a very deep interest in the Canadian Electrical Association among the electrical men in these provinces, because it would be impossible for many of them to attend the conventions. It is difficult to get up a warm enthusiasm in an institution the leading men of which you have never met, and may never meet, and the meetings of which you do not hope to be able to attend. Although the benefits to every one belonging to that association would be undoubtedly great, it is hard under these circumstances to get men to see it. They feel as if they were paying their annual fees without receiving an equivalent. It was therefore thought that if an association of a more local character were formed, that would draw together those who are able to go only a comparatively short distance, and if its conventions were held at points accessible to them, they would get to know each other, and also to realize the benefits of such an association, and would then be more ready and willing to give their support to the larger central institution, either by individually becoming members of it, or as a body lending their weight to assist it in any work affecting the industry generally, or in both ways.

When our movement towards organization was announced to the Canadian Electrical Association, we received some very kind words from them. The executive council expressed the hope that means would be found to have the two associations work in unison.

At this our first convention we have not been able to get a very extended list of papers to lay before you, and there is not a very large amount of business to be transacted. The spring and summer is recognized by all workers in technical associations as being the most difficult in which to get papers written. This is naturally so, not only on account of the weather, which is much more conducive to outdoor recreation than to indoor writing, but also because in our business most of us are busy working at extensions and improvements in our outside plant at this time of year, and in preparing for the rush of the fall and early winter's work. On the other hand, the season is well adapted to what must be a very large and important part of the work of our first convention, that is to say, the getting to know each other. Dotted down as we are all over the Maritime provinces, considerable distances apart, comparatively few of us know many of those engaged in the same business, except in the nearest towns. If this first meeting accomplishes no more than to do away with some of this state of affairs, and to send the members home feeling that they know more about their co-workers in these provinces, and that they have picked up some knowledge of other plants, a great and good work will have been done, and a solid foundation laid for future use. The local Halifax members have grasped this idea most strongly, and have gone about its accomplishment in an energetic fashion that will appeal very strongly to our sociability. Being myself from an outside town, I feel at liberty to thank them for their hospitality to us, and, as President, I thank them for their efforts to make our first convention a success. The present time was selected because cheap railway fares are available, and because it was thought that many who would be coming to the exhibition could not make a second trip a month or so one way or the other from it. This renders the efforts of our Halifax members the more laudable, as the present time is distinctly inconvenient to them, owing to the crowds that are in the city. We are gathered here as members of a business which is eminently a creation of and typical of the age, and in this gathering together we are also following the trend of the times.

Centralization and organization are the ruling ideas in every department of work to-day, and in fact almost equally so in our amusements. There is no question that the marvellous progress of the latter part of this century is due almost entirely to this movement. Individual workers could never have accomplished the results that have been attained within the life time of the youngest of us, if they had worked each on his own line without knowledge of what others had done or were doing. The capabilities of the greatest are limited, and each one, if he is to advance himself and his work, must begin where the man before him left off; there must be no time wasted in travelling over the same ground. Experience shows also that to really get the fullest benefit from another man's work, you must not only study him in print, in the abstract as it were, but also in the concrete, in the flesh and blood. Year by year we find the number of conventions and annual meetings steadily increasing in numbers, size and importance. This in itself is a proof that they meet a need, and accomplish good results. It is very easy for those who stay at home and never join in any of these gatherings to say that they are just a fad and a fashion and will die out shortly; that people feel very big to go to a convention and perhaps read a paper, and get their names in print. But hard-headed business men would long ago have ceased to patronize them if they had not seen the practical good that comes from them. Conventions are human institutions, and therefore are a mixture of good and evil, and often do not reach the ideal of the leaders and more earnest minds in them, but nevertheless, I do not believe that there is any person who has ever attended one, unless he is given over to a spirit of absolute cynicism or pessimism, but will admit that he has derived great benefit from it. Each one of us is struggling along in our larger or smaller sphere, meeting our special difficulties as best we can, conquering them after a long struggle, or sometimes being conquered by them, doing what we think is right and best, and always wishing that we knew more or could learn more. We always have a floating wish, more or less strong, according to the amount of self-conceit and self-assertion that we possess, to know how someone else would get out of the difficulty we are in. There is also an idea that possibly the other man may have a better method or a better system than we have. It is this feeling that is at the root of the convention idea. The strong movement of the last few years towards standard methods, not only of manufactures, but also of keeping accounts and making up reports, is the result of the feeling that more good benefit is derived from exchanging figures with your neighbors than by keeping yourself and your affairs secret. From this idea grows a convention, and at it are gathered together a number of men who are all struggling with the same business and therefore often with exactly the same difficulties. Papers are read and discussed, and we get a number of good ideas. The papers are generally on broad, fundamental principles, and were it not for the discussion and the personal opinions and experiences brought out in it, we would not derive as much benefit as if we sat down at home and carefully perused them in our technical journals.

But outside of the convention hall, between the sessions, at the hotel table, on the little excursions that generally take place, in quiet corners of the hotel office, you see little groups of two or three in earnest conversation. It is in those groups that much of the best work of the meeting is done. It is remarkable how even in an assembly of several hundreds, where the majority are necessarily unknown to one another, those whose experiences are somewhat familiar are drawn together. You meet those whom you already know, and are introduced to others, and the conversation of course gravitates towards the lines of work in which

you are all interested, and it will not confine itself, as the formal paper is apt to do, to general principles, but goes right down to actual details of work and methods. Presently you find that the other fellow is asking you if you ever had such and such a difficulty, and how you managed it, or how you did a certain piece of work and what it cost you. You lay your heads together and compare notes and exchange figures, and as a result you both find out just where you are making a mistake, or what would have been a better method of going to work. All this, perhaps, sounds very true and trite to you, and you all feel that you knew it before.

What I want to impress upon you as to the great value of conventions may be divided under two heads. Firstly, if you have been working comparatively alone, without anyone near you in the same line of business, there is a great deal of encouragement just to get into such a gathering and have it brought home to you that you are one member of so large and important a business. You see the style of the majority of the men about you, and feel that they are after all not all of so much greater ability than you are yourself, and if they are succeeding there is no reason why you should not; you hear those few who really do stand head and shoulders above the crowd speaking of the difficulties and problems they have to meet, and you feel that if they have so much trouble with all their foresight, experience and ability to help them, it is not to be wondered at if you get into a hole sometimes. Secondly, you make acquaintances which later ripen into close business and personal friendships, and when the time comes for united action on some point affecting the industry, you know just who is the one to lead and who is to be depended upon.

The feeling about the interchange of information has been steadily gaining ground for many years. In former times the great strength of each man's business was the trade secrets he had that no one else had, and the fact that if he built a machine you had to go to him for every bolt to repair it, because no one else's bolt would fit. To-day it is all different; everything must be made to a standard, and all parts must be interchangeable. With this progress the trade secret has largely vanished, and information as to processes and method of manufacture is gathered and spread broadcast by technical societies and trade journals.

The vital question back of all this, namely, the cost of production and the methods of keeping accounts, has been the longest to yield to this movement for the dissemination of knowledge. Men seemed to think that while they could afford to tell their neighbor a good deal or all about how they did their work, in order that they might get ideas in return, that they must keep their methods of keeping costs and the costs themselves closely secret; that if they let their competitors and the public know just what it cost them to do work and what profit they were making, that the knowledge would be used against them. This feeling is now disappearing to a certain extent, and during the last two or three years information has been made public that would hardly have been entrusted personal friends previous to that. Signs of this are all around us. One of the leading engineering periodicals has been publishing series after series of articles on shop cost, and methods of keeping them. In these the methods of accounting the actual costs are given from many of the largest and most successful works in the United States. The fact that so much space in this journal has been given to this subject shows not only that the articles are highly appreciated, but that the heads of these establishments find it to their advantage to give out this information. Another sign is the formation of a committee of the National Electric Light Association to take up the question of a standard system of keeping accounts. And a still stronger move is the formation among the street railway men of a Street Railway Accountants Association, which held its second convention two weeks ago in Boston, simultaneously with the street railway convention. Similar work is being done in the steam railway world. Probably the keen competition and the reduction of prices, and with them of profits, has largely forced on this movement, it being in many cases a matter of good policy if not of actual self-defence to show the public that prices are being forced down to or below the living point, and to break up the idea that nearly everyone has, consciously or unconsciously, that enormous profits are made in every other business except his own.

I would like to say a few words on the matter of the preparation of papers. Every association, except those with the largest and most learned membership, experience considerable difficulty in getting papers for the meetings. Much of this is due to a misunderstanding on the part of the members. They have an idea that a paper must be a learned discourse of considerable length, composed on a subject that no one else has touched upon, or else bringing out some strikingly new or original ideas on some older subject. They think that it must have an oratorical prologue to properly introduce the subject, a lot of mathematical formulæ strewn through it like the currants in a cake, and some illustrations with letters of reference all over them to represent the raisins, and then the whole thing closed up by an eminently logical peroration; that they must accompany the reading of it by elaborate verbal explanations, and have a blackboard at hand that they must cover with xs, ys and zs, until the audience has been worked up into such a state of bewilderment that it is ready to accept any statement the author likes to make. Now, this is an entirely mistaken notion. The theoretical and mathematical papers have their value, and a very high value it is, and we could not do without them. But we have room and a very large demand for shorter and more practical papers. The large societies and institutes can be depended upon to give us an unlimited supply of the former class, but it is from just such men as we have among our own members that the latter class must come. What we want is short practical papers touching on the difficulties and experiences that we all have in our daily work. The English Institution of Civil Engineers, the leading engineering society in the world, with a membership of over 6000, publishes many very short papers each year, as well as the longer ones, which it, of course, has comparatively little difficulty in obtaining. The short ones, as a rule, come from practical engineers all over the world. One man has had some trouble with a bridge pier and he sends in his experience, and a couple of pages of print holds it all. Others have met other small problems and attacked them successfully, and they give their fellow members the benefit of their work. Several of the large societies on this side of the Atlantic are doing the same thing and sending to their members each month a number of small papers, many of which cover only one page. A member of one of these societies assured me that he got many very valuable suggestions from them. Some, of course, were not directly in the line of work which he was following, and others contained points that he particularly wanted to know.

I want, therefore, to impress on you all that if asked to present a paper you do not begin to say that you have neither time nor ability, because you have both if you look at the matter in the light in which I have been trying to put it to you. Every one of us has had some experience that it would be useful to others to know of, and every one of us is capable of writing it down in a few plain words so that it can be understood. Do not think that a matter is too small to be worth talking about. If an experience has been of value to you it will be of value to someone else, and that someone else will be glad to get it, and your telling it to him will save him having to work it all out for himself. Even if he has had the same experience he has dealt with it in a different way perhaps, and will say so in the discussion, then each learns from the other and the rest of the association has the experience of you both to draw from. Again, a paper that does not amount to a great deal in itself may start a discussion that will draw out much valuable information. This is a very common experience in technical societies. The discussion often does not follow the lines of the paper at all, but the paper suggests some idea to a listener and he brings it forward and it is taken up by others and the ball set rolling.

So I repeat, if you are asked for a paper do not blush modestly and disclaim the requisite time, knowledge and ability, but stop and think over your work and see if there is not something that will be of value to others to know. Perhaps you spiked and painted a lot of poles and kept account of the material and labor on them. Now, this is a very simple every-day operation in the business, but I will venture to say that a great many of your fellow members would be very glad of some information as to probable cost and quantities. I know I had a good deal of difficulty in procuring it the first time I needed it, and am open to receive much more than I now possess. Again, possibly you have had some difficulty with a dynamo, something that has baffled you for a long time and that you sat up alongside of that machine for nights to try and find, and at last when you did find it, it was so simple you felt half ashamed of yourself for not having discovered it sooner. But do you not think that an account of the trouble with the method you adopted in your search might be just what some one else wanted? Or perhaps you have been successful in your method of lighting some hall, lodge room or church. I will give just one illustration of this. Some two or three years ago some one wrote for a leading electrical journal a short account of a method he had successfully employed in lighting a lodge room for a secret society. The article barely filled a column of the paper. Some time later I was called on for estimates for lighting a new lodge room for such a society. I remembered the article and, referring back to it, used many of the writer's ideas. A fairly vigorous canvass was necessary to get the scheme through in its entirety, and I was greatly aided in it by taking the number of the periodical and pointing out that what I was recommending was what had been found satisfactory elsewhere. I mention this because I believe many would have thought the ideas in that article much too simple and self-evident to be worth publishing. I am sure that I voice the sentiments of a large number when I say that I wish more of those simple ideas appeared in our technical journals, and I know they would be willingly published if contributed. I spoke of your being asked to present papers. Do not stop to be drummed up and asked. When you come across something of interest make a note of it and write it out simply and plainly and send it in.

The appreciation of the address was evidenced by hearty applause.

Mr. Hamilton: I feel that we owe thanks to our president for his interesting and able address. There is so much suggested by it that it is hard to deal with it in a fitting manner. The principal suggestion is perhaps that bearing on the preparation of papers. Most of us feel that the writing of a paper is a hard task, but we must feel encouraged by his remarks. While on my feet I would like to say, in reference to this our first meeting, that it is unfortunate that the elements are against us, but the attendance is encouraging, and I trust this will be the foundation of larger and better meetings in the future. Exchange of ideas at first is hard, but as we get to know each other it will become easier. Speaking of the class of papers as mentioned by the president where chasing the wily X is indulged in, they are valuable for reference, but the discussions they invoke are both useful and interesting. I feel that it is not my province to make any further remarks, but again wish to express my appreciation of the president's address.

Mr. P. R. Colpitt: I feel diffident about speaking of papers after Mr. Hamilton, as he has prepared a paper, while I, though invited to contribute one, did not, but I heartily second all his remarks. I beg to move the

acceptance of the president's address with the thanks of the meeting.

Mr. Daley: I have much pleasure in seconding that motion.

The motion was put by the secretary and carried.

The president then thanked them for the vote of thanks.

Mr. J. A. Young said he was very glad to have the opportunity of listening to the address. This was the first meeting he had attended, and he thought the suggestion of getting to know each other was a good one. "I am away down in Sydney, and it is hard to get any one to talk to," he said. Referring to the president's remarks regarding poles, he stated that he would probably have to erect eight or nine miles of pole line shortly, and though he had already erected some fifteen or twenty miles, he did not possess all the information he required, and by such meetings as this one could acquire many valuable pointers.

Mr. Daley then brought forward a letter just received from his town council calling upon him to execute a bond of indemnity against any damages the town might be liable for, through his poles and wires being in the streets, and desired to know the experience of other members in this matter.

Some discussion took place, during which it was shown that if a company was possessed of a proper charter this matter was thoroughly provided for without a bond.

Mr. Nash: As this is an experience meeting, I would like to give one. I noticed some time ago that there was a lot of hot air over my boiler, which was serving no useful purpose, and it occurred to me that it would be a good plan to obtain a blower and introduce this air under the grate bars, but my directors failed to see the point. On New Year's day we had a terrible windstorm and our chimney was suddenly reduced in height from 60 to 25 feet. I immediately telegraphed to Boston for a blower. When it arrived I belted it to the engine, ran a pipe to the grate bars, and have been happy ever since. Our income has increased about $300, and the coal consumption remains the same, so that I think the blower has paid for itself. I have figured that the blower has increased my capacity about 10 , and can often get over the peak of the load with one boiler, while before I always had to use two.

The president said he was glad Mr. Nash had brought up this matter, as it was the kind of discussion that was needed. Continuing, he said the question of forced draft had lately been growing in importance. It is a question with most of us, he said, between putting up an iron stack every three or four years or expending a large sum on a brick one. Iron stacks do not last with us as they do in the western provinces, owing to the greater corrosion caused by the dampness of the atmosphere. This was an illustration of the benefit of our local association, as it gave an opportunity to discuss a question that would never have come up in an association holding its meetings farther west.

Mr. Chambers said he hardly expected to speak on the question of forced draught, but he had studied it considerably of late, and thought that some of its advantages were over-rated; nevertheless, he expected to install shortly a blower in his own plant. There was another matter that might be mentioned, viz., that of the automatic stoker. He thought much of the advantage claimed for that was due to the improved draught.

Mr. Freeman stated that Mr. Nash's plant was under a hill and his natural draft was at times poor.

Mr. Nash explained that he had a gate in the outlet which regulated the flow of air, and when the gate was entirely closed the belt of the blower ran very slack, showing that very little power was being used.

Mr. Colpitt said that in a Sturtevant blower, when the outlet was closed, the whole body of air in the blower was in motion and called for comparatively little power to keep it moving, whereas as soon as the valve was opened, and the air in the blower forced out, fresh air entered at the centre and had to be put in motion, calling for an expenditure of energy. In reply to a question of the president, Mr. Nash stated that he used Cape Breton slack coal.

Mr Daley asked for the experiences of any of the members who were using jet condensers.

Mr. Chambers said that in plants of over 80 horse power and with water cheap, it would pay to install a condenser. His own plant had a capacity of 300 horse power and the saving was enormous, but in 60 or 80 horse power it hardly paid for the trouble and expense of installation.

Mr. Nash: Another question I would like to ask is, what is the advantage of insulation on the conductors of long distance transmission lines at high potential? I am about to utilize a water power and will have a transmission line of some eight or nine miles.

In the discussion that followed attention was drawn to the fact that all the great transmission plants, such as those at Montreal and Niagara Falls, used bare wire exclusively. It seemed to be the unanimous opinion of the members that covering on a wire carrying over 2,000 volts was largely a snare and a delusion.

The president mentioned that Capt. Brophy, of the American underwriters, condemned the use of a covering on high potential wires. After some further discussion it was decided to finish the business at the morning session, doing away with the afternoon meeting, as several of the members were anxious to get away.

The question of time and place of next meeting was then taken up. It was moved by Mr. E. T. Freeman, seconded by Mr. S. G. Chambers, that the next meeting be held at Halifax some time in January. Carried.

The president then introduced Mr. F. A. Hamilton, who read a paper on "Electric Gong Buoys," which is printed elsewhere.

The president remarked that the paper was singularly appropriate for the first meeting of a maritime association. The question of signalling in foggy weather had been very much in evidence in the technical journals during the last few months, owing to the loss of the French liner La Bourgoyne, and other recent accidents at sea.

Mr. Chambers: I have listened with great pleasure to Mr. Hamilton's paper, but I think we all would have enjoyed it more had we been able to have gone from here to the steamer for the excursion as originally proposed, and seen for ourselves the need for such a system of signalling. I have much pleasure in moving a vote of thanks to Mr. Hamilton for his interesting paper.

Mr. Daley seconded the motion, which was carried unanimously.

The president then conveyed the thanks of the meeting to Mr. Hamilton for his able paper.

Mr. Hamilton, in reply, requested permission to read a letter which he had received from Mr. W. H. Preece, of the English post office, in which he expressed his approval of the system, but suggested the use of alternating currents, thus doing away with the use of springs, which would be apt to stick.

Mr. Chambers: Is there a way of producing a noise at a distance by electricity, other than by a bell, that would be suitable for a fire alarm?

Mr. Hamilton: That opens up a wide field. A motor could be used to drive an air compressor which could store the compressed air in a chamber, and thus be utilized to blow a whistle.

Mr Chambers: That has been tried in the States, but the air leaked out, and when the alarm was wanted it would not work.

Mr. Colpitt thought that the buoy would be too small to contain the mechanism necessary to ring a bell of sufficient size to be heard any distance.

Mr. Hamilton explained that a small bell could be heard a long distance to leeward, and his idea was to get the buoys far enough out so that a vessel could always run to leeward of them without coming in dangerous proximity to the coast. The bell would be placed high up on the mast and the other mechanism low down in the buoy to counterbalance the bell.

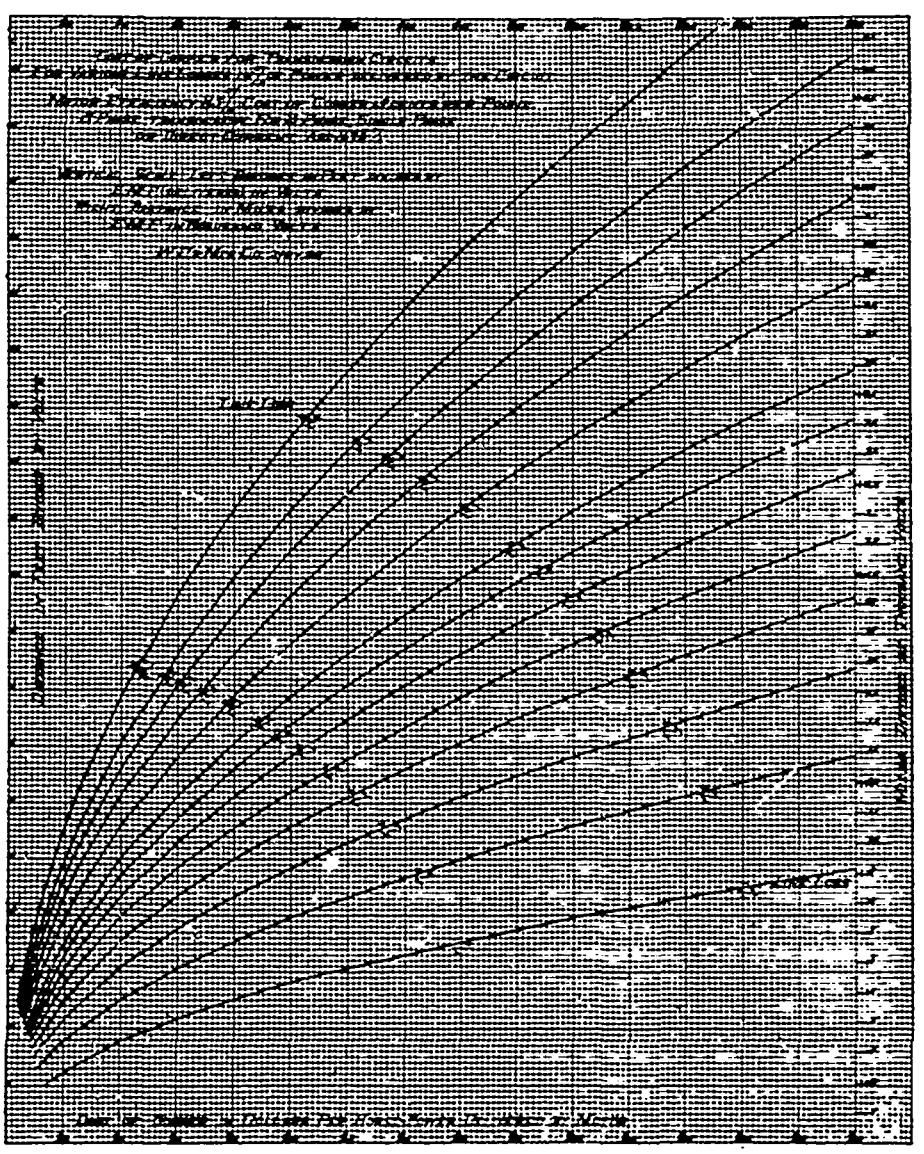
Mr. Daley then moved, seconded by Mr. Anderson, that this convention do now adjourn. Carried.

COST OF COPPER FOR TRANSMISSION CIRCUITS.

THE accompanying diagram, showing the cost of copper for transmission circuits, was prepared by Mr. Chas. F. Scott, electrical engineer of the Westinghouse Electric Manufacturing Company, and embodied in a paper on "Electricity in Paper Making," read before the American Paper and Pulp Association. The curves enable one to find the cost of copper for transmission circuits with any given percentage of line loss, the distance in feet or miles, and the voltage, and will no doubt be found useful.

Mr. Scott's paper explained in a brief and simple manner many of the characteristics of electricity and electrical apparatus, and showed in what way and under what conditions they might be profitably employed in the paper-making industry. His conclusions as to the efficiency of electrical apparatus are given in the following words:

"The full load efficiency of generators, both of direct current and alternating current, varies with the size and type, but for machines of 100 horse power and over



CURVES SHOWING COST OF COPPER FOR TRANSMISSION CIRCUITS.

the variation may be from 90 or 91 per cent. to 95 or 96 per cent. The efficiency of alternating current transformers, in the same way, may be said to vary from 96 or 97 per cent. in sizes less than 100 horse power and 97 or 98 per cent. in larger sizes. The efficiency of motors both for direct current and alternating current varies from 80 or 85 per cent. to 90 per cent. in sizes from 5 to 100 horse power, and is 90 per cent. to 96 per cent. for larger sizes. Efficiency of transmission lines and distributing circuits depends upon the E.M.F., the amount of copper and upon the cost. The approximate efficiency of a transmission plant will therefore be between limits about as follows:

Generators	90 to 96%
Raising transformers	96 " 98 "
Transmission line	90 " 95 "
Lowering transformers	96 " 98 "
Local wiring	97 " 99 "
Motors	85 " 96 "
Efficiency of plant	61 " 83 "

"In local distribution from low voltage generators the losses in raising and lowering transformers are of course eliminated, and the range of efficiency becomes 66 per cent. to 86 per cent."

THE BULLIER CALCIUM CARBIDE PATENT CANCELLED.

THE Berlin Patent Amt has nullified Bullier's calcium carbide patent, and in view of the constantly growing importance of acetylene, it is worth while to review the facts of the case. Bullier was Moissan's special demonstrator, and the patent was granted in 1894 for the only practical process of producing calcium carbide in the electric furnace. This German patent of the French chemist becomes the property of the Neuhausen Aluminium Company, and as they made difficulties over granting licenses it was a stumbling block in the way of the development of the acetylene industry in Germany. Hence, now that it is swept out of the way, carbide will quickly become cheap in the fatherland. As a matter of fact, it is astonishing that the German patent was ever granted, or that the Frenchman Bullier should have claimed the invention. Wilson, an American, obtained English and American patents in 1893 for the production of calcium carbide exactly in the same manner, and even his patents were not now unassailable, seeing that a German chemist, Professor Borchers, had made the first communication of the method of producing calcium carbide ten years before. The German Patent Amt accorded the patent to Bullier for crystallized carbide, but Lord Kelvin affirms that the calcium carbide sent to him by Wilson in 1892 was in perfect crystals.—Invention.

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Short-Sighted Methods.

FROM information to hand, we are of the opinion that the movement in favor of municipal control of electric lighting is being advanced by the unpopular methods of some of the private lighting companies. In quite a number of instances these companies have not pursued a business policy calculated to satisfy their customers and enable them to retain their business. They have acted on the principle, and, in fact, have in some instances been foolish enough to assert, that the customers must take light under whatever conditions and terms the company might see fit to impose. Such companies have not attempted to keep their plant in an up-to-date condition, but have endeavored to run their business with as little outlay for apparatus and operating expenses as possible. As might easily have been foreseen, the result of this line of policy has been forfeit of the sympathy and goodwill of the consumers on whom the success of the business must depend, and the dissatisfaction thus engendered has, in many instances, taken the form of active opposition and advocacy of municipal control. Electric lighting companies must recognize the fact that they are in identically the same position as the proprietors of stores and other enterprises which depend for their success on the extent to which they cater to public requirements, and they must not seek to avoid any reasonable amount of trouble to give satisfactory service to their customers. Their object should be to please by every means the persons from whom their business derives its revenue. It will be found to be good policy for the manager of the company to frequently drop in on his customers and learn whether they have any complaints to make regarding the character of the service.

Specifications for Electric Plants.

AT the present time, when several municipalities are considering the advisability of installing electric light plants, the question of having proper specifications on which to tender is one of much importance to manufacturers of electrical apparatus. It is, of course, preferable to have specifications prepared by a competent and unbiased electrical engineer, in order that all tenderers may be placed on the same footing, and that the municipality may obtain the best apparatus for the money invested. But where such an engineer is not employed, it becomes the duty of the official deputed to draw up the specifications to obtain as much information as possible on the subject. As our readers know, the city of London, Ont., recently invited tenders for an arc plant, upon specifications prepared by the city engineer. Exception was taken to these specifications by at least one company, on the ground that they were such as to exclude some manufacturers of electrical apparatus from tendering. While in some respects the specifications could have been amended with advantage, we are of the opinion that on the whole they gave quite general satisfaction, as will be seen by reference to a number of letters from interested persons, printed elsewhere in this issue. These letters will, we believe, serve a useful purpose, inasmuch as they show the prevailing opinion with regard to the conditions which should be embodied in specifications of this character. It is regarded as a mistake, so far as the purchaser is concerned, to place such restrictions on tenderers as will shut out good apparatus and limit the field for competition. A greater error is to specify a certain make of apparatus, thus permitting the manufacturer of same to fix his own

price for the goods. This was the mistake, and about the only serious one, committed by the city engineer of London. By specifying the Adams-Bagnell single carbon lamp, he excluded the manufacturers of all other lamps from tendering, and gave the Adams-Bagnell people the contract at any price they wished to name.

Canadian Materials.

ALTHOUGH it is only a few years since the first electric railway was built in Canada, it is now possible to obtain in this country all the materials necessary for the complete equipment of an electric road. In the case of the street railway recently completed at St. Thomas, Ont., we observe with pleasure that, with the exception of the overhead joists and fixtures, the line was built and equipped with Canadian material, the total cost being $85,000. The rails were made at Hamilton, Ont.; the engines at Amherst, N. S.; dynamos and electrical equipment at Peterboro', Ont., and the cars at Ottawa. We would gladly welcome more examples of this character, as upon the building up of our industries depends the future of the Dominion of Canada.

The Maritime Electrical Association.

THE Maritime Electrical Association is to be congratulated, as a new organization, upon the steps which have been taken to establish the foundation of a useful society. It is true that unless other than social advantages are to result from the formation of such associations, their existence is likely to be of short duration. This is fully recognized by the members of the Maritime Electrical Association, the proceedings of the first meeting of which are printed in this issue. Associations of this character permit of the discussion of questions having a local bearing which, even if taken up by a Dominion association, would interest but a comparatively small percentage of the members. In Canada, perhaps more than in other countries, owing to its vast territory, there exists the necessity for local organizations, and we therefore predict a reasonable measure of success for the association in question. We have no fear that the interests of the Canadian Electrical Association will be likely to suffer as the result of the formation of local organizations of this character; on the contrary, they should be a source of strength to the more important body. In the presidential address of Mr. Bowman are found many suggestions by which the members should profit. The practical experiences related by the members are likewise instructive. May the association extend in membership and usefulness.

Penny Wise and Pound Foolish.

SOME of the electrical companies are pursuing a "penny wise and pound foolish" policy with regard to the efficient operation of their plant. It would seem to require but little argument to show that machinery which has cost many thousands of dollars should not be entrusted to the care of an incompetent operative, yet we find managers of companies seeking to save money by cutting down the wages of operatives to a point which must result in bringing them only the services of incompetent men. An instance of this kind came to our notice recently, in which the owners of an electric light plant were compelled to replace two 100 horse power boilers and a 75 horse power engine, which had been rendered useless by lack of knowledge and carelessness on the part of the engineer in charge. The boilers, which had only been a short time in use, had rarely, if ever, been cleaned, and contained deposits of mud which resulted in the shell being burned and the boilers rendered unsafe. A high speed engine had been racked to pieces and the usefulness of a more valuable one so impaired as to render it unfit for the required service. After all this damage had been done and a loss of many thousands of dollars incurred, the manager of the company began to look around for a competent engineer. When told that he would have to pay at least $65 per month for an efficient man he said, "Why, that is $30 per month more than we have been accustomed to pay." Notwithstanding, he at last came to a realization of the fact that to double the engineer's salary might, after all, be the means of affecting a saving in operating expenses, and it is the purpose with the new machinery to install a man competent to properly operate and care for it.

Steam vs. Electric Railways.

IT is admitted by the management of steam railways that great inroads are being made upon their local passenger business by electric railways. The latter are steadily spreading out, and it is difficult to say to what extent they will become competitors to long distance roads. The fact is recognized that there are obstacles to be overcome in connection with the economical operation of electric railways in rural municipalities. In ten years up to and including 1893, the number of passengers carried on the steam railroads in the state of Massachusetts increased at the rate of 5,825,000 a year. The next four years they decreased at the rate of 4,766,000 a year, owing to competition from electric roads, as in these same four years the number of passengers carried by electric railways that enter Boston increased over 31 per cent. The experience of railroads in the vicinity of Chicago and other cities is identical in this particular. If steam railroads are to compete successfully with electric systems, it will be necessary to give cheaper fares and greater attention to the comfort of passengers. Uncleanliness is one of the greatest objections that can be urged against the steam road. But it is not alone the passenger traffic that has been and will be affected. The electric roads are now reaching out, with some success, for freight business. In this connection we observe that a successful test of the Bonner rail wagon, as described in a paper by Mr. W. T. Bonner, read at the last convention of the Canadian Electrical Association, was made recently at Toledo, Ohio. The purpose of this wagon is to convey farm produce to market, its construction being such as to permit of the wagon being separated from the truck and transported on the electric railway to point of destination. Should this scheme work out satisfactorily, as some believe it is likely to do, the field for the electric railway will be greatly broadened.

The amalgamation has taken place since our last issue of the Westinghouse Electric and Manufacturing Company, of Pittsburg, Pa., and the Walker Company, of Cleveland, Ohio, two of the leading electrical concerns in the United States. This is regarded as one of the most important transactions that has been recorded for some time, inasmuch as, besides making a particularly strong combination, it puts an end to litigation affecting Walker apparatus. By the change the Walker Company is brought under the terms of the agreement which has existed for two and one-half years between the General Electric and Westinghouse companies. In a few years the Walker Company have built up an extensive business, and we are glad to learn that their factories are to be continued.

AN ALTERNATING CYCLE-CURVE RECORDER.

By Prof. H. L. Callendar, M.A., F.R.S.

The study of alternating current phenomena by means of the delineation of the curves, which represent the mode of variation of the pressure and current throughout the cycle, has been rendered so familiar by the labors of Hopkinson, Ryan, Fleming, and many other observers, that no apology is needed for introducing a new piece of apparatus intended to reduce the labor involved in this method of investigation. Briefly stated, the function of the Cycle-Curve Recorder is to describe automatically, without any interference on the part of the observer, a continuous pen and ink curve representing the cyclical variation of the quantity to be recorded. The immediate object of its construction was the study of the variations of the form of the current or pressure cycle-curves of a particular form of alternator with variations in the character of the load on the station at different times in the day. The labor involved in this study by any of the usual means was such as to be prohibitive. The action of the present apparatus, however, is so completely automatic that it can be set to record the form of the cycle-curve every half hour throughout the day, and may then be locked up and left to itself, to continue recording for so long a period as may be desired. The complete carrying out of this programme was unfortunately interrupted by my appointment to to the chair of physics at University College, London, and it is now unlikely that I shall have leisure to pursue the investigation myself; sufficient, however, has already been accomplished to show that the apparatus is capable of very accurate work, and is likely to prove a labor-saving device of considerable utility.

The apparatus consists essentially of a recording potentiometer working in conjuction with a cycle contact maker, which selects the P. D. to be recorded from a particular point of the cycle in the usual manner. By means of a simple worm gearing, the contact brushes are slowly revolved, and the point of the cycle selected is continuously varied concurrently with the motion of the record sheet, so that the variations of the P.D. throughout the cycle are recorded in the form of a continuous curve. The recording pen is of the usual pattern, and is directly attached to the sliding contact of a delicate relay on the potentiometer bridge wire. This relay is made to actuate a pair of motors in such a manner as to keep the sliding contact always at the balance point. The drum on which the record sheet is wound may be of the ordinary kind, revolving once in an hour, but if continuous records of the forms of the cycle are required, extending over a longer period without changing the sheet, it is necessary to replace the simple drum by a continuous band. The width of the sheet, which limits the scale of the record, has hitherto been about 8 inches, which is found to give a sufficiently open scale for most practical purposes.

The Recording Potentiometer. - The recording potentiometer was not originally designed for this particular purpose. I had, as a matter of fact, previously applied it to a great variety of other uses, such as the recording of variations of voltage, current, power, resistance, temperature, pressure, etc. The idea of making a potentiometer or Wheatstone bridge record its balance point automatically, in the manner described, is a very obvious one. I first endeavored to carry it into practice when working with platinum thermometers at the Cavendish laboratory in 1886. With this object I selected the most delicate polarized relay that I could find in the apparatus room, and connected it up in the place of the galvanometer in my apparatus. I very soon found that in order to record temperatures successfully to the tenth of a degree, I should require a relay about a thousand times more delicate than the best of the post office pattern. After making several other experimental relays with selenium cells, etc., I gave up the attempt for the time, and did not return to the subject till the conclusion of the McGill College session in April, 1897. I then succeeded in constructing a sufficiently delicate relay, and in obtaining records of temperature in pen and ink, on a scale as large as 1 cm. to the degree Fahrenheit. Several of these early temperature and volt records were exhibited at the meeting of the Canadian Royal Society on June 23rd, 1897, and some of them have been reproduced in the Canadian Royal Transactions for that date. The apparatus itself has been recently exhibited at the conversazione of the Royal Society in London, and on other occasions in Canada, where the first instruments were constructed. It is hoped that an improved pattern, as made by the Instrument Co., Cambridge, may be exhibited at the forthcoming meeting of the British Association at Bristol, and that a description of the final form may then be published. In the meantime it may be of interest to describe the cycle contact-maker, and to give some account of the special difficulties which were encountered in connection with this particular application of the recorder.

The Cycle Contact-Maker. - The idea of applying the instrument in conjunction with a suitable cycle contact-maker for the recording of cycle curves automatically, first occurred to me in connection with the investigation of the form of steam temperature cycles in the cylinder of a steam engine by means of a very sensitive platinum thermometer, as described in a paper by Prof. Nicolson and myself, "On the Law of Condensation of Steam," which was read and discussed at a meeting of the Institution of Civil Engineers in November, 1897, and has since been published in their Proceedings, Vol. CXXXI. The application to alternating current cycles followed as a matter of course, being, in fact, very much the simpler application of the two. The method of obtaining a continuous record by means of a continuous motion of the cyclical contact point in unision with the record sheet or plate, was employed by Blondel (The Electrician, Vol. XXVII, p. 603), who made use of a spot of light reflected from a dead-beat galvanometer on to a slowly moving photographic plate, the deflection of the galvanometer being proportional to the instantaneous value of the P.D. or current to be recorded. The objection to the method above sketched, apart from the fact that it gives a photographic and not a pen and ink record, is principally that it is a deflection method and not a null method. In the present instance, in addition to the usual objections to a deflection method, there is the difficulty of the variable resistance of the cycle contact in the galvanometer circuit. In the null method, with the potentiometer, changes in the contact resistance are immaterial, and there are no errors introduced by inequality of scale, or hysteresis of the suspension.

The Synchronous Motor.—When completing the equipment of the McDonald Physics Building in 1893, for the application of the cycle-curve method to the study of alternating current phenomena, I ordered a small laboratory alternater of the Pyke and Harris pat-

tern, mounted on a bed-plate with a suitable continuous current motor. My reason for choosing this particular type of machine, with its overhung spider carrying the revolving keepers, was that it could be fitted with a cycle contact in a very simple manner, and could be used, either as a generator or as a synchronous motor, for delineating cycle curves of larger generators. The cycle contact brushes consisted of a pair of fine steel springs mounted side by side on a short projecting arm carried by a divided circle centred on the circular face of the field magnet, which was concentric with the shaft. The ends of the springs rested on the edge of an ebonite disc turned in position on the shaft, into the circumference of which were fitted, at intervals of a complete period, a number of narrow contact pieces of steel, each about one-hundreth of a cycle in width. This form of contact was found to wear very well and to give excellent results, provided that the disc was clean and running perfectly true. The performance of the contact was tested by taking curves, first by the potentiometer balance method, and then by the deflection method under the same conditions. In the second case, any variation in the contact resistance would be made evident by an unsteadiness of the galvanometer. The results compared very favorably so long as the resistance of the galvanometer was made as high as possible, but even in this case it was obvious that the potentiometer method was greatly to be preferred. I, therefore, abandoned the attempt to fit up an automatic recording apparatus of the Blondel type, as I had at first intended, and did not return to the question of obtaining automatic records, until the completion of the recording potentiometer at a later date appeared to offer a more convenient and accurate solution of the problem.

On making the first experiments with the recording potentiometer, I found, as I had anticipated, that the resistance of the cyclical contact was a matter of considerable importance. In order to secure the maximum sensitiveness for small differences of potential, it was necessary to make the resistance of the relay or galvanometer of the order of 10 ohms. Under these circumstances it was evident that any imperfection of the contact, although it would have no effect on the position of the balance point on the potentiometer bridge-wire directly, would reduce the sensitiveness of the relay, and thus make the position of the pen lag behind the correct reading, owing to want of quickness in following. With the object of reducing the resistance of the contact, the width of the strips in the circumference of the ebonite disc was increased, and they were made to project slightly and slope back at an angle with the edge of the disc, so as to maintain the contact as long as possible. It was found, however, that with the 9 in. contact disc originally fitted on this machine, the peripheral velocity was too great for this form of contact, and the brushes had a tendency to jump and break, especially at high speeds. To get over the difficulty of the peripheral velocity, without abandoning the steel spring contact, a small fan motor of a common type was fitted with a synchronising rotor, and an ebonite contact disc of 1 in. diameter. This was fitted with an oil pad to keep the contact clean, and gave very fair results up to speeds of 60 or 80 cycles per second. It would no doubt be possible to make some better form of contact for the purpose, but, as the small motor worked fairly well, and the time at my disposal was limited, I did not think it worth while to make any more experiments in this direction at the time.

The drum on which the record was taken in the potentiometer was made to revolve once an hour by means of an ordinary clock contained in the barrel. The simultaneous revolution of the contact brushes might have been very simply secured by means of a similar clock. But in order to secure sufficient power, and to avoid any possibility of slipping, it seemed preferable to obtain the motion from the spindle of the motor itself by means of worm gearing. It might appear at first sight that this would lead to a certain loss of accuracy, as the interval on the drum corresponding to the wave length of the cycle would vary with the speed of the motor. In reality, however, the accuracy of the record is, in any case, limited by the constancy of speed and voltage of the generator. The contact springs were mounted on an ebonite arm on the face of a worm wheel capable of turning freely on a boss concentric with the shaft of the motor. The tangent worm was driven by another worm wheel, the worm of which was driven by a large pulley belted with an India rubber band to a small pulley on the shaft. Each of the worm wheels had 100 teeth, and the ratio of reduction could be varied by varying the ratio of the pulleys. In the records here reproduced, the speed of revolution of the contact springs was adjusted to be about 20 min. to the half wave, as this happened to give the best proportions to the curve with the drum revolving once an hour, and a scale of 1 in. to 50 volts on the record. The small synchronous motor, fitted in this manner with a slowly-revolving cycle contact, was complete in itself, and proved to be extremely convenient and portable, the whole weighing only 10 or 15 lbs. It was generally brought up to speed when starting by means of a small direct-current motor, but a hand wheel and belt would probably be in many cases more convenient. Such faults as it was found to possess were not inherent in the method or design, but were due to the cheapness of the machine and the roughness of the workmanship. The poles and clearance were unsymmetrical, the rotor badly balanced, and there was too much friction and slack in the bearings and brushes, faults which might naturally be expected in a cheap commercial motor hastily adapted, but which could be easily remedied in making a special instrument for the purpose. The curves here reproduced, which were taken with the first rough experimental apparatus, must not, therefore, be regarded as a fair test of the capabilities of the method. And when we consider that the curves, in addition to the mechanical defects of the motor, include all the variations of speed and voltage of the supply company, it seems likely that the accuracy of the apparatus under favorable conditions will be limited only by the scale of the record, and the fineness of the line traced by the pen. The current cycle curve of the small motor itself is much the most irregular. This might naturally be expected, and is probably to be explained by variation of the friction, which would necessitate variation in the torque and in the angle of lag of the rotor. The majority of the irregularities are, however, too small to show clearly when reduced to half the original scale. This is very creditable to the steadiness of the voltage and speed of the Royal Electric Supply Company.

DESCRIPTION OF THE CURVES.—The first pair of curves are of a familiar type, representing the volt and current

cycles on the primary of a 5 h.p. transformer with a closed magnetic circuit, when working at a very low magnetic induction with no load on the secondary. *The experimental transformer was not connected* directly to the primary mains of the Royal Electric Co., but to the 100 volt side of the lighting circuit transformer, which was otherwise unloaded. The volt and current cycles were not taken simultaneously, but on successive days. The correct relative lag of the current curve is readily obtained on the record sheet, by setting the worm wheel carrying the contact springs at the zero mark, and putting the worm in gear at the moment when the pen reaches the zero line on the drum. The scale of amperes is placed on the right of the figure in each case corresponding to the ampere curve marked (a); the scale of volts is placed on the left and corresponds to the curve of volts marked (v). The scale of the bridgewire was adjusted in the present case to be 2 in. to the volt. The current to be delineated was passed through a non-inductive resistance of one ohm, so that the scale of the record was 2 in. to the ampere. For the volt curve, one-hundredth part of the voltage was taken by means of a ratio box. The scale was, therefore, 2 in. to 100 volts. The horizontal time scale in each case simply marks the speed of revolution of the record sheet on the drum. The length of a wave on this scale depends on the time required by the contact springs to turn through the interval corresponding to a cycle. This was determined by the speed of the motor, and by the ratio of the reducing gear. It would not have been difficult either to drive the recording drum from the motor, or to drive the contact springs by clockwork, in both of which cases the wave length on the record would have been constant. It would probably be more interesting, however, at least in view of the possibility of taking all day records in this manner, to have the variations of speed recorded by the variations of wave-length. The forms of the curves given in Fig. 1 were verified indirectly by compari-

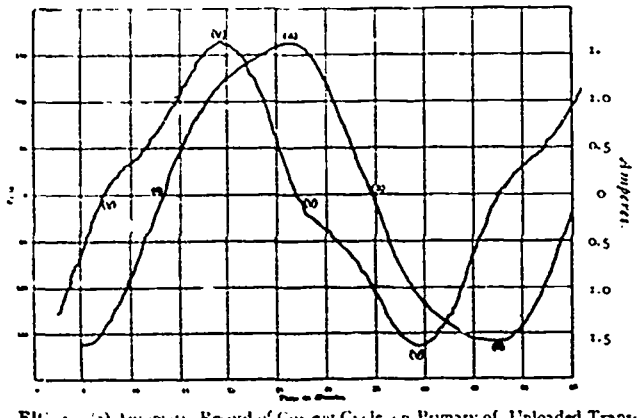


FIG. 1.—(a) Automatic Record of Current Cycle, on Primary of Unloaded Transformer. (V) Automatic Record of Volt-Cycle of Stanley Alternators of the Royal Electric Co., Montreal. Taken by Synchronous Motor at the McDonald Physics Building, one mile distant. Speed, 65 Cycles per Second.

son with curves taken off the same transformer under conditions as nearly similar as possible, by the potentiometer method, with a sensitive galvanometer in place of the relay and automatic recorder, and using the Pyke and Harris alternator as a synchronous motor. They were also verified by describing the hysteresis loop in each case, and comparing it with the results of ballistic tests. It was apparent that the results given by the automatic recorder were at least as accurate as those obtained by the much more laborious method of eye observations and subsequent plotting.

The pair of curves exhibited in Fig. 2 were taken on the same record sheet about the same time of day. The volt curve is practically a repetition of the previous volt curve. At other times in the day, under different conditions of load on the supply station, the form of this curve was found to be considerably modified. The inequalities of the curve, which are seen to be most conspicuous near the vertex of the wave, were in all probability chiefly due to variations of speed and voltage at the station. The current curve in Fig. 2 is the current curve of the small synchronous motor itself, and was located on the record sheet, as previously ex-

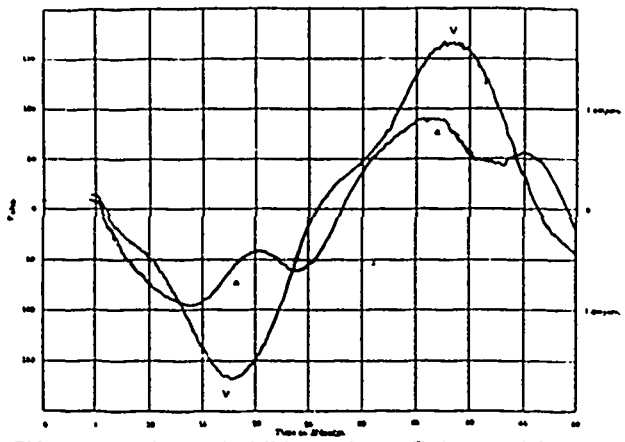


FIG 2. - Automatic Record of Volt and Current Cycles on small Synchronous Motor with Unsymmetrical Slot in Pole Pieces. The minute irregularities of curve are due to variations of speed and voltage of supply. Connected to the mains of the Royal Electric Co. Record taken at the McD nald Physics Building, McGill College, Montreal.

plained, as nearly as possible, in its true phase-relation to the volt curve. The load on the motor was largely due to eddy currents and hysteresis, in addition to mechanical friction. The mechanical friction was certainly variable, and the load due to eddy currents would diminish as the motor became heated. The curve shows a curious want of symmetry, which is no doubt partly to be explained by these causes, and partly by the want of symmetry of the construction of the motor itself. The dip in the crest of each wave is due to an unsymmetrical slot in each of the poles of the motor. These slots were occupied, in its original state, as a synchronous induction motor, by copper plates, partially shading the poles, the function of which was to give sufficient starting torque to the squirrel-cage armature, when used as a fan motor. The other irregularities of the curve are such as might naturally have been expected under the conditions described. The curve itself is of no value except as an illustration of the performance of the recorder. It is quite possible, however, that a study of similar curves, obtained from motors under different conditions of load and supply, might give valuable information with regard to the best conditions of working and the best methods of construction.

The pair of curves exhibited in Fig. 3 are not cycle curves, but are given as an illustration of the sensitiveness of the recorder and of the different uses to which the same instrument may be put. The change from one kind of record to the other is effected by changing the scale of the bridge-wire, by substituting a different wire and unplugging suitable resistance coils. In the curve Fig. 3 (a), representing the discharge of a small storage cell through a constant resistance, the scale of P.D. on the bridge-wire of the recorder was only 1 millivolt per inch, the record being intended as a test of the delicacy of the instrument. The P.D. to be recorded was taken from the potential terminals of a standard resistance of one-thousandth of an ohm,

through which the current was passed. The scale of the record was therefore 1 in. to the ampere. The resistance of the bridge-wire had been adjusted to be one-twentieth of an ohm per inch by means of a suitable shunt, and the current through it was adjusted to be 20 milliamperes by means of an adjustable resistance and a standard cell. The smoothness and steadiness of the record obtained under these conditions were very satisfactory, considering that the power expended on the shunt was only one-fortieth of a watt, at a current of 5 amperes. As compared with the more common types of recording ammeters it will be observed that the resistance of the shunt required is extremely low. The scale, moreover, is exactly one of equal parts, and the co-ordinates of the record are rectangular, as the pen is moved along a straight slide instead of describing a circular arc. The same recording instrument and scale can also be used for any range, from 20 milliamperes to 20,000 amperes, by connecting it to different shunts of suitable magnitude in each case.

The record shown in Fig. 3 (b) affords an even more severe test of the capabilities of the recorder. The current for the bridge wire in this case was taken off the power circuit, and was adjusted to be 30 milliamperes at 550 volts, so that the scale of the bridge-wire

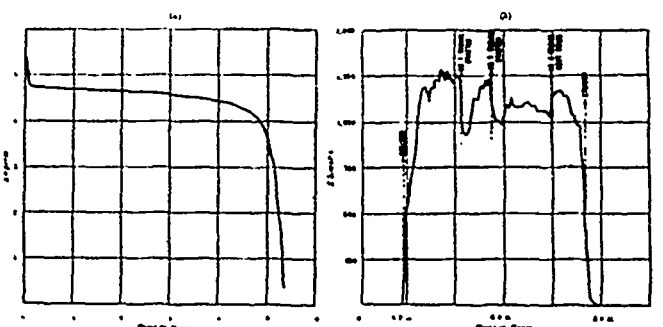


FIG. 3.—(a) Discharge Curve of a Small Storage Cell. (b) Record of Load on 1,500 Kilowatt Generator of the Montreal Street Railway Co., taken at the Power House. Note changes of load due to starting and stopping other engines. These two curves were taken on the same instrument, changing only the shunt.

was 2 in. to three millivolts. The P.D. to be recorded was taken off a low resistance shunt in the circuit of the large 1,500 kilowatt generator of the Montreal Street Railway. The shunt was one of very low resistance, so that the P.D. to be recorded on the bridge-wire was only 3.30 millivolts for a circuit of 1,000 amperes through the shunt. The scale of the bridge-wire being 1 in. to 1.5 millivolts at 550 volts, and being made to vary directly as the volts, the record was obtained in watts, on a scale of 250 kilowatts to the inch. The P.D. on the bridge-wire in this case was slightly larger than in the previous instance, but the performance of the instrument was in reality more remarkable, because it was hanging on the wall of the power house, in close proximity to the large machines and engines, and was exposed to a great deal of vibration and other disturbance. The record itself presents some features of interest which may be briefly referred to. The large engine (No. 7) was started a little before 4 p.m., so as to be in time for the evening load, which reaches a maximum between 6 and 7 p.m. A load of about 1,000 amperes was switched on, and gradually increased to over 2,000 in the course of the next 10 minutes. Other engines were started in a similar manner about 5:10 and 5:45, as the main load increased. The starting of these engines had the effect of diminishing the load on the big generator temporarily, as shown on the record. Between 6 and 7 p.m. four engines of 1,000 h.p. each were running, in addition to the big engine. One of these was shut down at 7 p.m., causing a temporary increase in the load on No. 7. About 7:30 p.m. the load on No. 7 was gradually reduced to 1,000 amperes, and it was cut out of circuit at 7:45 p.m., after which the reading of the record rapidly falls to 0. In power records of this kind, where the load is rapidly varying 10 or 20 per cent. up and down from second to second, it is necessary, in order to obtain a clear and legible curve, that the recording pen should automatically average these rapid fluctuations, a result which is readily secured with the present instrument by suitably limiting the rate at which the pen can follow a sudden change of load.

The foregoing illustrations do not by any means exhaust the possible limits of delicacy of the recording apparatus. It would be easy to make the relay much more sensitive, if required for special work. The present pattern is very simple, and is quite delicate enough for all ordinary purposes. For obtaining cycle records it is evidently impossible to work with so small a P.D. on the bridge-wire, as the galvanometer circuit is closed for a small fraction only of each cycle. For this reason a special bridge-wire was constructed of insulated wire wound in a fine screw thread on a brass rod in a manner similar to that commonly employed in rheostats for fine adjustments. The method of winding in a screw thread gives great regularity and uniformity almost equal to that of the plain wire. Brass is far preferable to hard rubber for accurate work, and there is no difficulty in obtaining sufficiently perfect insulation. The objection to the spiral is that the contact is not quite continuous, but in the present instance, the steps on the record due to the fine screw thread were much smaller than the irregularities due to variation in speed and voltage of the supply. For finer work, however, it might no doubt be preferable to use a straight continuous wire in conjunction with a more delicate form of relay.

The cycle records above reproduced were taken on one of my recording instruments by Mr. L. W. Gill, B A.Sc., one of the research students at the McDonald Physics Building of McGill College, who also assisted me by making a spiral bridge-wire and parts of the small synchronous motor to my designs.—The Electrician.

The city of New Westminster, B. C., is resisting the proposal of a company to tap the water of the Coquitlan Lake, and develop electric power. The civic authorities believe that the city will require as a reservoir all the water supply over which it has a right.

The ELECTRICAL NEWS is indebted to the Royal Electric Company for a souvenir of the recent convention of the Canadian Electrical Association held in Montreal. It consists of a photograph, 15 by 20 inches in size, of the members and visitors to the convention, taken in front of the power house of the Chambly Manufacturing Company at Chambly, Que., in which, as our readers know, Royal Electric apparatus is installed.

A recent issue of the Electrical World contains a description of a new central station built by the Paris Compressed Air Company, of Paris, France, a concern which is engaged in electric lighting on an extensive scale. The general plan on which the lighting system of this company is laid out is one which has never come into use in Canada or the United States, being what is known as the five wire system, making use of an extension of the three wire principle. Current is generated at 500 volts, and distributed on two wire feeders to sub-stations, wherein are storage batteries connected across the main, from which run five wire distribution systems, the pressure being equalized between the four ten-volt circuits of the distribution system in series with each other by means of batteries. In this way a great economy of copper is effected over the ordinary three wire system.

SPECIFICATIONS FOR THE LONDON ARC PLANT.

We have received the following letters relative to the specifications prepared for the installation of an arc plant for the city of London, Ont.:

MONTREAL, Sept. 5th, 1898.

GENTLEMEN: Replying to your favor of August 30th, I would say that it appears to be a pretty fair specification to cover this class of plant. Any criticisms which I have to make would be confined to the question of the advisability of placing restrictions on the tenderers which, if lived up to, may shut out good apparatus. For this standard apparatus the tenderer will offer his standard sizes, and any restrictions as to speed, efficiency, heating, etc., will have no effect on the tenders made, but may be used to block out certain bids when the contract is let. It appears to be more advisable, where standard apparatus is required, to request each tenderer to state and guarantee what his apparatus is capable of doing in regard to heating, regulation, efficiency, insulations, etc.

I also notice that no break down test is specified, but the insulation is to be 259,000 ohms, a figure much too low for this apparatus; the test in any case being useless except as a precaution before applying the high voltage test.

Yours truly,
ROBERT A. ROSS, E. E.

ST. CATHARINES, ONT., Sept. 7th, 1898.

DEAR SIR, We have looked over the specifications carefully and consider them very complete and a sufficient protection to the city. The only criticism we could make is that one particular style of arc lamp is mentioned under the heading of "Arc Lamps" in the first line of this article. There are probably several other lamps besides the Adams-Bagnell which would be equally as satisfactory and which could be obtained in Canada, whereas it would be necessary to import the Adams-Bagnell lamps at considerable expense. The size of dynamo and description would seem to indicate that the Brush 100 light machine was the one required. The specifications might have been broadened somewhat in this respect, though the wording is not such as to absolutely exclude other makes of dynamos.

Taken as a whole, the specifications are rather above the ordinary specifications met with in bidding on municipal plants, and aside from the items above mentioned contain no features which should exclude reputable manufacturers from bidding, while on the other hand the city appears to be amply protected, and should under such specifications obtain a very serviceable plant.

Yours very truly,
THE PACKARD ELECTRIC CO., Limited.
E. E. Cary, Manager.

MONTREAL, Sept. 3rd, 1898.

GENTLEMEN: Not being directly interested in the manufacture or sale of arc light apparatus, the question is not of sufficient importance for us to give as complete criticism as you might desire. We may say, however, that on going over same we rather think as a whole the specification is, from the point of view of the engineer, a very good one, except that one has but to read between the lines to see exactly what class of apparatus is aimed at.

Briefly, we consider the specifications on dynamos good. Guarantee on dynamos altogether too excessive, as we do not see why any manufacturer should be compelled to practically offer a blanket insurance on the whole plant against fire, water or lightning for one year. The specifications for testing instruments are all right, except that we doubt whether an instrument can be made that will stand being left in current at all times without altering the calibration.

Arc lamps. In this section we may say that the engineer has had sufficient confidence in himself to name the style of arc lamp desired. Here we consider he should stop, without asking for such a complete guarantee as "shall be free from hissing, flicking or flaming when provided with ordinary commercial standard carbons"; also, where does the limit come in for "no complicated clockwork mechanism"? Lamp guarantee is fair; hangers and hanging equipment all right, except that manilla rope is not satisfactory for the work required.

Switchboard apparatus is fair, with the exception that we do not see why he should put in the clause "with least possible danger to short circuit or error." Why not make it "with no possible danger."

Line construction is apparently all right. Not being acquainted with local conditions can make no comment.

Wire. This section is lengthy without striking the point. The wire is to be covered with a triple covering of insulated material. Question: What class of insulated material is required, dry mud or pure para rubber?

Acceptance of plant. We do not think it fair that such exacting specifications should be left in the hands of the city engineer or an electrical expert to be chosen by him, but rather that one should be named before, or mutually agreed upon. Finally, we would say that in our belief it is absolute folly in view of the present advanced state of the art, to install 9.6 ampere machines and open arc lamps for municipal arc lighting.

Yours respectfully,
JOHN FORMAN,
Per Geo. H. Hill.

PICTON, ONT., Sept. 19th, 1898.

DEAR SIR,—In your September number you publish copy of specifications for electric plant for city of London, and ask for the opinions of electrical men on the same. I am not a manufacturer, neither am I what you would call an electrical engineer, but am somewhat interested in electrical work, and I therefore offer the following short notes on the specifications:

The specifications are, I think, so far as the city of London is concerned, very complete, but they are a shade hard on certain manufacturers. The first, and about the most objectionable feature that strikes me, is the guarantee of the dynamo. The engineer says "the machine or machines must stand a sudden short circuit for a period of five minutes." Now, who ever saw a 100 light dynamo, 9½ amperes, about 75 horse power, that would stand a short circuit for five minutes and not burn up, and if the building was not fireproof it would surely set it on fire also. A regulator under those conditions would require to act very quickly, in fact I think it would have to shift the brushes from the heaviest point, where they would certainly be with 100 lights on a 100 light machine, to lightest point in five to ten seconds to avoid burning the dynamo very badly. Now, if regulator works in this short space of time, what is the use of limiting the test to five minutes. You may as well make it five hours, for the machines would not be generating any current after the brushes had been shifted to their lightest point.

As to the arc lamps, what is the use of asking for tenders and stating the name and style of lamp by specifying the Adams-Bagnell single carbon lamp? Does this not exclude all other makers of lamps from tendering for this part of the plant? If the Adams-Bagnell is the best lamp, and the city of London are bound to have them, why not buy them direct from the makers and thereby get a better price than they would by advertising and asking for a certain make of lamp. The makers, or agents for this lamp, can tender away up and still get the contract, as the corporation have already said we must have this make of lamp. Had the corporation asked for tenders in the usual way, they would likely have received a tender for this lamp, which would have been down among the rest; then they could have accepted this tender, and at the same time not caused the Adams-Bagnell Lamp Company to think that they were the only lamp makers in the world.

Yours truly,
T. O. CRANDEL.

TORONTO, ONT., Sept. 23rd, 1898.

DEAR SIR,—Replying to your favor of Aug. 30th, requesting my criticism of the London specifications, a copy of which you enclosed, would say:—

These specifications are quite comprehensive, and provide for a complete installation of high quality, hence a technical criticism will be more or less superfluous. Some adverse comments have, I believe, been engendered among a number of manufacturers of electrical apparatus by the action of the consulting engineer for the city of London in demanding through the specifications the furnishing of arc lamps made solely by a certain well-known company, and sold in Canada by themselves exclusively, thereby practically prohibiting or at least discouraging the makers of other lamps from tendering their respective types or makes. On this matter I have no objection to expressing my opinion as a consulting engineer.

Before dealing directly with the subject proper, it will perhaps be as well to briefly outline the position and duties to be reasonably expected of the consulting engineer in matters of this nature, in order that the apparent motives which actuated the city engineer in the present instance may the more readily be appreciated.

In the majority of proposed electrical enterprises entailing the ex-

penditure of large sums of money, the general design and technical details of the installation are placed under the direction of an expert or engineer making a specialty of such work ; this engineer, after carefully ascertaining the conditions under which the plant will operate and the requirements it may be expected to fulfill, formulates the requisite specifications enumerating and describing the general and special apparatus to comprise the complete equipment, the number of each separate kind or piece of apparatus, its capacity and other necessary general details, and lastly, but most important, the minimum degree of good quality and perfection in the apparatus permissible to ensure favorable consideration of the tender. The tendency is now fortunately gaining ground among engineers to call for and insist on the purchase of only the highest and most perfectly developed apparatus, electrical or mechanical. Tenders are then received and examined by the engineer, and those providing for that quality of apparatus best adapted to meet the requirements fully are usually recommended for acceptance. I say "usually recommended," since it occasionally happens that limited finances exert a strong influence in determining the quality of the apparatus to be accepted by the purchaser. Assuming the highest quality to have been accepted on the engineer's recommendation, after reception and examination of tenders, at least two very important results will have been attained : Firstly, the purchaser of the apparatus will have benefitted to an appreciable extent financially through the competitive prices received from the manufacturers of an acceptable grade of apparatus ; and secondly, a very strong incentive will have been offered the manufacturers to continue developing and improving their several lines of manufacture to the utmost limits of perfection cotemporaneously attainable—an incentive which cannot fail at least ultimately in producing results having an inestimable value for the human race in general.

It seems to me that the city engineer of London has faithfully endeavored to fulfill the duties of his responsible position with the above ends in view, since he has not only provided for the supplying of what he believes to be the best arc lamp on the market, but has otherwise specified qualities in the remaining portions of the plant which are certainly of a high degree. What his reasons are, however, for concluding that but one make of arc lamp is above all others the best adapted to meet the particular requirements of his clients I do not propose to discuss, and will therefore await his reply or explanation, if he be disposed to publish one. For my own part, I am of the opinion that when articles or apparatus of general manufacture, such as arc and incandescent lamps, supplies, dynamos, engines and boilers, etc., are to be purchased by tender, it will be more to the advantage of all concerned (the clients as well as the manufacturers) for the engineer to avoid specifying any particular make, even though it be of a type slightly different from the average, and instead to so present the requirements, conditions and guarantees to be fulfilled, etc., by means of a reasonably close specific description or general specifications, that the supplying of the requisite quality or essential type of apparatus can be provided for under the usual conditions.

If the engineer should feel justified in purchasing a specific make of apparatus before tenders for the remaining portions of the equipment are asked, and accordingly signifies this intention in his specifications, he renders liable the establishing of a precedent which has repeatedly proven detrimental to the best interests of clients and the electrical business in the United States. The reason for this should be apparent to the readers of your valuable paper who have had experience in these matters.

Yours very truly,

RODERICK J. PARKER.

PERSONAL.

Mr. Gardner, of the Ottawa Electric Company, has taken charge of No. 2 power house.

Mr. F. A. Cambridge has been appointed electrician for the city of Winnipeg, Man. One of the chief duties will be the inspection of electric wiring.

Mr. Alex. Hunter, for over thirty years assistant chief operator for the Great Northwestern Telegraph Company, Toronto, died last month. He was well known to the telegraph fraternity throughout the Dominion.

Mr. Charles B. Routh, of the Ottawa Electric Light Company's arc light station, has severed his connection with the company, and will in future reside in British Columbia, where he has secured a lucrative position.

The honor of being elected a member of the Executive Committee of the Street Railway Accountants' Association of America was conferred upon Mr. J. D. Fraser, secretary-treasurer of the Ottawa Electric Railway Company, at a recent convention.

Dr. John Hopkinson, the well-known English electrical engineer, was killed at Berne, Switzerland, while ascending the high Alps without a guide. Dr. Hopkinson had devoted much attention to electrical research, having given the results of his experiments in various papers read before the Royal Society and other institutions. In the year 1893 he made some improvements in the Edison dynamo, which proved to be of exceptional importance in dynamo construction. He developed to a large extent the theory of alternating dynamos, and received from the Westinghouse Company the sum of $9,000 for his British patents on the three-wire system of distribution, which he invented simultaneously with Edison in the United States. At the time of his death, it was Dr. Hopkinson's intention to shortly sail for New York, to form a syndicate to develop other recent inventions.

The Maritime Sulphite Fibre Co., Chatham, N.B., have ordered a 500 h.p. cross compound condensing engine from the Robb Engineering Co., to replace their present 250 h.p. simple engine and to provide for contemplated enlargements of their plant. They expect their new engine to effect a large saving in fuel over the type they are now using, as well as to give much better speed regulation.

CANADIAN ELECTRICAL STUDENTS' COMPETITION.

IT is the intention of the publishers of the ELECTRICAL NEWS to offer two or more prizes to students of electricity in Canadian schools and universities, for the best essay on a specified subject. The conditions and full particulars will be published in the ELECTRICAL NEWS for November. Meanwhile, it can be stated that the proposal has been favorably received by the authorities of some of the leading schools. It is hoped that the students for whose benefit chiefly the competition is being instituted, will take an active interest and thereby ensure its success.

PROF. R. B. OWENS.

PROFESSOR R. B. Owens, E.E., who has recently received the appointment to the W. C. McDonald Chair of Electrical Engineering at McGill University, Montreal, in succession to Professor Carus-Wilson, is a comparatively young man. He was chosen from among the teaching staff of the great universities of the United States, and brings with him a record for marked originality, ability and energy.

Professor Owens was born in the southern part of Maryland, a state of which his mother's great grand-

PROF. R. B. OWENS,
Professor of Electrical Engineering, McGill University Montreal.

father was the first Democratic governor. He spent three years in an old military school at Maryland, and was the youngest to graduate since its founding in 1774. After a brief connection with the old Baxter Motor Company, he resumed study at Johns Hopkins University in Baltimore, under Dr. Louis Duncan, and obtained a high standing in mathematics and physics. He was then for a time with the Excelsior Company in New York, and put in and superintended the Thomson-Houston station at Greenwich, Conn. In the year 1891 he obtained the degree of E.E. from Columbia University, having been a student under Professor Crocker.

In his organization work at Nebraska University Prof. Owens attained a high degree of success. He was first appointed Adjunct Professor of Electrical Engineering upon the opening of that department, becoming professor in 1894, and in 1895 he assumed full charge of the Department of Electrical and Steam Engineering, which position he resigned recently. While thus engaged he succeeded in building up the engineering course of that university to a high standard. He was one of the judges of electrical exhibits at the World's Fair. Prof. Owens has recently been elected to a Tyndall Fellowship by Columbia University, and is director of Bureaus of Electricity and Machinery at the Trans-Mississipi Exposition at Omaha. He is also a member of the Western Society of Engineers, the American Society of Mechanical Engineers, and the council of the Society for the Promotion of Engineering Education, and vice-president of the American Institute of Electrical Engineers.

ELECTRIC GONG BUOYS AUDIBLE VERSUS VISUAL SIGNALS.*

By F. A. Hamilton, E. E.

It is now some five years or more since I first made the proposition contained in this paper, viz., to make use of electricity for the purpose of facilitating navigation, more especially in providing a system of signal buoys by means of which the mariner would be enabled to reach his destination with comparative ease and safety, under conditions which normally would be both difficult and dangerous. The idea formulated was briefly as follows:

To connect by means of a submarine cable a system of buoys, fitted with powerful electric gongs, these buoys to be placed in the offing in such positions that

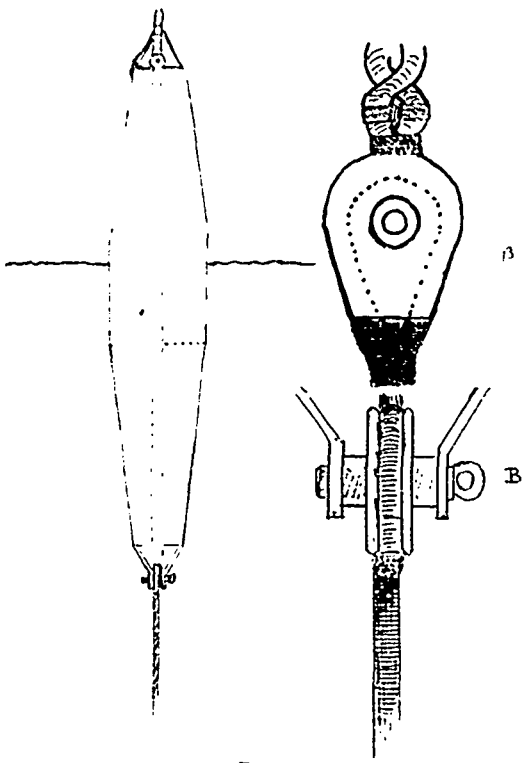


FIG. 1.

vessels could, without risk, run to leeward of them and consequently come within range of the gong signals.

It is well known that whilst even the report of a cannon can be heard but a short distance to windward, the camparatively feeble note of the automatic whistling buoy will be distinctly audible five or six miles to leeward. Bearing in mind this fact, it would seem reasonable that the vibrations which it is possible to cause by striking a bell by means of power produced and controlled by electricity could be heard some considerable distance down the wind. With this object in view I planned out the system hereinafter described.

Before proceeding to explain the details of the method proposed, I would beg to be permitted to submit a few observations with regard to the necessity of providing means for facilitating the entrance of vessels to our harbors.

Whilst it cannot be denied that the whistling buoy, commonly known as Courtney's automatic buoy, has done, and is doing good service, it must be admitted that something more is needed in the way of guides to the mariner, for these ponderous whistling buoys must necessarily be moored in shallow water, and, consequently, in the majority of cases, near the shore, so that in the endeavor to "pick up" the sound of the whistle it is necessary to run the vessel nearer to the shore and to outlying dangers than is desirable. Let us take the approaches to Halifax Harbor as a typical case.

An automatic buoy is moored on the Outer Bank, 5 miles from Sambro light, in a depth of twenty-four fathoms, and another nine miles to the north-eastward of this in 37 fathoms. To stand in to leeward of these buoys in thick weather during a southerly gale would be a hazardous proceeding, as there are many outlying dangers in the vicinity.

Taking into account the fact that the conditions of weather are such that south in the wind means fog, rain or snow, it is evident that a vessel must pass inside the buoy, that is to say, between it and the land, before the sound of the whistle will be heard. There are times, it is true, when the buoy signal will be audible in the other direction, for instance during fog unaccompanied by wind, but the point I wish to emphasize will be at once recognized when the combined conditions of a south-east gale with rain are considered. Under these circumstances we have thick weather and, for a vessel approaching the land, a lee shore. The vessel has perhaps made a rapid passage across the Atlantic. A master of ortho-dromics has navigated the latest triumph in marine architecture to within an hour's run of her destination, but, owing to thick weather, and the absence of any indication as to his whereabouts, the prudent mariner has perforce to point his ship to the wind and await more favorable conditions. It is possible that after groping about in the fog and rain, anxiously listening for the moan of the automatic buoy, and continually heaving the lead, the worn out but vigilant commander is fortunate enough to come within the range of the spasmodic toot of the buoy, but the chances are against any such lucky hit, and at the very best many hours are lost in the endeavor to establish the position of the ship, under conditions not altogether unaccompanied by danger.

Now, what would be of incalculable value to the mariner could be provided by means of a system of audible signals placed broad off in the offing at such a distance that vessels could boldly stand in to leeward, and therefore be sure of coming within range of the signals.

In order to multiply the chances of attaining the desired result, at least three buoys should be distributed across the approaches to the harbor, in a manner to be hereafter determined by those who are the best qualified to select the respective positions. The writer would here merely suggest the placing of these buoys in the positions indicated on the accompanying chart, on which it will be seen that the distribution is such that in standing across, in perfectly safe water, and parallel to the coast, a vessel could pass to leeward of the buoys, so

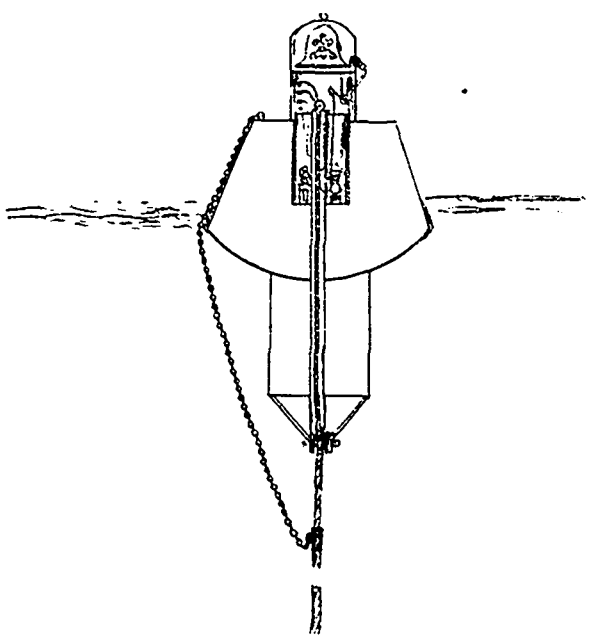


FIG. 2

that in approaching the vicinity of the harbor, a few short runs in the direction shown by the arrows would bring the ship near to and to leeward of one of the buoys.

It is, of course, well known, and recognized, with no small degree of admiration for the skill and nerve displayed, that there are certain captains for whom the weather is always clear—that is to say, it is never too thick to prevent their running in, even to the very wharf, without a glimpse of anything, save perhaps the ghostly form of Meagher's Beach light-house but it is only fair to state that such instances are not the rule, and here it may be remarked that the chief object aimed

* Paper read at the first convention of the Maritime Electrical Association, September 27th, 1898.

at is to assist the ocean liner and other vessels that have run long distances, and not so much the coaster, with a comparatively short departure. At the same time, the fact must not be lost sight of that the additional facilities here proposed would be of inestimable value to every description of craft, including pilot vessels, which could, under the conditions proposed, patrol in safe waters.

Having indicated in a cursory manner the needs and objects of the proposed scheme, I now proceed to the details connected with the apparatus required. This part of my subject may be conveniently considered under the following heads, *viz.*, *buoys, moorings, fittings,* cables and signalling appliances. A suitable form of buoy is that known as the "spar buoy," which consists of an iron cylinder terminating at each extremity in the frustum of a cone. Such a buoy is shown in Fig. 1, in which a sectional elevation is presented. The fittings consists of shackles, thimbles, bridle chain, staff and junction box. The moorings consist of the cable itself, connected to the buoy in the manner hereinafter described. Another form of buoy is shown in Fig. 2. The shape is that of a truncated cone, the base of which is the segment of a sphere with a cylinder attached, a cylinder being also recessed in the cone for the reception of a detachable cylindrical box in which the electrical and mechanical appliances are placed, and over which the bell is supported. A tube through which the cable is led is run through the middle of the buoy.

The upper part of the buoy not including the cylindrical portion is the air chamber, and the lower part provides a space for water ballast, and at the extremity of this two arms are attached, between which the cable is secured in the manner shown at B, Fig. 1, and at A and B, Fig. 3. The two parts of the cable are crossed and "seized" and worked over the thimble (b), and further "seized" below the latter. Above the thimble the two parts, twisted together and served, are led through the pipe inside the buoy, or up the side of the buoy if necessary,

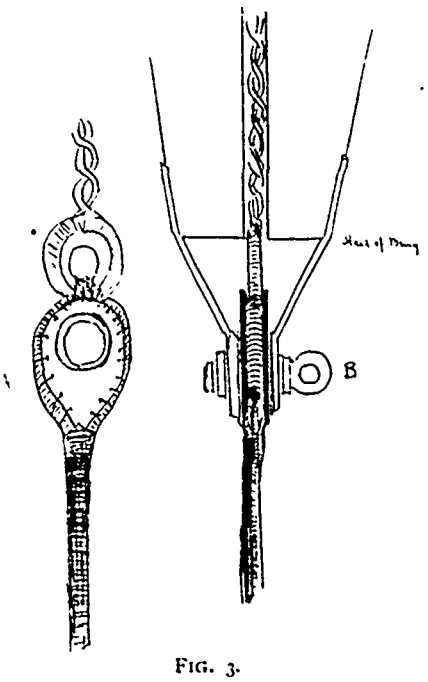


FIG. 3.

protection in this case being afforded by means of battens or other suitable appliances. A bridle is attached below the thimble and secured at a convenient place, for the purpose of facilitating the operation of disconnecting the buoy from the cable.

The main line- that is to say, the cable connecting the outer position with the station on shore—I divide into as many sections as there are buoys. Each section is connected by means of couplings, the ends of the sections being fitted with thimbles through which the coupling bolts are passed.

The coupling pieces consist of two cast iron plates, in which are three bolt holes and three slots. These plates are crowned or rounded above and below in order to provide a hollow chamber for the cable connections.

The bolts serve the double purpose of holding the two plates *together and securing the cable ends to the couplings.* The hollow receptacle affords protection to the joints between the main cable and the branch lines leading to the buoy. A suitable sort of coupling is shown in Fig. 4. The main cable ends 1 and 2 and the branch cable 3 are placed in their respective slots and secured in position by means of the top plate and the bolts, as shown in the diagram.

The yoke and chain are for the purpose of facilitating the operation of buoying the bight, as explained hereafter.

The following modus operandi is proposed: The cable having been paid out from the shore to the end of the first length, the second section is connected to it by means of the coupling. Having carefully joined the cores and secured the two ends of the cable to the coupling by means of the bolts, paying out is resumed, and at the same time a small anchor buoy is slipped with a convenient length of rope attached, the connection being thus readily accessible.

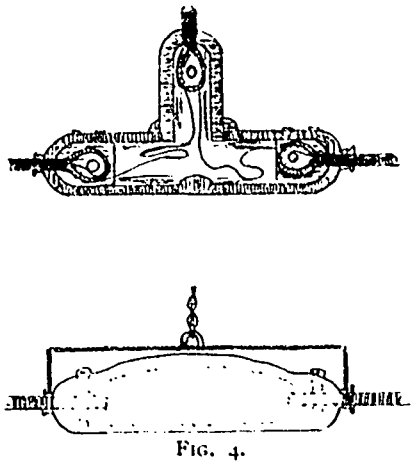


FIG. 4.

The yoke to which the chain carrying the buoy rope is attached is for the purpose of preventing the anchor buoy tackle from being twisted up around the coupling as it and the cable are lowered to the bottom.

The same operations are performed at the end of each section, with the exception of the end one. Here the first branch cable is connected by a perfect joint between it and the main line. The branch cable, being paid out to near the end, is secured to the buoy and the latter is slipped. The cable is then picked up at the various couplings and the branch lines connected and paid out at right angles to the main cable.

As the buoys are moored by the cable itself, it is necessary that this be provided with some protection against abrasion. This object is effected in the following manner: A rounding of chain is applied over a length of cable depending on the depth of water in which the buoy is moored and the nature of the bottom. It is to render the examination of this portion of the system comparatively easy that paying out at right angles to the main cable is recommended; besides this, it reduces the chances of wear and tear on the main line, which remains undisturbed whenever the buoy moorings are examined.

The following explanation concerning the operation of attaching a buoy to a branch cable may be of interest: Having paid out a branch line to within a few fathoms of its end, attach a slip rope. Pass a heaving line down through tube of buoy and bend on to thimble at end of cable, pull the latter up the tube, remove cover placed over the cores for protection, secure the conductors to their respective terminals in the connecting box, insert pin through eye of thimble and close the box, at the same time pass bolt through thimble of cable at heel of buoy, attach bridle chain to cable and secure it to tripod of buoy. Drop buoy and cut slip rope. In picking up the buoy and moorings the following precautions should be observed: On disconnecting the junction box, attach a "tail" of heaving line through the eye of thimble, in order to provide a means of saving the ends of core from being used as a lanyard. Secure cover over tube and close junction box. Shackle on bridle chain, heave away and cant buoy; remove bolt at heel of buoy. In order that the bolt may be easily withdrawn when the strain is taken up by the bridle, the latter may be attached to the cable at a distance of about a fathom below the thimble that carries the bolt by which the cable is secured to the buoy.

THE SIGNALLING APPARATUS.—In my original design the plan was to employ electro magnets and gongs, of large dimensions, placed on the flagstaffs. The following is an extract from a letter dated January 31st, 1893, in which I explained my proposed scheme:

"In reply to enquiries respecting my proposed system of electric bell buoys, I beg to furnish the following information: Electric bells when exposed to wet or moisture are apt to fail owing to the contacts becoming oxidised, and this is probably the chief reason why electricity has not been applied, in the manner now suggested, to marine signalling. To obviate the difficulties hitherto presented and to protect the electrical contacts from the action of damp and salt, I enclose the electro magnet and contacts in a sealed chamber or box, which whilst being impervious to water does not impair the action of the rod to which the bell hammer is attached. The sealed box containing the electro magnet is, together with the gong mounted on a cage, supported by a staff which is carried by a tripod attached to the buoy. The electric cable is passed through a tube in the buoy or up the

outside of the latter and connected to the terminals in the box. The cable is attached to the buoy in the following manner: Two parts of the cable are crossed and "seized" and worked over a thimble and further "seized" and served below the thimble. A bolt passed through the eyes of the arms of the buoy secures the thimble, which carries the cable to the buoy. The ground parts of the cable are protected from abrasion by a "rounding" of chain applied over a sufficient length to not only provide against chafe, but to ensure enough weight to moor the buoy. The type of cable recommended as most suitable for mooring the buoy consists of one made up of two closings of armor, applied in opposite directions in order to prevent any tendency to twist or kink."

Here followed a description of buoy, moorings, etc., and an estimate of cost.

The feasability of the system here proposed could be easily and economically proved by means of some old cable and a buoy of suitable dimensions fitted in the manner described."

The advantages claimed for this method of producing audible signals are:

1st. The certainty of the sound being emitted during calm weather when there is not sufficient swell to cause a whistling buoy to act.

2nd. Its usefulness for positions where there is no swell, such as in rivers, harbors, and channels not open to the sea.

3rd. The convenience with which the apparatus can be handled, the buoys, and consequently the moorings, being light.

4th. Its adaptability for positions in deep water where the mooring of a whistling buoy would be attended with great difficulty.

In positions where only a short length of cable would be required to connect the buoy and the shore the cost would be small, and in places where the water is smooth and the bottom favorable, light buoys and moorings could be used. There are doubtless many positions where the system would be of great value.

In reconsidering this matter I have recognised the necessity for providing a system by means of which each buoy would signal its own number, and the plan is to arrange the apparatus in such a way that in the case of a system comprising several buoys only one is in circuit at a time, so that the full power available on the line is concentrated at one point. In the case of three buoys—whilst number one buoy is striking its number, the other two are out of circuit, and when buoy two is in operation, one and three are mute, likewise when number three appeals to the elements, one and two are silent.

The simple mechanism required to accomplish this result consists of a small electric motor, which, besides performing the operation of working the lever which connects the rod leading up to the bell hammer, winds the spring of a system of clockwork by means of which the current is switched on and off at each buoy.

This portion of the apparatus, together with the bell, can be readily shipped and unshipped, so that the appliances can be easily examined an overhauled. There are possibly others who have taken up this subject since I first mooted the question. It would be interesting to know what advances they have made, and it is to be hoped that the remarks contained in this paper will give rise to such discussion as may pave the way to practical results, for there can be little doubt but that much useful work is to be done in the direction indicated.

In conclusion, I desire to state that I emphatically disclaim any intention of reflecting on the usefulness of electrically lighted buoys or of automatic whistling buoys, both of which are of the utmost value in their respective spheres. I merely claim for the system concerning which your opinion is asked a place in the advanced line of our littoral outposts.

TRADE NOTES.

The McLaughlin Carriage Co., of Oshawa, Ont., have ordered a 100 horse power Robb-Armstrong engine from the Robb Engineering Co., Amherst, N. S.

The Warwick Clothing Manufacturing Company, of Warwick, Que., are lighting throughout by electricity. The order for the necessary apparatus has been given to the Royal Electric Co.

Messrs. Bowin, Wilson & Company, of Montreal, have recently ordered from the Canadian General Electric Company a 100-light incandescent dynamo for their premises at Berthier

The Lachine Rapids Hydraulic & Land Co. have awarded to the W. A. Johnson Electric Co., of Toronto, a contract for all the transformers (of the Wagner type) required for a year.

The Canadian Pacific Railway have purchased from the Royal Electric Company one of their 50 light 2 000 candle power arc dynamos, together with 52 arc lamps, for use in their car shops at Hochelaga.

The exhibit of John Starr, Son & Co. at the recent Halifax exhibition was very creditable and attracted much attention, being awarded a diploma and medal by the judges. The current used for the illumination was generated by their dynamo in Machinery Hall. Two telephone switchboards were to be seen, for fifty subscribers each, gotten up in handsome cases. Two styles of telephones were exhibited, stationary for the wall and portable for desk use. These instruments are made by John Starr, Son & Co., and are fitted with the new Starr transmitter, patented in Canada and elsewhere, the feature of which is the double diaphragm, enabling sound to be transmittsd with increased distinctness. They are adapted for either long or short distance telephoning, and cannot easily get out of adjustment. They also show a complete line of electric supplies.

SPARKS.

The Northey Mfg Co., of Toronto, are building a horseless carriage, to be propelled by a 6 h.p. gasoline engine.

Messrs. H. Vick & Sons, of Orillia, recently ordered from the Canadian General Electric Company a 50 light incandescent dynamo.

The town of Newmarket, Ont., has granted a franchise for an electric railway to the Metropolitan Railway Company.

A young man named Aikens was killed last month by the explosion of a boiler in the brickyard of F. W. Entricken, near Tavistock, Ont

The Fredericton Electric Company have under consideration the erection of a new power house, rendered necessary by insufficient accommodation.

The Midland Elevator Co., of Midland, Ont., are having placed in their elevator a fifty light T-H dynamo, from the works of the Royal Electric Company.

The Deseronto Iron Company, of Deseronto, Ont., have closed a contract with the Canadian General Electric Company for a 200 light dynamo, with marble switchboard for same.

The Packard Electric Company, Limited, of St. Catharines, Ont., have issued a neat booklet, giving the code word for various terms and phrases used in the electrical supply trade. This should prove very useful to central stations.

Messrs. Tromanhauser Bros., of Goderich, have placed an order with the Canadian General Electric Company for a 200 light incandescent dynamo which they propose to install to light their elevator buildings.

The Bell Telephone Company expect to have their new building in Quebec completed early in January. The company are also doing considerable work in the way of placing large cables underground.

The British Columbia Electric Railway Company, in order to meet the increased traffic over their road, recently placed an order with the Canadian General Electric Company for additional car equipments of the well-known C.G.E. 1,0 o type.

Mr. Percy Domville has been instructed by the Hamilton City Council to prepare an estimate of the cost of an electric light plant, buildings, etc., for 500 arc and 3,000 incandescent lights, and for 700 arc and 5,000 incandescent lights.

The Y M C A. of Montreal have established a course for the study of electricity, under the direction of Mr. Louis A. Herdt, E E., of McGill College. The department will be equipped with the latest apparatus for experimental work.

It is rumored that, as a result of the franchise granted by the city of Ottawa to the Metropolitan Electric Company, the Deschenes Electric Company will again renew its effort to secure a franchise for electric light and power from the city.

The Canadian Pacific Railway smelter, at Trail, B. C., recently placed an order with the Canadian General Electric Co. for a 50 light 2,000 c.p. Brush arc dynamo, together with the necessary lamps for same. These are to be used at their smelter works at Trail.

Messrs. John Ballantine & Son, of Preston, have given a contract to the Canadian General Electric Company for a lighting plant, including a 200 light dynamo with instruments. The order includes the wiring up of their premises for use of incandescent electric lighting.

The storage sheds of the Montreal Street Railway Company at Hochelaga were destroyed by fire on September 16th. Sixty cars were burned, on which there was an insurance of $2,500 each. Seven sweepers, just half of the company's equipment, were also destroyed.

The city council of Hamilton, Ont., has agreed to extend the franchise of the Hamilton Street Railway Company for fifteen years from 1913. It is said that as a result of this extension, the company will undertake considerable improvements to the system at an early date.

The scheme to utilize the water power of Whiteman's Creek for the supply of electric light and power to the city of Brantford, Ont., and vicinity, has been revived. There is a head of 18 feet, and the dam and race are in good condition. The promoters claim that 75 h.p. could be obtained the year round.

The village council of Acton, Ont., have appointed a committee to visit Aurora, Newmarket, and other places where municipal electric plants are in operation, and secure all possible information on the subject The report which will shortly be presented, will likely recommend the installation of a plant by the village.

The earnings of the Toronto Street Railway Company for the fortnight commencing Monday, August 29th, and ending Saturday, September 10th, 1898, were the largest on record. During the two weeks the company carried 1,879,298 passengers, making a total increase in receipts over the same period last year of $15,167.11.

The Hamilton Blast Furnace Company, of Hamilton, Ont., have given a contract to the Canadian General Electric Company for the installation of a 250 light incandescent dynamo, with switchboard and the necessary instruments, and are also having their factory wired up for the use of incandescent lights and long burning direct current arc lamps.

The new contract between the city of Brantford and the Brantford Electric and Operating Company came into force recently. Instead of arc lights of 68,000 candle power, there are now over 200,000 candle power, while the price has been reduced from $81.95 to $53 per lamp. Incandescent lights have been reduced from $10 for 16 c.p. lamps to $9.60 for 32 c p.

The T. Eaton Company, Limited, of Toronto, have given an order to the Canadian General Electric Company for the installation of a 130 kilowatt direct connected generator, with marble switchboard, containing the necessary instruments for the generator. When this generator is installed the T. Eaton Company will have three 130 kilowatt generators and two 50 kilowatt generators of the Canadian General Electric Company's well-known type.

The annual meeting of the Great Northwestern Telegraph Company was held in Toronto on September 28th, at which the following directors were re-elected: H. P. Dwight, president and general manager; Adam Brown, of Hamilton, vice-president; H. N. Baird, James Hedley, A. S. Irving, W. C. Matthews, of Toronto, Richard Fuller, of Hamilton, Hon. William McDougall, C.B., of Ottawa, and Charles A. Tinker of New York, directors; George D. Perry was reappointed secretary and auditor, and Arthur Cox treasurer. The statement of the year's business showed a considerable improvement over the previous year.

A public demonstration of the Bonner rail waggon, as described by Mr. W. T. Bonner in a paper read at the last convention of the Canadian Electrical Association, was made at Toledo, Ohio, on September 9th, and was regarded with much interest by the public. Col. Bonner showed how the wagons were unloaded from the trucks by means of incline planes, and how they were again loaded by reversing the former operation. Packages will be carried at the rate of 10 cents per hundred pounds, with a regular rate for carloads. The company will have regular schedule time for through trains to outside towns, and will do a general freight business in traffic which is too small for the railroads to handle advantageously.

A meeting of the shareholders of the Royal Electric Company has been called for October 18th, for the purpose of, authorizing an issue of preferred stock, and the acquisition of shares in the Chambly Mfg Co. for an additional amount of $100,000. In 1894 and 1895 the company sold in England $750,000 of its bonds, bearing 4½ per cent. interest. $37,500 of said bonds being redeemable and redeemed every year. By pledging preference stock the company is now in a position to command capital in England at a materially low rate of interest. In view of the continued and constant growth of the company's business, demanding large extensions and additions, the board of directors deem it advisable to raise, for the time being, additional capital in England by means of a loan on the pledge of preference paid-up stock.

SPARKS.

The Chambers Electric Light Company, Truro, N. S., have added to their plant a 1,200 light dynamo.

Some of the aldermen of Hull, Que., are discussing the question of municipal ownership of electric light.

A charter for an electric or steam railway from Sault Ste. Marie, Ont., to Michopicoten, has been applied for.

The Stevens Manufacturing Company, of London, Ont., have discontinued the electrical department of their business.

The Vernon & Nelson Telephone Company has completed its telephone line from Greenwood City, B.C., to Spokane, Wash.

The C. O'Dell Electric Company, of Annapolis, N. S., have just installed a Leonard-Ball automatic engine in their lighting station.

The council of the town of Mitchell, Ont., will submit a by-law to the ratepayers to borrow the sum of $5,000 to improve the electric light plant.

During Exhibition week the Ottawa Street Railway Company carried 267,600 passengers. This was an increase of 31,000 over the record of the previous year.

The C. P. R. telegraph operators at Winnipeg, Man., have established an institute, containing a reading room and library. Means will be afforded for the study of electricity.

The Bell Telephone Company have reduced their prices in Chatham, Ont., from $25 to $20 for telephones in dwellings. The rental for stores and business places remains the same.

Mr. Thos. Hilliard, of the Winnipeg branch of the Canadian General Electric Company, has just installed two generators for the Brandon Electric Light Company, of Brandon, Man.

The Hamilton Electric Light and Power Company have lately placed in their lighting station one 2,000 light Royal alternator and one 100 h.p. 250 volt direct current Royal power generator.

The town of Galt, Ont., by a vote of the ratepayers, has decided to operate the gas and electric light plants. Unless the existing works are taken over, entirely new plants will be installed.

The town of Barrie, Ont., having authorized the purchase of an electric light plant, negotiations are now pending looking to the taking over of the Barrie Electric Light Company's plant at a valuation.

The Toronto Street Railway Company is building a new shed for the housing of street cars. It will be 324 feet long, 60 feet wide and 20 feet high, closed in with corrugated iron siding and having gravel roof.

The town council of Ingersoll, Ont., has appointed a committee, consisting of Mayor Mills and Aldermen Clarke, Macauley, Horsman and Fleet, to negotiate for the purchase of the Ingersoll Electric Light Company's plant.

A scheme is said to be on foot for the construction of an electric railway from Waverley, N. S., to Dartmouth, thence to Musquodoboit Harbor and Little Musquodoboit. The promoters will shortly discuss the matter with the Dartmouth Board of Trade.

The Citizens' Electric Light Co., of Smiths' Falls, Ont., are increasing their electric lighting plant, and have purchased from the Royal Electric Co. one of their 1,500 light "Royal" incandescent dynamos, with station apparatus complete. This is to be installed at once.

Tenders were received as follows by the city council of St. John, N.B., for fitting up the ferry steamer "Western Extension" with an electric light plant: James Hunter, $337; F. W & J. W. Myers, $345; Geo. F. Calkins, $950. The tender of James Hunter will likely be accepted.

The Toronto Street Railway Company is said to be considering the advisability of extending the Toronto and Scarboro railway from the present terminus, at the Hunt Club, to the west side of the Highland Creek hill, a distance of seven miles. Mr. James McDougall, C.E., has made a survey of the proposed route.

The Canadian Electric & Water Power Co., of Perth, Ont., are installing a 5 h.p. two-phase S.K.C. motor. This is the third installation within a short time, and shows what can be done with the polyphase system for developing a power trade for electrin light companies and assisting to make the much desired day load.

A Technical Commission, appointed by the city of Paris, France, has lately concluded tests of 110 mechanical stokers, and awarded a prize of 5,000 francs to the one giving the best results. The competitive stokers represented 76 from France, 19 from England, four from Germany, three from America, three from Austria-Hungary, two from Italy, one from Belgium and one from Poland.

The Western Canada Telephone Company, Limited, composed of British stockholders, has been incorporated, with a capital of £60,000, to acquire and construct telephone lines and deal in machinery relative thereto in British Columbia. Among the promoters are J. H. Wade, Bradford, and R. I. Cratchley, Dewsbury, England.

No definite information is to hand regarding the intentions of Messrs. Haines, of New York, the purchasers of the Niagara Central Railway. It is rumored, however, that they are considering the advisability of converting the road into an electric system. The plans may also include the extension of the road to Port Dalhousie.

The tender of the W. A. Johnston Electric Company, of Toronto, has been accepted by the town of Beeton, Ont., for the installation of an electric light plant, at the price of $1,900. Two other tenders were received, at $2,200 and $3,151. Steps will be taken at once to erect a power house and purchase the necessary engine and boiler.

The Metropolitan Railway Company propose to extend their railway north to Lake Simcoe, west to Schomberg, and in a northeasterly direction to Jackson's Point, Roach's Point and Beaverton. When the extensions are completed, there will be a special service for light freight, as well as a regular passenger service. The new power house now being constructed at Bond Lake will replace the present one near Tannery Hollow.

Everyone has heard something of the wonderful fruit district of the Niagara Peninsula, and has promised that some day they would visit the great garden spot of Canada. The management of the Hamilton, Grimsby and Beamsville electric railway, which runs through the district, has just issued a handsomely illustrated booklet, describing the whole peninsula, and telling a good deal of the wonders of the fruit harvest there. It will be sent free to anyone writing for it.

Concrete has been adopted in place of stone for the masonry in the subways of the Chicago, Milwaukee & St. Paul railway crossing under the Chicago elevated railway tracks. The side walls, foundations and arches are being constructed of it, and an unusual arrangement has been adopted whereby a 5 horse power Ransome concrete mixer is belt-driven by a Fairbanks gasoline engine. It is stated that 3,000 cubic feet of concrete is mixed and delivered in ten hours by a force of six men.

The shareholders of the Montmorency Electric Power Company, of Quebec, have ratified the action of their directors in selling the property of the company to the Quebec, Montmorency and Charleboix Railway Company. The shareholders of the Montmorency company not only receive for each $100 share of their stock in that company a share of an equal amount in the Quebec, Montmorency and Charlevoix railway, but also a twenty year debenture of $100 at 5 per cent.

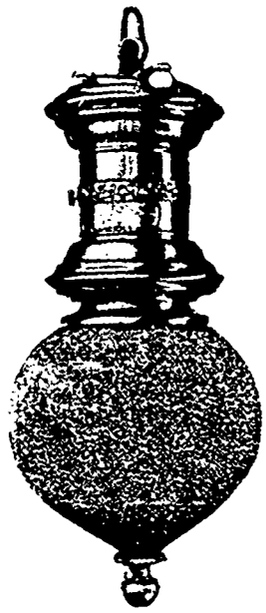
Reverting to the recent fire at the London Electric Company's works at London, Ont., we learn that the second night after the fire the lamps were again lighted. It is said that two hours after the fire was discovered an order was placed for new belting, and twelve hours later it was being fitted to the machines. The generators which were destroyed were also replaced at the earliest possible moment. The citizens are to be congratulated upon the efficient service rendered by the company, under the management of Mr. C. B. Hunt.

The directors of the Hamilton, Grimsby and Beamsville Railway Company were recently waited on by a deputation of farmers in the township of Louth, who requested that the railway be extended from Beamsville to St. Catharines. Mr. R. S. Martin, on behalf of the company, stated that to do this it would be necessary to obtain a new charter. The building of the road, he said, would depend upon the cost of construction, a report on which would be made by Mr. James Patterson, the company's engineer.

The C.P.R. Company's new transcontinental telegraph wire, a description of which appeared in the ELECTRICAL NEWS for June last, was completed within the past month, and at 5 o'clock on September 20th the first message was flashed from Montreal to Vancouver. The line passes via Vaudreuil and the short line to Ottawa, and thence by the main line to the coast. The actual distance covered is about 2,900 miles, constituting probably the longest direct line in circuit for daily work in the world. To pass across this immense distance signals occupy only one-fifth of a second.

CANADIAN GENERAL ELECTRIC CO.

(LIMITED)



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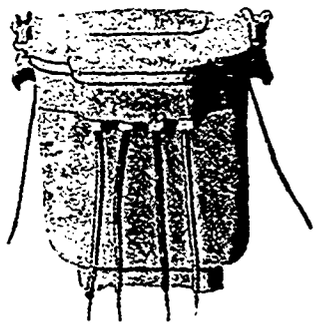

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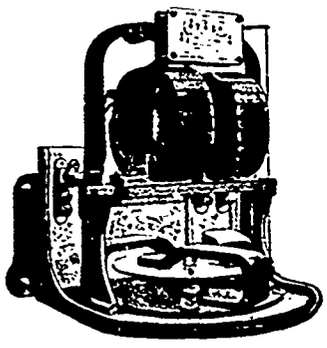

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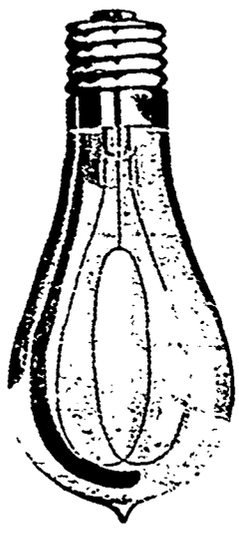

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CANADIAN ASSOCIATION OF STATIONARY ENGINEERS.

NOTE.—Secretaries of Associations are requested to forward matter for publication in this Department not later than the 6th of each month.

MONTREAL NO. 1.

At a regular meeting of Montreal No. 1, held in their hall, No. 1863 Notre Dame street, recently, it was unanimously carried that the meeting of September 26th be an open meeting, to which the public in general, and all those interested in the C.A.S.E., be cordially vited. The subject under discussion that evening was a paper on the "Precipitation System of Sewage Disposal," as in operation at Hamilton, Ont., by P. McNaughton.

BRANTFORD NO. 4.

The above association has elected the following officers: President, Arthur Ames; Vice-President, Thos. Pilgrim; Secretary, O. S. Merrill, Brantford Carriage Co.; Treasurer, A. C. Walker; Conductor, J. Nichols; Door-Keeper, A. McKinnon. The Secretary writes that they are in a prosperous condition, having made all arrangements for the coming winter.

Why does it cost less to run a condensing engine than a non-condensing one with the same machinery running in the factory? Simply because the former develops less total power than the latter. The area of the card will be the same, but the average height above the vacuum line will be less in the former case, and this is what determines the total power developed at a given speed.

CEMENT FOR LEATHER BELTING.—The importance of suitable cement for making joints in leather driving belts has led the Society of Chemical Industry to endorse the following formula: First, equal parts of good hide glue and American isinglass, softened in water for 10 hours, then boiled with pure tannin until the whole mass is sticky, the surface of the joints to be roughened and the cement applied hot; second, one kilogramme of finely shredded gutta percha digested over a water bath with 10 kilogrammes of benzol until quite dissolved, when two kilogrammes of linseed oil varnish are stirred in; third, one and a half kilogrammes of finely shredded india rubber are completely dissolved in 10 kilogrammes of carbon bisulphide by heating, and while hot one kilogramme of shellac and one of turpentine are added, and the solution heated until the two latter ingredients are also dissolved; fourth, one kilogramme of best glue is dissolved at a moderate heat in one and a half kilogrammes of water, and thickened to the consistency of syrup. One hundred grammes of thick turpentine and five grains of carbolic acid are carefully stirred in while hot; the mixture to be poured into flat tin pans and allowed to cool, then cut into pieces and dried in the air. The cement is made liquid with a little vinegar and applied to the point with a brush; this being done, the two ends of the joint are properly placed together and thoroughly pressed between two iron plates heated to a temperature of about 86 deg. Fah.

AN EXCELLENT SUPPLY CATALOGUE.

THAT a first-class catalogue is appreciated by the trade is apparently recognized by the Canadian General Electric Company, who have, in their recent production relating to electrical supplies, surpassed all previous attempts in this direction. This supply catalogue contains some 350 pages, seven by ten inches in size, and enclosed in a beautiful cover. Upon opening the book we find in the front nicely printed half tone illustrations of the company's works at Peterboro', the head office and warehouse in Toronto, and the branch offices at Montreal, Vancouver, Winnipeg and Halifax. Then comes the catalogue proper of the various lines of electrical goods, divided into the following departments. Switches, sockets and receptacles, cut-outs, miscellaneous incandescent supplies, incandescent lamps, shades, fixtures, construction material, tools, arc light supplies, instruments, rheostats and circuit breakers, lightning arresters, transformers, marine appliances, fan motors, electric cooking and heating appliances, bell supplies and house goods. We find also valuable wiring tables and data, the telegraph code, an index to code words, index to materials, and the rules of the National Board of Fire Underwriters for the installation of wiring and apparatus for electric light, heat and power. Altogether, it is a book of almost inestimable value to central station managers and purchasers of electrical supplies, and a credit to the compilers, the Canadian General Electric Company.

MOONLIGHT SCHEDULE FOR NOVEMBER.

Day of Month	Light	Extinguish.	No. of Hours.
	H.M.	H.M.	H.M.
1. ..	P.M. 5.10	P.M. 8.50	3.40
2 . .	" 5.10	" 8.50	3.40
3....	" 5.10	" 9.50	4.40
4.	" 5.10	" 10.50	5.40
5....	" 5.10	" 11.50	6.40
6....	" 5.10	A.M. 12.50	7.40
7....	" 5.10	" 2.00	8.50
8....	" 5.10	" 3.00	9.50
9....	" 5.10	" 4.00	10.50
10....	" 5.10	" 5.00	11.50
11 ...	" 5.10	" 6.00	12.50
12....	" 5.10	" 6.00	12.50
13 ...	" 5.10	" 6.00	12.50
14....	" 5.10	" 6.00	12.50
15. .	" 5.10	" 6.00	12.50
16 .	" 5.10	" 6.00	12.50
17 ..	" 5.10	" 6.00	12.50
18....	" 5.10	" 6.00	12.50
19 ...	" 5.10	" 6.00	12.50
20.. .	" 7.00	" 6.00	11.00
21...	" 10.00	" 6.00	8.00
22...	.....	" 6.00	5.50
23..	A.M. 12.10	.....	
24..	" 2.00	" 6.00	4.00
25 ..	" 3.00	" 6.00	3.00
26....	" 3.00	" 6.00	3.00
27..	No Light.	No Light.	.....
28...	No Light.	No Light.	. ...
29 . .	No Light.	No Light.	... .
30..	P.M. 5.00	P.M. 9.00	4.00
		Total.....	227.40