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Papers and correspondence on all subjects of practical interest to our readers are cordially invited. Our columns are always open for the discussion of problems of operation, construction, engineering, accounting, finance and invention.

Special effort will be made to answer promptly, and without charge, any reasonable request for information which may be received from our readers and advertisers, answers being given through the columns of the JOURNAL when of general interest, otherwise by letter.

Street railway news and all information regarding changes of officers, new equipment, extensions, financial changes, etc., will be greatly appreciated for use in our news columns.

All matters intended for publication in the current issues must be received at our office not later than Wednesday of each week.

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The Kansas City convention terminated with the banquet at the Coates House, Oct. 19, and the American Street Railway Association closed the nineteenth year of its history. It is extremely gratifying to both the officers and members of the association that, with the additions to its membership announced at the Kansas City convention, the association is now larger than at any time during the past eight years. This is all the more striking because the withdrawals have not signified a lack of interest in the aims and purposes of the association, but, as stated by the secretary, are due in nearly every case to consolidations. Thus many of the large cities of the country, like New York, St. Louis, Kansas City, etc., which sent to former conventions eight or ten delegates from many member companies, were represented at the convention which has just passed by one or at most two companies, which control all the lines in their respective cities.

No better commentary can be afforded of the extension and growth of the electric railway industry than the fact that the large number of interurban railways, which are now pushing their way through all sections of the country as rivals of the existing steam railroad lines, more than make up in numbers the loss occasioned by the existing tendency to unite under one management the local lines in each of our large cities. It is also significant that these large interurban properties, many of which correspond closely in operating conditions to the steam railroad lines to which they are contiguous, ally themselves naturally with a street railway association rather than one composed of steam railroads only. There is more reason for this than the use of the same motive power. That alone would not be a bar to uniting with the steam roads, as it is well known that they also are making a careful study of electricity as a motive power for their branch lines. The real reason lies in the fact that the modern city street railway system is no longer merely a tramway. It installs the heaviest track, employs nearly as long cars and runs them at speeds approaching those used in the open country. Its conditions, therefore, approximate more and more closely those on interurban roads proper, and the problems presented on each are growing more continually alike. Even the steam railroad companies themselves, which have gone into electric traction, like the New York, New Haven & Hartford Railroad Company, find, when investigating electric problems, that the American Street Railway Association is the medium through which experience in this line can best be obtained. The conclusion inevitably reached by this tendency is that the broad questions of electric traction, in all its phases, will ultimately have to be solved by the American Street Railway Association, as the one best fitted to deal with the situation. That it is capable of doing this no one acquainted with it will for a moment doubt. It will and must take in all branches of electric railroading, and, living up to its best traditions, be the exponent of the wider field of electric traction, as it has been in the past of city transportation.

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Although Kansas City is further west than any city selected for a street railway convention in the past, the attendance was large and the exhibits were as interesting, taken as a whole, as at any previous convention. The long ride West undoubtedly did deter certain members who live in the East from attending the convention, and a number of cities, particularly in New England and the Eastern Middle States, which have previously sent delegates, were not represented at the convention. This deficiency was nearly made up, however, by a larger attendance from the cities in the Middle West. It was the general hope that more managers from the Pacific Coast would be able to attend than at previous conventions, but this was not the case. While this was a disappointment, it must be remembered that Kansas City is as far in distance, and further, reckoned by time, from San Francisco than from New York, and while a few companies in California sent delegates, the three States bordering on the Pacific Coast, with their important street railway systems, were for the most part unrepresented. The striking feature of the convention, however, was not those companies who were not present, but those who were, and the fact that cities as far distant as Portland, Maine; Boston; Augusta, Ga.; Atlanta, Ga., and Birmingham, Ala.,

not to mention many others, sent three or four delegates each to attend a four days' convention, is sufficient proof that there is no lack of enthusiasm and desire for improvement in the managers who control the operation of our vast street railway systems.

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The weather was ideal and the association was royally entertained by its host, the Metropolitan Street Railway Company, of Kansas City. Too much credit cannot be given to the local committees who had the arrangements for the convention in charge, but especial mention should be made of the entertainment committee. Its members were indefatigable in caring for the welfare and pleasure of the attendants at the convention and providing entertainment for them, and also for the ladies, while the others were in attendance during the morning at the convention hall. Many favorable comments were also passed on the system of the Metropolitan Street Railway Company, which was inspected for the first time by many of the railway managers present. The local conditions of the city have compelled the continuance there to a large extent of the cable roads, but both cable and electric lines were found maintained in an excellent condition, the track work and rolling stock compared favorably with those elsewhere, and the principal electric power station of the company, as is well known, is one of the most economical of any railway system. The grades surmounted by the electric as well as the cable cars, the attractive appearance of the cars, the high grade of employees and the efficiency of the service, all called for high encomiums, and words of praise were unstinted as to the character and equipment of the lines in Kansas City.

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The exhibits equaled in interest, if they did not exceed, those of past conventions. The electric railway business is such a recent development that a railway manager, to secure the greatest efficiency from his service, must keep posted on the improvements in apparatus made from year to year, and there is no better or quicker way of doing this than by a careful inspection of the new apparatus shown at the annual conventions of the American Street Railway Association. In fact, these exhibits are now generally regarded as one of the most important instructive features of the convention, and receive careful attention. One prominent Eastern manager remarked to us that he made it a point to visit every exhibit at every street railway convention which he attended, and that he had never left a convention without placing at least one important order as a result of the examinations he had made of the apparatus shown. No sample cars were exhibited either inside or outside at the convention hall, and in this respect the exhibit differed from any which has been held for a long time. Another feature of difference was in the fact that the exhibits all meant something. There was a notable absence of a tendency to show simply piles and pyramids of the different appliances exposed, but the samples presented had each a bearing on its desirability in railway operation.

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It was a source of regret to many that more results were not accomplished in the actual proceedings. Of the five papers on the programme four only were presented, and of these two only were read by the authors. This was extremely unfortunate, as to secure the best results the author

of a paper should be present to answer questions which may be raised by the presentation of his paper and to elucidate any points mentioned in it which may not be perfectly plain to the members. It was also extremely unfortunate that there was practically no discussion on any of the papers except one. We noticed in one of the Kansas City papers that the statement was made that the meetings of the association were held principally for social intercourse. The editors thought that in saying this they were commending the convention and saying what would please the members most. The principal value of any large meeting of this kind, however, lies in the interchange of experience. While this applies to the meetings of every trade or scientific body, it is particularly true of a business like that of electric railroading, where such a large part of the work is experimental, and in which the best methods of caring for different problems have not yet been determined. For this reason, as we stated recently in discussing the proceedings of the New York State Street Railway Association, every means which will stimulate the discussion of the several points brought out in the different papers should be used to increase and add to the general knowledge on those subjects. At the same time, it is not always possible to depend upon entirely extemporaneous discussion of a paper from members who have simply heard it read. It would certainly seem as if the experience of other bodies on this subject would be of value. While there are some differences in procedure, nearly every other large body holding annual conventions prints its papers in advance and distributes them to the members. Then if they are long they are read by abstract only. Again, arrangements are made beforehand to have certain members commence the discussion, give their own methods on the subject treated, and approve or criticise the methods suggested in the paper. This plan, as stated in these columns recently, not only tends to produce the end sought in bringing out a full discussion, but in the case of a long paper will often economize considerable time. As a result, an association like the American Society of Mechanical Engineers will often have presented to it during a four days' session from twenty to thirty papers instead of four, as in Kansas City. With the International Tramway Association the practice is not only to print the papers before the meeting for distribution among the members, but also to publish a full appendix with each paper, giving in detail the opinions and practice of the other members of the association on the subject under discussion. This, of course, widens considerably the opportunity of debate.

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The meetings of the association should also commence promptly. The Accountants' Association at Kansas City was notably better in this respect, as it was in the discussions, than was the American Street Railway Association. We should be glad, too, to see a renewal of the early practice of incorporating in the report of the executive committee a resumé of the progress made in the street railway industry during the past year and such pertinent reference to present problems as might be of assistance to the members. These reports used formerly to be of great value, and we believe that they would be helpful in pointing out lines of investigation in which the member companies could devote their energies to the benefit of themselves individually and of the association as a body.

Cincinnati extended, through its mayor and also through Mr. Kilgour, president of the Cincinnati Street Railway Company, a most cordial invitation to visit that city in 1901. New York, however, seemed to be the popular choice of the delegates, who evidently believed that the association should come East next year. This puts Cincinnati in line, however, for the convention in 1902. There are many who would be very glad to see the convention go there in that year, and the city, as well as the Cincinnati Street Railway Company, received well deserved recognition by the election of John Harris as a member of the executive committee.

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The decision to hold the convention in New York next year met the unanimous and enthusiastic approbation of the delegates to the convention. The invitation, which was extended in the name of all the companies in New York and Brooklyn, was most cordially appreciated, and there was no dissenting voice to the decision as announced. New York will have much to show the members of the association during their visit to that city in 1901. In addition to the gigantic power station at Ninety-Sixth Street, which is now practically completed and then will be entirely so, the delegates will probably be able to see electric trains on the Manhattan Elevated Railroad. The power station of this company will probably not be entirely finished by next October, but the work ought to be so far advanced that an excellent idea can be obtained of the immense 11,000-hp units which will be used. New York City, of course, contains the best possible facilities for hotel accommodation and exhibition room in its magnificent hostelrys and in the Madison Square Garden. Just what arrangement will be made for hotel headquarters and exhibit space, of course, will not be known until the ground is gone over carefully by the committee and the merits of all possible plans are considered. It is needless to say, however, that the association will be well cared for in New York, and it could not be in better hands than in those of Messrs. Vreeland, Rossiter, Maher and Beetem.

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The proposition to limit the meetings of the convention to three days instead of four also met with hearty commendation. We believe this a wise step, as three days should be ample for the business of the association. It is proposed to make the time for the inspection of exhibits the middle day of the three instead of the last day of the four. This plan also seems a wise one. It is important, however, that the exhibits should all be ready for inspection by the morning of the first day, and exhibitors should be more prompt in this respect than at the convention just held. There, the proceedings of the association were disturbed to a considerable extent on Tuesday morning by the noise occasioned in putting on some of the finishing touches to the belated exhibits.

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While the meeting hall of the association was not all that could be desired, we understand that the local committee was not responsible for its defects. It would have been possible, of course, to have secured much more comfortable and commodious quarters elsewhere outside of the convention hall, but the advantage of having the meetings held in the same building with the exhibits was too well recognized to have sanctioned any change from past customs in this respect.

No more popular selection for a president for the association was ever made than that of Walton H. Holmes, who, with his brother, Conway, gained the immediate favor of all the attendants at the convention by his good fellowship and assiduous devotion to the comfort of all.

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Mr. Holmes will be associated in his work in the association next year by a particularly strong executive committee. The first vice-president, Mr. Vreeland, is generally recognized as one of the leading street railway managers of the country, being conversant alike with the mechanical and financial conditions surrounding street railway properties, and possessing in a very marked degree the high respect and enthusiastic loyalty of his employees. Mr. Vreeland has taken a great interest in the welfare of the American Street Railway Association since his connection with street railroading, and was one of the vice-presidents of the association during the past year. Colonel Heft, of Meriden, who was elected to the office of second vice-president, is at the same time president of several city systems and the chief of the electrical department of one of our largest steam railroad corporations. To him more than to anyone else is due the credit for the successful development of the third rail for interurban lines, and his papers before several conventions have been marked by great thought and originality, and have been of much value to the street railway fraternity. Mr. McClary, the new third vice-president of the association, is an excellent representative of the Southern street railway manager. His system, which includes both city and interurban lines, is one of the largest in the South, and he has always taken a great interest in the association and in attending its meetings. The association was fortunate also in retaining the services on the executive committee of ex-President Roach, of Chicago. Mr. Roach has been most loyal to the association during the term of his office as president, and although an extremely busy man, has given his time freely to advancing the interests of that body. The other members of the executive committee, Messrs. Fuller, of Wilkesbarre and formerly of Chicago; Baumhoff, of St. Louis; Graham, of Quincy, Mass., and Harris, of Cincinnati, are all very well known, and no better selections could have been made. The excellent financial showing of Secretary and Treasurer Penington is a high testimonial to the care with which he managed the business end of the association. Mr. Penington added to his already great popularity by the uniform courtesy with which he treated all in attendance at the convention, and his re-election met with hearty approval.

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Many favorable comments were passed upon the work and enthusiasm of the Accountants' Association. Under the able presidency of Mr. Duffy, the association has done a great deal of valuable work. The meetings were well attended, the papers were able and well received, and the discussions were pointed. The department of blanks and forms, which is under the personal charge of Secretary Brockway, made a most interesting display. These forms were shown in sixteen blank books, which were shown for exhibition on a long table 96 ft. in length, located in the gallery between the meeting halls of the two associations. An interesting addition to the collection of forms made during the year was a complete set of blanks used by the Glasgow Tramways, of Glasgow, Scotland. As these differed in so many particulars from those used on our American roads, it was considered advisable to place them in a

separate book rather than to try to classify them with the American forms. The collection was inspected not only by the accountants, but by most of the delegates of the American Street Railway convention. In this connection it is interesting to note that the Accountants' Association includes in its membership a number of foreign tramway companies.

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The first paper read at the convention, by D. B. Holmes, on "The Consolidation of the Street Railways and Its Effect Upon the Public," was an able treatise on one of the most marked recent developments in railway organization methods. It is a popular doctrine in some quarters now to decry monopolies of every kind, and particularly street railway monopolies, but Mr. Holmes showed that all monopolies are not undesirable and that a street railway consolidation brings benefits to the public which could not be conferred by a number of independent systems operating in the same city.

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Mr. Bancroft's paper on "A Comparison of the Various Systems of Electrical Distribution for Street Railways" outlined clearly the six methods at present in more or less general use for this purpose, viz., the 500-volt continuous current system, the alternating-direct current system, the booster system, the three-wire system, the purely alternating system, the storage battery system; and the advantages and the disadvantages of each were outlined. The subject is an important one in electric railroading, particularly when the problem of power distribution for interurban traffic is considered, because these lines are, so to speak, on the border line, certainly so far as alternating power distribution is concerned. We should have been glad if Mr. Bancroft had discussed several concrete examples, citing some installation and operating costs for each of the two or three methods most applicable for the case under consideration. Again, if he had enlarged upon some of the problems which have arisen in the practical operation of the newer systems of power distribution, and described the methods by which these troubles have been overcome, it would have been of great value. This would undoubtedly, however, have increased the scope of the paper beyond that which was originally intended by the executive committee, but might well be taken up in a second paper next year.

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The subject of repainting and maintenance of street car bodies was treated in a paper by Mr. Brydges, superintendent of car shops of the Chicago Traction Company. It was a thorough, practical description of the methods employed by his company, which has given a great deal of thought to the subject, and as such was of great value to the other members of the association. Our only suggestion on the paper is that if figures could have been given as to the cost of the different operations described, it would have afforded a measure of comparison for the other delegates present. The paper brought out clearly the advantage of simplicity in lettering and ornamentation, not only as regards first cost, but especially maintenance. This, it is generally recognized, is most important. Not only the design of the lettering and the ornamentation, but the colors as well should be selected so as to insure the longest life and involve the least expense in maintenance and repairs.

The paper by Col. Heft on "Double-Truck Cars: How to Equip Them to Obtain Maximum Efficiency Under Varying Conditions," contained the description of an entirely new type of car as well as of a very novel truck. While some doubt was expressed by the delegates present as to the rigidity and transverse strength of a car supported at the center, too much praise cannot be given to the author for the pioneer work which his company is doing under his direction in the development of a lighter car than is now being generally employed. Pioneer work is always expensive work, in the benefits of which, however, all the members of an industry participate; and whether the construction as described by Col. Heft shall be entirely successful, or whether experience with it will dictate certain modifications, the company with which he is connected certainly deserves the thanks of all those engaged in electric railway operations. The discussion which followed the reading of this paper was more upon the question of employing two motors or four motors on a double-truck car than upon the actual construction of the car described by Col. Heft. This is a very important subject, and our discussion on it will be found below.

◆◆◆ Four-Motor Car Equipments

There seems to be no question from the practical standpoint that four-motor car equipments have come into the art to stay, and that they form a very useful means for accomplishing certain satisfactory results. A four-motor car equipment means that every axle on the car is a driving axle, and that all of the weight of the car is directly available for traction. This implies a better grip on the track than can be secured where only part of the total weight is available for traction. The development of the motor-car equipment in this line is strictly in accordance with modern railway practice, which puts, where traction conditions are heavy—as in grade climbing over the mountains—as much weight as is possible on the drivers of the locomotive. Where the service conditions in electric railroading are such that quick acceleration is a matter of fundamental importance, the four-motor car equipments have a most material practical advantage. The equipment, however, is more costly for the same output, and somewhat more complicated than the more common two-motor car equipment, and the general consensus of opinion among the practical street railway managers who have carefully considered the question seems to be that for the same service the four-motor equipments require about 15 per cent to 25 per cent more energy than the corresponding two-motor equipments. Supposing, in each case, that the motors are of similarly good design, the causes of this difference in power required forms an interesting subject of study. An increase of 20 per cent to 25 per cent in power demanded means a very material loss of efficiency at some point, a loss which assuredly must be located to obtain a proper comprehension of the results. Now, it has long been known among steam railway experts that the wear of the track depends more on the engines than on the cars for equal weights in the respective cases. Likewise it has appeared in numerous experiments with electric trains composed both of motor cars and trailers that the power per ton required to drive a motor car, after making the fullest allowance for the loss of efficiency in the motors and gears, is very considerably greater than the power required

per ton to pull a trail car. The experiments, being made under widely differing conditions, have not been very concordant as to the exact amount of this increase in power, but as nearly as can be ascertained it may range from 25 per cent to even as high as 50 per cent.

We think the key to the situation will be found in this difference between the track friction of the driving wheel and the rolling wheel of the trailer. There is every reason to expect, in case of a driving wheel—particularly when working during rapid acceleration very near to its limit of adhesion—a grinding friction on the rail, which is quite distinct from the rolling friction of the wheels on the trailer, or the wheels not driven on the motor car, and very considerably greater in amount. In other words, there may be material slipping of the driving wheel, and even when the slipping does not rise to any considerable amount, there is a tendency to grind wheel and rail together, which ought to consume, and from the experiments does consume, a considerable amount of power.

Mr. MacCormack made in this connection a most interesting contribution to the discussion. On the Cleveland system he undertook the investigation of possible slip, by putting cyclometers on the wheels so as to count the relative revolutions of the driving wheels and the rolling wheels on the same car in a given run. Not only did he find most unmistakable evidence of slip of the driving wheels, but in some cases found this slip rising to very considerable amounts. Of course, the nearer to the limit of adhesion one is working the more probability of getting grinding action between the driving wheels and the track. This cause alone is sufficient to account for the difference which has been observed between the power required for four-motor and two-motor equipments. In addition to this, the four-motor equipment generally is more liberal in its capacity than the two-motor equipment, so that there must be some little difference in the average efficiency of the motors while in service, a difference probably not large, but perhaps enough to accentuate the difference between driving two and four axles, to which we have just referred.

And this brings us to the second important point in the discussion, and that is, the relative repairs in the case of two-motor and four-motor equipments. In spite of the fact that the four-motor equipment is more expensive and more complicated than the two-motor equipment, the discussion conveyed a pretty definite impression that the depreciation actually found in the four-motor equipments was materially less than in the case of two-motor equipments, enough less in the opinion of some experienced managers to offset the difference in cost of the two forms of car equipment. This statement, if borne out by further investigation, is most important, giving a strong additional reason for the employment of the four-motor equipments. It is, however, very difficult to see why there should be a difference in wear and tear in favor of four motors rather than two, assuming the motors to be of equally good construction. In the one case there are four commutators and a doubly complicated set of connections, as against two commutators and the ordinary controller in the other case. On form, as our sporting friends would say, there would be every reason to expect a greater depreciation with the greater number of motors. It is a subject which would be worth careful investigation at the hands of the Street Railway Association, for it is one of vital importance in the

extension of street railway practice which is now going on. On the facts set forth up to the present, we are rather disposed to doubt any intrinsic advantage in the matter of depreciation to be gained by the use of four motors. There are two causes which would tend to produce this impression without proving the case in any general way. As a matter of fact, most four-motor equipments are materially greater in power capacity than the corresponding two-motor equipments with which comparison would have to be made. That is, assuming the two-motor equipment to consist of two 40-hp (nominal) motors, one is very much more likely to find four 40-hp motors on the four-motor equipment, than four 20-hp motors. Now, assuming the maximum continued power demanded from the car to be 100 hp, in the one case we would have two motors working on 20 per cent over-load, while with four 40-hp motors we would have an equipment working far below its rated capacity. It, therefore, would work somewhat less efficiently at light loads, but would suffer much less at maximum load conditions. In other words, taking two-motor and four-motor car equipments, not as they might be, but as they generally are found in practice, the conditions which lead to a desire for the advantages in acceleration to be gained by the four-motor equipment, indicate that the two-motor equipment is being hard pushed in one way or another. It therefore seems more likely that on an average the four-motor equipments are run less frequently at over-load and more steadily at loads well within their powers. The comparison thus does not directly involve the presence of two motors or four motors per car equipment, but the relative merits of over-loaded and moderately loaded motors in point of resisting wear and tear. Under these circumstances the favorable results in depreciation which seem to be generally reached with four-motor equipments, are very readily understood.

Another fact which may have its bearing on this question is the comparatively recent development of four-motor equipments. When a company undertakes comparison between the repairs of its two-motor and four-motor equipments, it will in most cases be comparing four-motor cars recently put on with two-motor cars which have been some time in use. Now, depreciation in such apparatus is not a constant quantity per year, but usually an increasing quantity with the age of the equipment. Hence, unless great care be taken in such a comparison to value the repairs on two-motor and four-motor cars which have been in service about the same length of time, the results will decidedly favor, at the present time, the four-motor cars, which, on the average, have not been in use so long. These two causes probably furnish a sufficient explanation of the facts brought out in the discussion, so far as it related to depreciation of equipments.

As regards the matter of power consumed, it would be worth while for some company, or better yet, a committee of the association, to investigate carefully the cause of the extra power which seems to be required with the four-motor equipments, with the purpose of finding out how much of this extra power is due to the increased number of driving wheels, and how much may be chargeable to differences in efficiency of the motors or in other service conditions. As we have already indicated, both of these causes are probably involved, although we are inclined to attach by far the greater importance to the former. In

any event, the extra power required must not be considered in the light of a general argument against the use of the four-motor equipments. The manager who employs them employs them for a specific purpose which he accomplishes, and which frequently he could not accomplish by any other means, and the extra power required is merely part of the price paid for the useful result.

The Future of the American Street Railway Association

We believe that the American Street Railway Association has reached a critical period of its existence. No one appreciates more than the STREET RAILWAY JOURNAL the valuable services which it has rendered in the past to its members and to the street railway industry as a whole. This paper and the American Street Railway Association were started at nearly the same time, and have grown together with the industry which they both represent. The association always has, and always will, receive our heartiest and most loyal support, for we believe in united action and consider the association the most potent agent in securing those ends which can only be gained by the co-operation of all the members of an industry. The question is whether the association will rise to the emergency which now confronts it. It cannot stand still, and if it is to advance, as it has in the past, it must face the situation as it exists to-day. There has been no time in the history of the industry when more problems which require immediate attention have been presented to the electric railway manager; problems of management, of relations with employees, of construction and of operation, which must be solved. Most of these demand more attention and more knowledge than can be commanded by any one railway company. If all are to participate in the benefits, all should contribute to the end sought.

We do not wish to appear captious in considering the work of the association. The Kansas City convention was successful, and we do not believe that any person who went to Kansas City returned with any feeling except that he was repaid and more than repaid for the time and expense of making the trip. The association is performing an important service to its members and the street railway industry in general. The only question is whether it cannot be of more benefit to the immense capital which is invested in street railroading in this country, and consequently to the many employees and others who are directly and indirectly connected with the electric railways of this country. Even with the sessions of the association reduced to three instead of four, or two working days instead of three, as in the past, an ample opportunity is given to treat a large variety of subjects which interest vitally the railway managers of to-day. The sessions should commence promptly at 10 o'clock certainly, and if possible, earlier. Additional time can be secured by publishing the papers beforehand, and by reading them in the abstract in the case of long papers, as suggested elsewhere. In this way three or four times as many papers could be presented as is now the case, and an ample time could be had for a thorough discussion of them all. These discussions would bring out the practices of other companies besides the one described in the paper proper, and in this way the sum of the experience of the entire body would be presented to the manager to

assist him in overcoming many of the knotty problems with which he is now confronted. Informal discussions on pertinent subjects connected with street railway conditions could also be introduced to advantage. This method was introduced several years ago by the New York State Street Railway Association, and was found to be productive of the best results.

But it is not only in the literary work at the convention itself that the association could assist the everyday labors of the street railway management. Where special information is required committees could be appointed made up of representatives from the leading companies to carry on tests through the year, the results of which could be reported to the association at its next annual meeting. In this way a basis could be arrived at for intelligent action on the care and selection of appurtenances used in the street railway service. Other organizations are conspicuous in this united work for the common good, and their activity is fruitful of results. Oftentimes these committee reports are the most valuable features of the convention. It is not necessary that such reports should be laid before the general public; some of the most necessary work may be upon topics only suited for executive session. But the vital thing is united, persistent effort for mutual benefit. The American Street Railway Association is probably freer from commercial rivalry among its members than any similar organization, and by so much the more should there be only free interchange of opinion and experience. Above all, if it has chanced that a certain member has been thrown in the way of securing unusual information on some particular point, he should be induced to give it to the association.

There is no lack of suitable topics for study. Two most pertinent ones we have already noted in commenting upon the question of four-motor *vs.* two-motor equipments, questions which could with advantage be turned over to a committee to investigate. A general discussion of the brake question or of the grounded circuit would be of immense value if the members could be allowed or coerced into telling their experiences. It might have to be held in executive session for the sake of peace, but that is one advantage of such sessions. Free and full discussion is the important thing, and the hardest to attain. Once in a while some one gets up and bluntly states the facts, whether they are palatable to his auditors or not, and a single such statement in a discussion is worth half a dozen smoothed and edited reviews on the same subject. Aside from these technical matters, there are even graver matters of concern. Just now street railways, in passing through their evolution from urban to interurban roads, are, in their public relations, between the devil and the deep sea! There is an altogether unfortunate tendency, merely because a road is doing interurban service to the great convenience of the public, to thrust upon it the responsibilities and inhibitions that belong to great trunk lines. It is the proper function of interurban roads to afford a degree of cheap and facile rapid transit that has never been reached by any other means, and the road is ill requited by hampering its progress. The relations between interurban roads, as well as city roads, and the public, with means for their betterment, is a subject which is well worth the most careful attention of the ablest committee which the association could organize.

Again, the three-cent-fare craze takes occasional possession of the political under world by spells of unhappily increasing frequency. A standing committee to undertake a campaign of common sense and education would go far toward averting the need of combating such attacks by costly and disquieting litigation. These and many topics, such as wages, hours of labor, and others which readily suggest themselves, might properly be made part of the active life of the association.

Notes and Comments on the Street Railway Accountants' Convention

BY A. O. KITTREDGE, F. I. A., C. P. A.

There are at least two plans upon which a convention may be discussed: One is to be present in person, to listen to the papers read and the discussion that follows, taking copious notes meanwhile, and then to reduce to writing one's conception of the affair, pointing out those features that are most striking and interesting, and making such comments as the occasion may seem to warrant. The other is to observe the convention from a distance, to read in cold type the carefully prepared papers that were submitted and the discussions which followed, and then to write out one's impressions. Both plans have advantages. In the one case the commentator is liable to be carried along, as it were, by the current of argument, and thus in a sense becomes a part of the convention—that is, a partisan disqualified for impartial discussion. In the other he remains entirely dispassionate, and is in an excellent position to assume the semi-judicial point of view so desirable to occupy, weighing carefully the arguments pro and con, to the end that he may point out conclusions and clearly indicate the trend of events. It is not every convention that knows which way it is drifting, to say nothing about the course it is trying to steer.

At the last moment I found it impossible to attend the convention of the Street Railway Accountants' Association, assembled at Kansas City on Oct. 16, although I had expected to be present. It was a disappointment to me, because my attendance upon the previous conventions of the organization, together with more or less special committee work, in which I had the pleasure of co-operating, has made me many pleasant acquaintances among the members of the organization whom it would greatly please me to greet once more. I know that I should have greatly enjoyed all the exercises of the occasion. Notwithstanding that I was not present, the editor of the STREET RAILWAY JOURNAL tells me that my comments on the proceedings of the convention are desired, and therefore he urges me, in the light of a careful reading of the papers which were submitted and a perusal of a verbatim report of the discussion, to present running comments, very much the same as I have done for several years past in the issues following the conventions. I am somewhat reluctant to do this, but can scarcely decline so hearty an invitation, and if, as he says, the accountants are at all interested in what I have to say on this matter, I am sure I have no good reason for withholding my remarks. In addition to reading the proceedings of the convention, I have had the opportunity of conversing with some of those who were present, and in the light of all that is before me, I shall attempt to reflect in these long-distance notes some of the impressions made upon my mind by what was done.

The accountants are to be congratulated upon the good

impression they made upon various men prominent in what is familiarly called the regular convention. Viewed from my distant standpoint, it would seem that the accountant's convention was specially characterized by promptness in getting to work on each of the several days, by businesslike methods throughout all the sessions, and particularly by the lively and interesting discussion which followed each of the several papers that were presented.

If I may believe the reports that reach me—and certainly no one is interested in anything else than stating the exact truth—President Duffy acquitted himself as presiding officer with even more grace and dignity at this convention than on any previous occasion. His reputation in this regard was already very high. The accountants are to be congratulated in having had so able a presiding officer, one who is so thoroughly in touch with everything that is up for discussion, who is sympathetic with the audience, and who personally knows the rank and file of the members of the association so well. Mr. Duffy not only retires with high honors, but has set the pace for his successor, who has been his co-worker in this organization from the very start. Mr. Ham will no doubt be equal to the occasion, for in a sense he has long been in training. Nor is the association likely to lose the energetic and intelligent work of Mr. Duffy, for as chairman of the executive committee he is likely not only to find plenty to do, but also to be able to exercise a potent influence for good upon the affairs of the organization.

I hear many words of praise for Secretary and Treasurer W. B. Brockway, formerly of Toledo, and now of the New Orleans & Carrollton Railway Company, New Orleans. His businesslike methods, his indefatigable industry, his modest and unobtrusive ways, the thoroughness with which his reports are made up and his exhibits arranged, together with numerous other high qualities, endear him to the officers of the association, as well as to the rank and file of the members. In many respects Mr. Brockway is an ideal secretary. The association is to be congratulated on having found him, in the first place, and, in the second place, in being able to retain him in office year after year.

The new officers which the association has chosen are men who are likely to infuse new life and energy into the various parts of the work. The association will gain by the change that has been made, not because the old officers were inefficient—quite the contrary—but because “a new broom sweeps clean,” and because there is enthusiasm and inspiration among new leaders. Each of the officers in whose hands will be the work of the organization for the ensuing year has had a long and special experience or training. Each is in a responsible position in the field of practical street railway work. Each has clear-cut ideas of what he would like to see the association accomplish, and each has a clear conception of the good that the association can do in the field in which it is working. The Street Railway Accountants' Association, under the management of Messrs. Ham, Harder, Smith, McDole and Brockway, assisted by the executive committee headed by Mr. Duffy, is in most excellent shape for a larger and broader and more useful service than it has ever before achieved.

The keynote of the usefulness of the association was very happily expressed in the brief remarks of Mr. Ham, when Mr. Duffy called him to the platform, and, in his own language, “turned the chair over to him.” Modesty is

Mr. Ham's besetting fault, and therefore he was not expected to say as much as he might. However, what he said was right to the point. I quote: "If I have done anything for the association, it has done tenfold more for me. I believe that any man who comes to the convention of our association is greatly benefited, and that his company is also benefited. It is by coming in contact with other men in the same line of work that we are enabled to free ourselves from the dust and cobwebs which accumulate in our brains." The "tenfold more" that the association has done for Mr. Ham means, I take it, the advantages which it has afforded him in the way of coming in contact with his fellows and benefiting from the attrition of minds. Mr. Ham on this occasion very clearly expressed his conception of the future of the association. It is that the work of the organization from year to year will come to be more special and that the members will come into closer and closer touch with the operating department, thereby being made more valuable to street railway work, and that in time the "position of the accounting officer will become more dignified and more honorable than at present." This is an object well worth working for. I notice particularly that Mr. Ham puts first in order the use that the members may be to the industry with which they are associated, and last, the advancement which is to come to the individual worker.

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The only criticism that I can justly offer at this time concerning the work of the association is virtually one that has been repeated in these columns on several occasions in the past. The organization is styled an accountants' association. Its object ostensibly is a standard system of accounts. The methods discussed and the real work so far done, however, are in the realm of bookkeeping, rather than in that of accounting. No one can quarrel with the members of this association for styling themselves accountants rather than bookkeepers, for they are in fact the accounting officers of the companies that they represent. Under them, as their employees, for whom they are responsible and whom they are directing, are bookkeepers and cashiers, voucher clerks, ledger clerks, and so on to the end of all the classes of help that their offices require. They are accountants, and are entitled to the name. But the time of the association so far has been largely devoted to a discussion of mere account classification, or, to be more particular, to expense account classification, and not to real accounting. They have given attention to bookkeeping details rather than to real accounting. There has been lacking in the work of the association a definition of accounting principles applied to street railway work which would serve as the logical foundation for the expense classification that has been adopted. The absence of a declaration of the accounting principles to which the members could subscribe—in other words, the absence of a formulated accounting creed, if I may use the term—has been the reason for various misunderstandings that have occurred, and is the cause of a certain amount of bewilderment at present. With a skeleton exhibit of the accounting system of a street railway, worked out and adopted, being something to which, as before stated, all could subscribe, there would be very little opportunity for the differences in opinion which now exist concerning certain points. It would be the ready key to the solution of various problems which the association has yet to meet.

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The line that divides bookkeeping from accounting, or that distinguishes the interpretation of details from the principles upon which those details are based, is so subtle that many persons fail to perceive it. Perhaps subtle is

not the word to express the idea. It is as though the boundary line were represented by an elastic cord. Those who happily jump over the cord, thus passing from the realm of bookkeeping and routine detail into the realm of accounting principles, find themselves in a new world, while others, who, instead of jumping over the cord, push against it, apparently make progress into what would seem to be the new territory, but which is obscured to them because they have insensibly carried along with them the fog of their old location. Such persons, further, are all the time restrained by the cord, elastic though it be, against which they are pressing. They are never released from its confinement until they are able to leap over it, until they experience a new life. If the distinction between bookkeeping and accounting is so hard to perceive by those who are in active work, it evidently must be harder to describe in an article of this kind. Therefore, I shall not attempt it. I merely point out that the association in this regard apparently still stands just where it did one, two and three years ago.

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One more thought, however, in passing, and that is that perhaps the time will come when some one out of the ranks of the organization will rise up with a paper on the theory of street railway accounts, that shall be so clear that his hearers will at once see the new light. Perhaps he will see his way clear to a discussion of principles entirely divorced from blanks and forms, cash books, ledgers, statements and reports, and be able to lead his hearers into a consideration of street railway accounting in the abstract, thus indicating what it is the object to produce by means of the details attendant upon daily work, but leaving out of consideration for the moment all methods whatsoever. If the officers and members of the Street Railway Accountants' Association were able to agree upon such a theory and were to succeed in getting it properly charted, they would find their differences disappearing one by one, and each particular idea that is advanced taking its proper place. In saying this I do not mean to intimate that there are essential differences between the members at the present time, but that in the presentation of ideas and suggestions there is no scheme of classification in vogue in the organization that serves to show where they belong. I wish for the good of the association there were more differences of opinion than there are at present. The fact that there are so few differences and that the majority of the members are apparently satisfied with things as they are is opposed to the best interests of the association rather than an indication of work completed.

To sum it up, the agreement upon a theory properly charted as above suggested, would help wonderfully in discussing such questions as units of comparisons, departmental accounts, materials and supply accounts, etc. There is a variety to the discussion at present, because each man proceeds with his work from his own particular point of view, without any regard to limits and without any definition of fundamentals. By the new plan each man would be confronted by what may be likened to a pigeon-hole system, with the suggestion that at the outset he indicate in what divisions it properly belongs. This preliminary agreed upon, the discussion could proceed to advantage. Some one should have taken the idea from Mr. Beggs' paper entitled "What Does the General Manager Want to Know from the Accounting Department?" and have risen to the occasion at once. What the general manager wants to know, as Mr. Beggs pointed out, is easily reduced to a formula. It is something constantly recurring, and it is something for which there must be a scientific reason in every detail. A theory of street railway accounts, properly

declared and defined and expressed in a chart, would be the best exemplification of an answer to Mr. Beggs' question.

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The exhibit of blanks and forms, which has been a leading feature of the association's annual convention for several years past, received more attention, I am told, this time than on any other occasion. As time goes by, the collection becomes more and more complete, and in the sense of a mere display is of greater interest each succeeding year. I am told that the blanks contributed by the Glasgow Tramways, an enterprise, by the way, that is owned by the municipality, excited special interest. Various members, I am informed, claim to have got new and valuable ideas from their study of the blanks on this occasion. No doubt every one who examined the blanks, if questioned, would admit more or less advantage in this respect. I have always regarded the effort of the association in this particular, however, as of very limited utility, for it seems to me that a blank, to be of any real value, must be a clearly defined part of a complete system. In street railway work, as well as in almost every other line of business that I have ever investigated, I find in use many curious fragments of systems and the blanks in general characterized by the absence of a comprehensive system. This brings us back to the fundamental need in all the work that the association is doing—namely, a skeleton of an accounting system of which the blanks shown would be merely the working parts.

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The genesis of a blank in street railway work, as well as in any other branch of business, is something of interest. Some person at some time or other, for some particular reason, wants some special item of information. Thereupon, either personally or at the hands of an assistant, he produces a form that is calculated to secure the information desired. The relationship of that form to the whole accounting system, or to other blanks which are already in use, is, as a rule, far less thought of than the immediate want it is to satisfy. Accordingly, very often information is duplicated, although perhaps changed in form of presentation. The work required in filling out the report is not only duplicated, but in many cases quadrupled, simply by reason of the conflicting forms of blanks in use and the conflicting requirements in the work of filling them out. It is like adding on to a house rooms for the accommodation of people of peculiar ideas, the work proceeding not under the charge of an architect, but under the management of the persons who are to occupy them, and who, as a fact, are inexperienced in both designing and building. It would be a very peculiar looking house and of doubtful sanitary qualities.

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It is plain to see, therefore, that blanks and forms, to be of the greatest possible use, must be devised as working parts of a carefully designed system, each particular blank being considered with reference to all the others, to the end, first, that the information sought to be conveyed shall be presented in the best and simplest form, and second, that for no reason whatsoever shall clerical work be duplicated. There are very few forms and blanks in use, save only those which have been designed upon the principle above laid down, that do not embody features which make them expensive in preparation and cumbersome in use. The ideal blank is simple in form, and is so related to the general system as to receive the special information it is to present to the management without the requirement of extra labor in searching for the information. I like to regard the blank—using the term now particularly in the sense of a blank for a statement of results—very

much as a ledger account, being that into which items will be posted in natural course from properly designed posting mediums. I have very little sympathy with the statement form that requires the abandonment of all the regular bookkeeping work of the office and a digging after facts along original lines of investigation for the purpose of finding it out. Yet there are many such forms in use. To the student of accounting systems—using the term "system" now in the sense of a complete working plan—the library of blanks accumulated by the accountants' association is of great value. To the so-called "practical," but incomplete man, who, without scientific basis for his selection, is disposed to pick up various fragments and attempt to put them into practice in his own office, the collection may prove a veritable stumbling-block. It all depends upon the use that is made of it.

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The recommendation of President Duffy that a committee should be appointed, charged with the work of preparing model blanks and forms general in their adaptability to use, with such explanations and instructions as may be necessary and desirable, shows that he, for one, appreciates what may be derived from the collection of blanks now in the possession of the association that will be of advantage to all the members. It also indicates that he is aware of the danger that comes from the indiscriminate use of bright and attractive looking fragments. And yet, without knowing more of the idea that was in Mr. Duffy's mind than can be derived from the report that is before me of his annual address, it would seem that he has not gone to the root of the matter. As above said, before the blank can be intelligently devised, whether it is to be general in its application or specific, there must be present the skeleton or outline of the accounting system of which it is to be a part. The standard accounting system—using the term "accounting" now in the sense of defined theory and application of principles, rather than in the sense of classification of accounts and applied bookkeeping, and the word "system" in the sense of something complete—is the one thing that as yet the association has not seriously inquired into. The proceedings of each annual convention, however, show that gradually this subject is being approached, and there is reason for hoping that before long it will not only be reached, but taken in hand and ultimately settled to the satisfaction of both the managers standing for the capital invested and the accountants responsible for the detail work of their departments.

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To the ordinary layman, who for the first time inquires into the affairs of the Street Railway Accountants' Association, it must be a matter of astonishment that the membership at the end of four years is less than one hundred. When the number of street railways in operation throughout the United States, Canada and other parts of the world is considered, and it is right that we should take in other parts of the world, in view of the foreign membership which the association already has, one would imagine that this organization would be very much stronger numerically than it is at present. Looked at from another point of view, the membership is perhaps quite as large as could be expected, for in street railways, as in other industries, there are many persons engaged who have neither the capacity nor the ambition, the leisure time nor the inclination to co-operate in a movement calculated to advance the industry. It is only the leading, the more progressive and the really aggressive men in any branch of business that get together for the good of that business broadly.

(To be Continued.)

CONVENTION PAPERS AND REPORTS

Consolidation of Street Railways and Its Effect Upon the Public

BY DANIEL B. HOLMES

It is no part of the purpose of this paper to enter into an extended discussion of street railway consolidations from a legal point of view. It is assumed that no considerable number of those present would be particularly interested in that branch of the subject. Suffice it to say that the laws of nearly, if not quite, all of the States of the Union are in such condition that practical street railway consolidation may be brought about and made effective by union of companies as a technical consolidation, or by purchase and sale of the corporate property or capital stock or by common ownership of the corporate shares of several companies, or in other ways which might be mentioned. Whenever consolidation is desired by the parties in interest, it may be safely assumed that counsel learned in the law will find little or no difficulty in pointing out the way in which that end may be legally accomplished.

Street railway companies may be properly classified as public service corporations, and whenever a union takes place of several such companies, it at once becomes obvious that the interests of the capital invested and of the traveling public may, and probably will, be positively affected thereby. Therefore, these two interests will form the chief basis of what I have thought proper to lay before this convention of practical street railway men, whose calling is such that they never feel at liberty to disregard either the best interests of their stockholders or the welfare of the dear public, whose constant servants they are. And I may be permitted to ask, in the light of an experience and intimate association with street railway managers extending over a period of upward of twenty years, that no class of men with whom I have come in contact in the active practice of a profession which brings about the most intimate relations with all sorts of men, are so constantly mindful of the best interests of the public they serve by night and by day as the street railway men. I am the more pleased to make this acknowledgment because the street railway man has so many impatient masters among the traveling public that he is much more often the subject of unjust criticism than of the well deserved encomiums he would surely receive if the difficulties of his situation and his conscientious efforts to faithfully discharge his company's duty to the public were even half-way understood. Above all men it is his lot to bear the "whips and scorns of time," and if he will but pin his faith to the teachings of the Good Book, he may expect to receive hereafter that reward which in but few cases, I am sorry to say, comes in this life in the shape of an adequate salary for so hard and thankless a job.

That the consolidation of street railway interests affords opportunities for the introduction of many various economies is a truth which is almost axiomatic, and this may be fairly said to have been the controlling consideration which has inspired and accomplished the many consolidations which have taken place in various parts of the country. By this process the managerial force is greatly reduced and the salary list largely diminished. Where three or four presidents, managers or superintendents were required for the successful management of the separate properties, but one officer of each kind is needed in their united state, and while he receives more salary than any one of his predecessors, as of right he ought, because of enlarged duties and more weighty responsibilities, still there is substantial saving over what was previously paid.

But there is, in this connection, a still more important consideration. As is the case with any other calling in life, the supply of really first-class street railway managers is more or less limited, and the larger salary offered by the consolidated interests naturally commands, and in all probability secures, a higher order of talent than the separate properties could retain even where it had been fortunately possessed. In this way, the consolidated properties in nearly every instance are managed with greater ability than was shown by the management of the disconnected parts, and this is a positive gain, the value and importance of which can scarcely be estimated. This successful manager, you may be sure, is truly a remarkable man. The relations existing between street car companies on the one hand, and the municipality or its citizens on the other, are the fruitful source of jealousies and complications constantly arising which can be successfully disposed of by nothing short of the possession of genius for diplomacy, and for affairs and finance all at the same time, in order to be able to satisfy the de-

mands of the public without involving the company in irretrievable financial ruin.

In most instances the consolidation of street railway properties creates opportunities for marked reduction in the cost of generating motive power. Location is a most important consideration as regards the power station. Unless the power station is so situated that both fuel and water can be delivered to it at minimum cost, the highest degree of economy in developing motive power is altogether impossible. This is greatly facilitated by the union of properties, since the car lines are so situated in most cities that but few of them, if independent, could operate from power stations located near steam railroad switches and water courses. A greater or less number of high-priced employees are always necessary around every power station, whether large or small, and this is an expense which is greatly curtailed by generating as much power as is practicable to handle from one station. A company possessed of an extensive system with large mileage has thus presented to it the opportunity of producing power at the minimum cost, a thing altogether impossible on a short-line railway.

But perhaps the most important result from consolidating street railway lines is the great stimulus it affords to street railway traffic. Outside of a few of the very large cities, where the problem is not how to get business, but how to successfully handle that business, which, of necessity, must come to the car lines, the street railway companies are quite generally engaged in efforts of all kinds to create travel on the lines artificially by offering to the public attractions of various and sundry kinds. This is all well enough, but one of the most effective means to this end is the consolidation of the street car lines. I believe it is the uniform experience that the aggregate travel on the united lines exceeds by a large percentage the business formerly done by the separate properties. This is partially accounted for by the fact that short distances are now ridden which were formerly walked, because two fares were then necessary in order to ride, and this was considered too great an outlay for the accommodation afforded.

But how stands the case with the public? I am altogether sure it is no different. Indeed, the immediate benefit to those who ride upon the cars far exceeds the increased returns to the consolidated company. Where, before the union, two and even three fares in some instances had to be paid in order to convey the passenger to his destination, he may now take the same journey for a single fare by means of transfers and through cars, which was previously impossible. Taking Kansas City as an example: 50 per cent of all the passengers who ride on the cars make at least one transfer in every journey, so that it may be truly said that 60,000 passengers save 5 cents each, and every day in the year in Kansas City alone, and this saving is due solely and directly to the consolidation which took place only a few years ago. And who are the people thus benefited? It is chiefly the laboring classes who can least afford to spend their hard-earned gains unnecessarily. The sons of toil who were formerly compelled to shelter their wives and rear their children in the polluted air and noise and smoke because unable to pay more than a single fare in going to and from their avocations, can, and do now, dwell in the neat little cottage in the suburbs, where loved ones breathe the pure air of heaven and bask in the sunshine of life all the day long, and when eventide comes, smiles and mirth and joy are the companions who have taken the place of sickness, suffering and grief. Who can estimate the value of blessings like these? If the public welfare is the first and highest duty of the State, who can gainsay the immense value to the public of street railway consolidations, and who can say that the State ought to throw any obstacles in their way?

But it is said that competition is the life of trade, and that monopolies are odious. Accepting these as general truths, let us see how it is with the street railways. Except to a very limited and unimportant degree, there is no such thing as competition in street railways, and their consolidation is entirely devoid of any objectionable feature of a monopoly. In the very nature of things street railways are seldom competitors in business. They were never known to compete in rates, and can only be laid on such public highways as the authorities may determine. The necessity for keeping some streets open for ordinary vehicle traffic keeps the street railways sufficiently far apart, as a rule, as to eliminate any matter of choice on the part of the intending passenger. Each line supplies and accommodates its own peculiar territory, and there is no real choice, and hence no real competition. As to rates, these are universally fixed by the franchise ordinances. They are the

same on all roads, so that the intending passenger is moved in his choice solely by consideration of convenience to himself. In short, he simply takes the line that carries him to his destination with the least inconvenience. Monopolies are only odious when of a character that they do or have the power to fix their own price for what they alone can sell. Not so with the consolidated street railway. So far from having the power to increase the cost of travel, consolidation always results in a practical reduction of cost by giving to the passenger the right to ride for the same single fare the increased distance brought about by the consolidation. No thoughtful man would condemn a street railway consolidation, because it neither stifles competition nor increases cost of travel, nor creates a monopoly, as that term is generally understood.

There can be no doubt that consolidations of this character are greatly beneficial, both to invested capital and to the public at large. And, happily, this is so, because the public is never so likely to have its wants provided for as when it is to the interest of capital to do so. There is no tie so strong as common and mutual interest. This is a principle which would render many conflicts and controversies impossible, if kept always in mind and strictly adhered to in all dealings between public service corporations and the municipality in which they dwell. I commend it to the thoughtful consideration of all who are assembled in this convention as the firm foundation on which aggregations of capital may safely rest, the Gibraltar of justice and right, garrisoned by an always sound and healthy public sentiment, against which the assaults of prejudice, passion and demagoguery would be hurled in vain.

Comparisons of the Various Systems of Electrical Distribution for Street Railways

BY C. F. BANCROFT

In preparing a paper on "Comparisons of the Various Systems of Electrical Distribution for Street Railways," I find that the conditions to be met in the numerous localities where the various systems are in use are so widely different, and each system so generally satisfactory under certain conditions, and so completely unsatisfactory for meeting other conditions, that comparisons are altogether impossible, except in a very general way.

There are six systems of electrical distribution for street railways at present in more or less general use.

First, what may be called the standard 500-volt continuous current system, where the current is generated at from 500 volts to 600 volts and delivered direct to the car motors, usually by means of a feed wire and trolley, third rail or underground conduit.

Second, what may be called the alternating, direct-current system, where the power is generated as alternating current, usually at high voltages of from 5000 volts to 15,000 volts, and transmitted to sub-stations, where the voltage is usually reduced by means of static transformers, transformed into direct current by rotary converters, and delivered to the lines at about 500 volts continuous current.

Third, the "booster" system, where the current is generated usually at about 550 volts, and where, by means of an auxiliary generator, usually series-wound, called a "booster," additional voltage is generated and compensates for that lost on the line.

Fourth, the so-called three-wire system, where the current is generated at about 1000 volts, usually by means of two 500-volt generators connected in series, and is delivered to two motors or two groups of motors in series.

Fifth, the alternating-current system, where the power is generated as alternating current, usually at high voltage, and transformed down to about 500 volts at the trolley wires by means of static transformers which may be located on the poles supporting the feed wire and trolleys, the cars being equipped with alternating-current motors.

Sixth, the storage battery system, where the batteries are carried on the car and charged at the power house or at special points on the line. Storage batteries can also be used to advantage in connection with any of the above systems under certain conditions, and, in fact, combinations can be made of any or all of the above systems.

For any given conditions as to speed, traffic and length of line, some one of the above systems is likely to be much better fitted and more efficient than any of the others; therefore, it seems to me that a comparison of the various systems can best be made by considering the particular conditions most favorable to each. In the distribution of power for street railways the result to be aimed at is usually the maintenance, at variable loads, of an approximately constant pressure of 500 volts on the trolley wire at a minimum total cost for power.

The cost of generating electric power under the same conditions, as regards fuel, depends to a great extent on the amount of power

generated and the capacity of the generating apparatus with reference to the average output required. Under ordinary operative conditions, with the same power factor, that is, the same ratio of output to capacity, the cost of power per kw-hour from stations of less than 500-kw capacity increases very rapidly as the station decreases in size. With from 500-kw to 1500-kw capacity, the cost of power per kw-hour decreases slowly as the size of the station increases. From 1500-kw to 2500-kw capacity the cost per kw-hour decreases very little as the output increases, and above 2500-kw station capacity the cost of power per kw-hour becomes nearly uniform. This is due to the fact that in small plants the labor item is disproportionately large, and the general efficiency less than in larger ones, while in plants of 1500-kw output and larger the cost of labor remains proportionately nearly the same as the plant increases in size. It follows from this that there is often very little or nothing to be gained from an economical standpoint by substituting one station of 5000-kw capacity for two of 2500-kw capacity each, provided the local conditions, as regards cost of coal, water, etc., are the same.

The system of distribution most suitable to a particular road depends to a great extent on the location of the power station or stations and the nature of the load. It is always expensive to transmit power, the expense being either in interest on copper investment or in fuel or both; and, therefore, other things being equal, the location of the power station or stations should be as near the load center of distribution as possible. The location of the station is, however, usually governed to a considerable extent by local conditions as regards cost of fuel, water and real estate.

On a large system, requiring an average output of 12,000 kw, even though the load be distributed within a 5-mile radius of a practical station location, it will usually be found economical to generate this power at several smaller stations rather than at one large station, provided the conditions as regard cost of fuel, water and real estate are about the same, as the cost of power station buildings and machinery per kilowatt of capacity and the cost of generating power per kw-hour, with a station of 5000-kw capacity, is about the same as at a station of 10,000-kw capacity. The interest on the saving in cost of feed wire by having several stations, each located near its load, would more than offset the slight saving in cost per kw-hour due to the generation of power at one large station, and it also has the advantage that in case of fire or accident to one station the other can usually be so interconnected as to temporarily carry the entire load, and thereby avoid much of the stoppage of traffic which would occur if the road was supplied entirely from one station.

For an example of what was called the first or standard 500-volt continuous-current system of distribution, a city may be cited in which the street railway lines radiate west from the center of the city like the spokes of a half-wheel, with a radius of about 5 miles. Instead of having one large station at the hub of the wheel, the road is supplied with power from seven stations, distributed throughout the system, having an aggregate capacity of over 26,000 kw.

The generating and distributing system in use in one of our most densely populated cities may be taken as an example of the way in which the system of distribution adopted is governed by conditions outside of those indicated for the most economical generation and distribution of power to the car motors. Although this system is compact and will probably require an average station output of over 30,000 kw, which it would seem to the outside engineer could be more economically distributed and almost as economically generated at several stations, the street railway company is installing a high-tension alternating, direct-current system of distribution with a main station of 45,000-kw ultimate capacity, and five rotary converter sub-stations of from 3000-kw to 6000-kw capacity each. It is probable in this case that the location of the power station and the system of distribution was governed almost entirely by the great cost of real estate at points suitable for separate power stations.

It frequently happens that several miles distant from a street railway system much cheaper power is obtainable than at or near the center of the system. This may be due to an available water power, or to a difference in the cost of fuel, etc., at two points. In cases of this kind the second, or what may be called the alternating, direct-current system, is usually the most applicable. To transmit power at 500 volts in any quantity from a distance of 10 miles, or even less, is very expensive, owing to the large amount of copper required and the great loss. For instance, to deliver 500 amps. at 10 miles distance will require about 150 tons of copper, allowing a loss of about 30 per cent in the line. This same amount of power could be transmitted at 5000 volts by an alternating, direct-current system with about 5 tons of copper and with a loss of less than 10 per cent in the line.

The weight of copper required to transmit power a given distance, other things being equal, is inversely as the square of the

voltage, that is to say, if it takes 100 lbs. of copper to transmit a certain amount of power a given distance at 500 volts, it will only take 25 lbs. of copper to transmit the same amount of power the same distance with the same loss at 1000 volts. It is owing to this fact that the alternating, direct-current system is so applicable where the power has to be transmitted for any considerable distance, as it allows of the use of very high voltages on the line, 10,000 volts or more being in general use, which, by means of transformers and rotary converters, can be reduced to 500 volts direct current for the trolley wire at points where the power is required. For an example of this system of distribution, a street railway system may be cited which derives its power from a waterfall. Here the power is generated at a pressure of 2200 volts, and is stepped up to 11,000 volts for the line. About 6000 hp is transmitted at this voltage for a distance of about 21 miles. The voltage is then reduced to 500 volts, direct current, by means of static transformers and rotary converters at five sub-stations, located at or near the points where the power is required.

The third system mentioned, the "booster" system, is chiefly applicable on lines where there is a light average load, but where, for short periods, an extra heavy load has to be taken care of. It would seldom be economical to supply an entire road with power by means of a booster system, as the greater part of the power generated by the booster represents wasted energy, which is usually generated in an extravagant way, as the power required to drive the booster varies as the square of the current in the feeder, that is to say, if it requires 50 hp to drive the booster with a load of 100 amps., it will require 200 hp to drive it if the load is increased to 200 amps. Line losses which necessitate the continuous waste of more energy than could be compensated for by an ordinary compound-wound railway generator are seldom economical, even on a portion of a system, but there are many cases where there is sufficient copper installed to take care of the average load economically, but where for a short time each day, or for a few weeks in the year, owing to local conditions, the traffic is unusually heavy.

In cases like the above, where the heavy traffic is of short duration, a well designed booster system may save a large investment in copper at a total cost of much less than would be required to pay the interest on the copper investment. For an example of this method of distribution I might cite a street railway company which supplies power to its own lines by means of a standard 500-volt direct-current system, and which also supplies power to a smaller road about 13 miles distant by means of a three-phase alternating-current system, using 5500 volts on the line. Here the booster system is used in connection with the high-tension system. When it became necessary to repair the high-tension line, it was found expensive and inconvenient to do the work between the hours of 12 midnight and 4 a. m., the only time when the power was off, and as it was not considered safe to work on the line when it was in operation, a booster system was arranged to supply power to the distant road for short periods at times of light load. A 200-kw booster was installed at the generating station and was designed to raise the voltage 1 volt per amp. of current. Switches were installed at the sub-stations so that the high-tension line could be connected directly with the 500-volt feeders, some 8 miles from generating station, and the booster was arranged so that it could be readily connected to the high-tension feeders.

When it was necessary to replace broken insulators or make other repairs on the line the attendants were notified at the generating station and at the sub-stations, and at a prearranged signal, made by varying the voltage on the line, the alternators were thrown out and the booster thrown on in such a way that the power was only off from the trolley wire for a fraction of a minute. It was thus found quite practicable to make repairs on the line while the booster was in operation, and the system proved very satisfactory for supplying power at times of light load, while repairs were being made; the load on the booster frequently running as high as 500 amps., at which time the voltage generated by the booster was about 500, which in addition to the 575 volts of the direct-current system gave 1075 volts at the generating end of the line; the voltage at the sub-station averaging about 450. While it would have been very expensive to run this booster for any great length of time, for the short time it was used the total cost was much less than the interest on the copper investment required to build a duplicate line.

The fourth system mentioned, or three-wire system, is most applicable to double-track lines, where one trolley is made positive and the other negative, there being about 1000 volts potential difference between the two, the current flowing from the positive trolley wire through the car motors to the rail and from the rail through the car motors and the other track to the negative trolley. The track is usually cross-bonded and also connected to the conductor or connecting the two generators, which are operated in series in the station. This connection with the track forms the

third wire, and tends to equalize the voltage should there be more cars on one side of the system than on the other. This method of distribution is usually capable of saving from 20 per cent to 40 per cent in copper, according to the character of the track return. If well balanced, it also greatly reduces the electrolytic action on buried conductors, such as water pipes, etc., and is most applicable where there are excessive track losses with fair opportunities for a balanced load.

There are few roads in this country using the three-wire system of distribution, although it is used almost universally by lighting companies. This is probably due to the complications introduced in railway systems by the high voltage, usually about 1000 volts, between the trolley wire and feeders on different sides of the system and the difficulty of balancing the load. The saving in copper, while not as great as in the three-wire lighting system, is still enough to warrant the extra complication, and under favorable conditions may prove very valuable.

I am only familiar with one example of this system of distribution. In this case there is very heavy traffic over a double-track line to a park, about 6 miles from the power station. It was found impossible to handle the increased traffic on the ordinary 500-volt system with the existing feed wire. By reinsulating the line and operating it on the three-wire system, the efficiency of the distributing system was very much improved, and they were enabled to easily handle the increased traffic with the existing feed wire.

The fifth system mentioned, or the alternating-current system, is practically untried in this country. It seems peculiarly adapted to lines having long runs at uniform speed with few stops, such as lines connecting cities, rather than for ordinary street railway service. The alternating-current motors at present in general use are of the polyphase type, and require at least three working conductors, which is a serious objection in many cases for railway work, as it necessitates the use of two trolley wires in addition to the track as conductors. The disadvantages of this system appear to be the necessity for at least two trolley wires and the probable difficulty in building alternating-current motors suitable for railway work which will have a good power factor.

The main advantage of the alternating-current system is the possibility of feeding lines with stationary transformers which need no supervision, but which can be considered simply as a part of the feeder, thereby multiplying many times the length of line which can economically be supplied with power from one station. The alternating-current motor also has the advantage of running at fairly constant speed independent of the load. It will not race going down hill if the power is left on, but will return power to the line, nor will it slow down much in going up hill. There are four or five railway companies abroad using this system, and judging from the reports that appear from time to time in the railway journals it is giving very satisfactory results.

The sixth system referred to, or storage battery system, is decidedly more expensive than the usual methods of electrical distribution, owing to the great first cost and the short life of the batteries. Lead is at present the only metal capable of resisting the attacks of sulphuric acid, and modern batteries consist largely of lead, which is very undesirable from a mechanical point of view and is very heavy, so that unless the present type of storage battery is substantially improved, this system is only likely to be used where other systems are not practicable owing to peculiar local conditions or restrictions. The storage battery, however, has a large field in connection with the other systems of electrical distribution for street railways, and under favorable conditions may considerably increase the station capacity and reduce the fuel consumption; and when used on the line may greatly improve the regulation and increase the copper efficiency.

From this brief outline of the various systems it will be seen that each has its peculiar advantages and that no one is suitable under all conditions. It will generally be found that where the traffic is heavy and the distance short, the standard 500-volt system is most applicable. For suburban work, where the distances are greater and the traffic less congested, or where it is necessary to transmit the power for some distance, the polyphase alternating direct-current system will usually be found more economical. In special cases, where, for short periods of time, an unusually large amount of power is required, the "booster" system will often prove very valuable, while for high-speed, long distance, interurban work the three-phase alternating-current system may be attractive. The cars on this system, however, would have the great disadvantage of not being able to run over the ordinary direct-current street railway lines.

There can be no general rule given that will determine the most advantageous system of distribution to use under the varying conditions to be met in street railway work. Each case must be considered as a separate problem and that method selected which will best meet the peculiar conditions involved.

Painting, Repainting and Maintenance of Street Car Bodies

BY F. T. C. BRYDGES

In giving my views as to the proper manner in which to paint, repaint and maintain street car bodies, I thoroughly realize that it is a subject of the greatest interest to street railway men; and as it is a part of my daily duty to supervise this class of work, the subject is of the greatest interest to me, and I will endeavor to give my views on the three topics separately.

Our object in painting a street car is two-fold: Maintenance and durability of structure, and appearance. It is needless for me to go into the question of the increased life and durability of a street car, when properly painted, repainted or revarnished as often as necessity may require to keep it up and maintain it in good condition, as it is an admitted fact that painting, repainting or revarnishing, as necessity may require, adds to the life and durability of street cars.

Our methods of painting new cars are simple, and, we think, very efficient. We apply our first, or priming coat, on all woodwork to be painted, then putty all nail holes and other imperfections, and then sandpaper the priming coat. In place of applying four or five coats of rough stuff to produce a surface, we apply one coat of glaze, or scrape-in coat, as I am of the opinion that the least number of coats of paint applied to produce a surface for painting the better. There is not so much danger then of the finished surface cracking and checking as when four or five coats of Japan or quick drying material are used to produce a surface with rough stuff, which, as a rule, is dry, brittle and non-elastic, and owing to the thickness of the four or five coats, is almost sure to check more or less within a short time after the work is finished. After the glaze, or scrape-in coat, is thoroughly dry, the same is sandpapered down close. The iron sill plates, in the case of open cars, are scraped in with the same quality of material, and then sandpapered in the same manner as the woodwork surface, the iron plates and all other iron work being thoroughly painted with best quality of Prince's mineral, mixed with raw oil, turpentine and Japan, as the first coat, to prevent rusting of iron. After the glaze coat has been thoroughly sandpapered to a smooth surface, we apply the first coat of body color, consisting of 10 lbs. of bleached white lead, 5 lbs. of Japan body color, and one pint of raw oil. We then apply the second coat of pure Japan body color and one coat of color varnish, sandpapering slightly with one-half or No. 0 sandpaper each coat of color before applying the next coat of color. Dashes and all iron work are painted with Prince's mineral, as above described, as the first coat, to prevent rust, and are then brought up in the same manner as the woodwork, except the glaze or scrape-in coat, which is omitted on all iron work. This exception, however, does not apply to sill plates or any part that is to be finished in connection with the body or wood work. After an application of a coat of varnish color, which is the last coat of color, the ornamentation and lettering are put on. We believe our style of ornamentation and lettering simple, and yet very neat in design. It consists of a fine line, a broad line and a small corner ornament worked into the fine line, making the ornamentation not expensive, but very neat in appearance. We are of the opinion that expensive and elaborate ornamentation on street cars is needless, a waste of money, and does not appear as well on the cars as a less expensive design. The great objection to expensive designs for ornamentation is not only their original cost, but it is more difficult to touch them up when damaged in service by some careless teamster who has punched a hole in the panel with the pole of his wagon, or scratched the entire length of the body and thereby damaged the side of the car. This class of car damage is a very frequent occurrence in large, crowded cities, and is much increased by careless teamsters. After the lettering and ornamentation are complete, we finish the entire surface with two or three coats of varnish of standard quality, the first coat being rubbing varnish if two-coat work, and the second coat being rubbing varnish if three-coat work, the last coat being finishing varnish. We do no rubbing with pumice stone on the rubbing varnish, as with street car surfaces we consider it unnecessary to waste time and money in rubbing down finishing varnish. We object to rubbing with pumice stone, as, in our opinion, it reduces to a certain amount the life of the varnish.

INTERIOR FINISH ON OPEN OR CLOSED CARS

Our rules for this class of work are as follows: Apply one coat of good wood filler for hard woodwork. Stain all soft woodwork for molding or otherwise to such tint as desired; clean up with fine sandpaper and apply a very thin coat of varnish, allowing it to stand about twenty-four hours. Then sandpaper and apply a second coat of coach rubbing varnish; then sandpaper lightly with

No. 0 sandpaper and apply the third coat of varnish. We use no shellac on our soft- or hardwood finish. We object absolutely to the use of shellac in connection with car finish. We prefer to have the first coat of varnish applied on the wood next to the hardwood filler or applied on the soft wood. The backs of the panels are finished with two or three coats of good standard paint, applied on the canvas and other unfinished woodwork.

Roofs.—All roofs are painted with three coats of standard paint, or a good brand of white lead, tinted as desired.

Floors.—All floors are painted with two coats of standard floor paint or Prince's mineral paint.

Trucks.—All trucks are painted with one coat of Prince's mineral paint and one coat of standard truck color, striped to some extent if desired on trail cars.

Time Required for Painting Cars.—By following the methods described, cars, open or closed, can be painted and finished ready for service within eight days.

REPAINTING

Our system for repainting cars, so far as the painted surface is concerned, is about the same as described above. When their condition requires that the old paint be removed from the wood, we do so by burning off all the old paint. We then scrape the surface smooth to receive the priming coat, and then proceed in the same manner as described above with glaze coat, color, ornamentation and lettering. We then finish with the same number of coats of varnish as in the case of new work. If, however, the old paint is not cracked too much, and the surface has sufficient life to receive new paint, we clean up the entire car by thoroughly washing, then sandpaper the surface smooth and apply two coats of body color and a coat of varnish color, on which we apply our lettering and ornamentation. We then finish with one coat of rubbing and one coat of finishing varnish. We revarnish the interior with one coat of finishing varnish, except the seats and other hardwood surfaces of open cars, which we revarnish with one coat of varnish, one-half rubbing and one-half finishing. Two coats may be applied in the same manner if the condition of the car requires it.

MAINTENANCE OF CAR BODIES

Under this head I am of the opinion that the best manner to maintain the life of street car bodies is:

First.—At the car station from which the cars are run, have them properly and thoroughly washed every day with cold water and a good quality of pure non-alkali soap, prepared ready for use in liquid form at the paint shop of the company, or elsewhere. In all cases the use of warm water should be avoided, as if the water is too warm it will damage the life and appearance of the varnish. After the car has been thoroughly washed, all the varnished surfaces should be thoroughly rubbed dry to prevent water remaining on the varnished surfaces, and thereby causing damage thereto and shortening the life of the varnish.

Second.—I am of the opinion that all street cars, closed or open, should pass through the car shops once each year for general repairs. At this time they should be thoroughly cleaned, touched up and revarnished with one coat of varnish, interior and exterior, or with two coats of varnish if their condition requires it, and the roof should be painted with two good coats of white lead or standard roof paint. Floors, platforms and all canvas and unfinished interior woodwork should also be painted with two coats of paint, and the trucks and all iron work should be repainted with at least one coat of good standard paint.

Cost of Car Painting on the Camden & Suburban Railway Company, Camden, N. J.

Schedule submitted by W. H. Harrington, of Camden, in the discussion on car painting.

First class operation.....	\$28.00 contract
18-ft. body.....	.10 bonus
1. Outside, burning off old paint.	
2. " sandpapering.	
3. " two coats of priming.	
4. " four (4) coats of surfacer or rough stuff.	
5. " rub to a smooth surface.	
6. " first coat of color.	
7. " second coat of color.	
8. " color and varnish.	
9. " striping and lettering.	
10. " one coat rubbing varnish.	
11. " one coat finishing varnish.	
12. " blacking off iron work.	
13. Roof, one coat of paint.	
14. Inside dashers, one coat paint.	

- 15. Floors and platforms, one coat paint.
- 16. Inside, one coat rubbing varnish.
- 17. Inside, one coat finishing varnish.

MATERIAL

6 sheets No. 1½ sandpaper.....at \$.04-10	\$.03	
6 sheets No. 2 sandpaper.....“ .½	.03	
25 lbs. priming color.....“ .06½	1.63	
½ gal. Coralline, or rough stuff.....“ 2.50	1.25	
16½ lbs. cream color.....“ .06	.99	
6½ lbs. special red.....“ .46	2.99	
4 books gold leaf.....“ .35	1.40	
1½ books aluminum leaf.....“ .12	.18	
2½ spools Coe's ribbon gold.....“ .87	2.18	
¼ lb. golden ochre.....“ .25	.07	
½ lb. sizing.....“ .48	.24	
¼ lb. white paint.....“ .08	.02	
¼ lb. drop black.....“ .32	.08	
¼ lb. Venetian red.....“ .25	.19	
2½ qts. rubbing varnish.....“ 3.50	2.20	gallon
2 qts. inside finishing varnish.....“ 3.50	1.76	“
1 qt. black iron varnish.....“ .75	.19	“
2 gals. red rubber paint.....“ 1.17	2.34	“
2 qts. outside finishing varnish.....“ 4.04	2.02	“

Material, \$19.79; labor, \$27.90; bonus, 10c..... \$19.79
 47.79

Second class operation.....\$22.50 contract

- 16-ft. body..... 2.41 bonus
- 1. Burning off.
- 2. Outside, sandpapering.
- 3. “ one coat of priming.
- 4. “ three coats of surfacer or rough stuff.
- 5. “ rub to a smooth surface.
- 6. “ first coat of color.
- 7. “ second coat of color.
- 8. “ color and varnish.
- 9. “ striping and lettering.
- 10. “ one coat rubbing varnish.
- 11. “ one coat finishing varnish.
- 12. “ blacking off iron work.
- 13. Roof, one coat paint.
- 14. Inside dashers, one coat paint.
- 15. Floors and platforms, one coat paint.
- 16. Inside, one coat finishing varnish.

MATERIAL

4 sheets No. 1½ sandpaper.....at \$.04-10	\$.02	
4 sheets No. 2 sandpaper.....“ .½	.02	
14 lbs. priming.....“ .06½	.91	
3 pints Coralline, or rough stuff.....“ 2.50	.94	
16½ lbs. cream color.....“ .06	.99	
6½ lbs. special red.....“ .46	2.99	
4 books gold leaf.....“ .35	1.40	
1½ books aluminum leaf.....“ .12	.18	
2½ spools Coe's ribbon gold.....“ .87	2.18	
¼ lb. golden ochre.....“ .25	.07	
½ lb. sizing.....“ .48	.24	
¼ lb. white paint.....“ .08	.02	
¼ lb. drop black.....“ .32	.08	
¼ lb. Venetian red.....“ .25	.19	
1¾ qts. rubbing varnish.....“ 3.50	1.54	gallon
2 qts. inside finishing varnish.....“ 3.50	1.75	“
1 qt. black iron varnish.....“ .75	.19	“
2 gals. red rubber paint.....“ 1.17	2.34	“
2 qts. outside finishing varnish.....“ 4.04	2.02	“

Labor, \$17.08; bonus, \$2.41..... 19.49
 \$37.56

Third class operation.....\$14.00 contract
 1.62 bonus

- 1. Outside, painting vestibule and dashers.
- 2. “ cutting in all painted work.
- 3. “ relettering and striping dashers.
- 4. “ blacking off iron work.
- 5. “ one coat rubbing varnish.
- 6. “ one coat finishing varnish.
- 7. Roof, one coat paint.
- 8. Inside dashers, one coat paint.
- 9. Floor and platforms, one coat paint.
- 10. Inside, one coat finishing varnish.

MATERIAL

4 lbs. special red.....at \$.46	\$1.84
8 lbs. cream color.....“ .06	.48
2½ books gold leaf.....“ .35	.88
½ spool Coe's ribbon gold.....“ .87	.44
¼ lb. golden ochre.....“ .25	.07
¼ lb. sizing.....“ .48	.12
¼ lb. white paint.....“ .08	.02
¼ lb. drop black.....“ .32	.08
¼ lb. Venetian red.....“ .25	.19
1 qt. black iron varnish.....“ .19	.19
1¾ qts. rubbing varnish.....“ 3.50	1.54
2 gals. red rubber paint.....“ 1.17	2.34
2 qts. outside finishing varnish.....“ 4.04	2.02

Labor, \$12.38; bonus, \$1.62..... \$10.21
 14.00

Fourth class operation.....\$8.50 contract
 1.42 bonus

- 1. Outside, painting vestibules and cutting in dashers.
- 2. “ touching up main body.
- 3. “ blacking off iron work.
- 4. “ one coat finishing varnish.
- 5. Roof, one coat paint.
- 6. Inside dashers, one coat paint.
- 7. Floors and platforms, one coat paint.
- 8. Inside, one coat finishing varnish.

MATERIAL

2½ lbs. special red.....at \$.46	\$1.15
2 lbs. cream color.....“ .06	.12
½ lb. Venetian red.....“ .25	.13
1 qt. black iron varnish.....“ .75	.19
2 gals. red rubber paint.....“ 1.17	2.34
2 qts. outside finishing varnish.....“ 4.04	2.02
2 qts. inside finishing varnish.....“ 3.50	1.76

Labor, \$8.50..... \$7.71
 8.50

Fifth class operation.....\$4.00 contract
 .66 bonus

- 1. Outside, touching up dashers and main body of car.
- 2. “ blacking of iron work.
- 3. “ one coat finishing varnish.
- 4. Roof, one coat paint.
- 5. Inside dashers, one coat paint.
- 6. Floors and platform, one coat paint.

MATERIAL

1½ lbs. white paint.....at \$.08	\$.12
1 lb. special red.....“ .46	.46
1 qt. black iron varnish.....“ .75	.19
2 gals. red rubber paint.....“ 1.17	2.34
2 qts. outside finishing varnish.....“ 4.04	2.02

Labor..... \$5.13
 4.00

Address of President of Street Railway Accountants' Association of America

BY C. N. DUFFY

Gentlemen of the Association: In welcoming you to the fourth annual convention of the Street Railway Accountants' Association of America in this progressive, hospitable Western city, permit me to refer briefly, and with great pride, to the present standing of the association, what it has accomplished, and what it should accomplish.

The association is now on a solid foundation. The membership embraces the representative companies of the United States, Canada and Mexico, in addition to companies representing England and Scotland. Whatever may be the political faith or opinions of the accountants, there can be no doubt that they are thorough "expansionists" on the question of membership in this association. Notwithstanding the fact that the annual dues have this year been increased from \$10 to \$20, and that numerous consolidations have been effected in the year 1900, I am glad to say that our membership has not been materially affected. The deficit in the treasury, reported at the last convention, has been more than wiped out by

the voluntary subscriptions of the members; we have a substantial cash balance on hand and no unpaid bills or other obligations outstanding.

For the fourth time we are holding our annual convention in the same city, in the same building, at the same time as the American Street Railway Association. We are under many obligations to that association for the hearty support and earnest co-operation it has extended to us, for the privilege of attending its meetings, and for other courtesies that we have enjoyed at its hands. Unquestionably, the attitude of the older association toward this association has brought the operating and accounting departments of street railways in closer touch with each other, to the mutual advantage and benefit of both departments, as well as the good of the companies represented. To the American Street Railway Association we owe much, and I take advantage of this opportunity to express our appreciation of what it has done for us.

The Standard System of Street Railway Accounting of this association, strongly indorsed and unanimously adopted by the Convention of Railroad Commissioners of the United States, is now the standard of that body. All reports to State boards of railroad commissioners (who are members of the national association) for the fiscal year beginning July 1, 1900, will be made in accordance with the standard system, thus placing it in the same position with reference to street railways that the Interstate Commerce classification of accounts occupies with reference to steam railroads.

The department of blanks and forms is now firmly and permanently established and in successful operation. This valuable collection of thousands of blanks and forms, securely bound in books, perfectly arranged and classified, thanks to the genius of our worthy secretary, Mr. Brockway, forms a library of rare and valued books, of which each member is privileged to make use. This feature is of special value and assistance to all members of the association. The exhibit of the blanks and forms at the annual conventions is one of the most interesting and instructive features of our meetings. A valuable addition to our library is the "Railway Officials' Private Report and Reference Book," published by an enterprising supply firm and distributed by it gratuitously. The first copy of this book issued, with the name of the association stamped on the cover, was presented to the association by the publishers. In publishing this book, which is pocket size, admirably arranged and a marvel of the printer's skill, the publishers have recognized the growing importance and value of accounting work in street railways and paid our association a graceful tribute by dedicating the book to it.

In connection with the use of the Standard System of Accounting of this association, we have a strong committee at work, charged with the responsibility of determining a standard unit of comparison. The members who attended the Chicago convention one year ago will remember the valuable paper on this subject presented by Mr. H. C. Mackay, the able and energetic chairman of the committee, and will recall the animated and interesting discussion that followed the reading of the paper. The committee will present another report to this convention; it is hoped you will give the subject the earnest, thoughtful consideration its importance demands, that there will be a thorough discussion, in which every member present will participate, and that we will agree on a standard unit of comparison which will be acceptable from every standpoint and go hand in hand with the Standard System of Accounting.

The advantages of membership in the Accountants' Association, to those engaged in the street railway business, are many and varied. No man could ever hope to accomplish, single-handed, what the association can accomplish as a body. The annual conventions give the members an opportunity of meeting each other, interchanging ideas, learning from each other, and acquiring knowledge and experience which could not be obtained in any other way. The classification of accounts of the association is a self-instructing text-book; the department of blanks and forms is a valuable library of reference. Where, outside of the association, could the street railway worker find such advantages? To those of us who struggled through the disadvantages of an unsystematic accounting system, incident to street railways prior to the advent of modern transportation methods, going through the evolution of horse, cable and electric railways, construction and operation, these advantages appeal strongly. What would we not have given to have had then what we have now? The work of the association, chiefly educational in its character, has only begun.

Having thus referred briefly to the present standing of the association and what it has accomplished, I will now draw your attention to the more important question of what it should accomplish.

Our first and most important duty is to increase the membership. There are some large companies and many small ones not represented on our membership roll which should be with us. An earnest, determined effort should be made, in a systematic way, to see that every company is solicited to join the association, and that they are made acquainted with the advantages and benefits to be derived from being members. This effort should not only be made by the association as a body, but each member individually should take up the work, as a personal canvass is often successful where other measures fail. The life and success of this association depend upon its membership.

I earnestly recommend that this association consider the question of formulating a standard system of accounting and a standard unit of comparison applicable to the lighting and power business. The growing importance of this industry, owing to the introduction of modern electrical machinery, making it possible to generate current at one central power plant, economically transmit and distribute it at long distances, the increased consumption of current for commercial and domestic purposes and the tendency of the present day to combine the railway, lighting and power business, demand that we give this subject immediate attention. There are a number of our membership companies now engaged in the railway, power, electric lighting and gas business. I would suggest that a committee be appointed, charged with the responsibility of this work, and that they be instructed to make their first report to this association at its annual convention in 1901. I would advise that this committee confer and co-operate with a similar committee of the National Electric Light Association, to whom has been delegated the same work for that association. I am pleased to announce that our William F. Ham has been appointed a member of the National Electric Light Association committee. This is a compliment to Mr. Ham, a recognition of the valuable work he has performed for this organization, and an honor to our association of which we may well feel proud.

It would not be amiss to state that the committee on a standard system of accounting, at the suggestion of Mr. Brockway, gave the question of a classification of accounts for lighting and power companies some consideration prior to the annual convention of 1899, but decided not to present it to the 1899 convention, as there were other matters of more direct importance to this association to be considered at that convention. This accounts for our association not taking the initiative.

Accounting is one of the vital elements of business. This is being recognized more and more every day. In reading the proceedings of the conventions of different organizations held during the current year, I was so impressed with this fact that, with your permission, I will present for your consideration some of the more important points which were brought out with reference to accounting, as I feel we should take advantage of every opportunity to study this broad subject in all its phases. At the convention of the New York Street Railway Association, held in Buffalo, Sept. 18-19, 1900, Mr. G. Tracy Rogers, the president of the association, in his annual address said: "Much has been accomplished in the standardization of our accounts, which will work out untold benefit to the roads; besides strengthening our securities, it will give confidence to the public, and afford us material for comparison."

In discussing a paper before the Southwestern Gas, Electric and Street Railway Association, the president of a railway and lighting company said in part: "The point of a comprehensive set of accounts to be kept so that the condition of business can at all times be understood is a great deal more important than we imagine until we go into it, and the more you get into it the more information you will get. We are trying to be able to tell the details of the cost of producing a kw-hour from the time the coal leaves the car until the consumer pays for it. This looks at first as if it was uncalled for, and I have had the question raised that it took too much time. After you have once got into it, it does not take any more time than it did a year ago to make out your monthly report, with a detailed statement, and you can see any little difference as to where your expenses are increasing or decreasing."

In appointing a committee to formulate a uniform system of accounting, the National Electric Light Association recognized the advantages of a uniform system that would be a standard for all to conform to. At the convention of this association, held in Chicago, May, 1900, Mr. J. B. Cahoon presented a paper on "Uniform Accounting." He pointed out the necessity of a system of accounting that would show "true costs," not by single companies, but by a great body, all of whom would follow the same method and use the same system of account in determining the cost of production.

In discussing this paper, Mr. Samuel Insull, president of the Chicago Edison Company, said in substance: "The first step in

this matter is to have our own members, if we can educate them to a uniform system of accounting, state in their accounts what their cost is, and stop them, as far as moral suasion will stop them, from working their construction accounts. If moral suasion will not stop them, if we can get copies of their reports, kept on a uniform system of accounting, we should bring them up here in the convention and ask them to explain their accounts, when some company shows an abnormal profit as the result of immoral accounting."

The question of publicity of accounts of corporations, especially companies engaged in operating public utilities, is receiving close attention. At the twelfth annual convention of railroad commissioners, held in Milwaukee in May, 1900, to which this association was invited and officially represented, the president advocated the enactment of legislation that would compel street railways in all States to make reports to the railroad commissioners, as steam railroads now do. At the convention of the National Electric Light Association the point was brought out in Mr. Cahoon's paper on "Uniform Accounting" that there was no objection to publicity of accounts if "true costs" were shown.

At the last convention of this association it was suggested that we should have not only a standard unit of comparison, in connection with the standard system of accounting, but a standard form of report, full and complete in every particular, a standard system of blanks and forms, and a standard system of accounting methods. I most heartily indorse and approve this proposition in all that it embodies. Now that we have adopted a uniform system of accounts, we should bear in mind one of the fundamental objects of the association, as set forth in Article II. of the constitution, namely, "To improve the work of the accounting department." On the principle that he who does not go forward goes backward, it should be the fixed purpose of this association to broaden and perfect the standard system of accounting in every feature of its practical working application, so that the best results possible from every standpoint may be attained. How shall we do this? The question of a standard unit of comparison has already received careful consideration from the committee to whom it was referred, and they will report to this convention.

As to a standard form of report, I will say that the matter has received attention and will be submitted for your consideration later.

With reference to a standard system of blanks and forms and a standard system of accounting methods, I would recommend that a committee be appointed, charged with the work of preparing model blanks and forms, general in their adaptability and use, with such explanations and instructions as may be necessary or desirable. These blanks and forms should cover the accounting work of every department. I would suggest that the best form for each specific purpose could be selected from the library of the association, and in that way a book of model forms could be prepared. The necessary explanations and instructions concerning the use of forms should include in a general way suggestions as to the methods to be pursued in gathering the figures and data that are to be compiled in each specific form. These suggestions must of necessity be general in their application. Special local conditions will require special study and treatment.

In connection with what this association should do as a body, "to improve the work of the accounting department," each member individually, for himself, for the association, and especially for the company he represents, should take up this work and devote to it all the energy, ability and application that he may have. We should be thoroughly posted on the affairs of the company we are connected with, and have a general knowledge of the operation of the road in all departments, or our sphere of usefulness and the value of our work will necessarily be limited.

We should closely study the special local conditions which are a part of the operation of every road, so that the accounting problem involved may be correctly solved and the conditions of operation clearly and comprehensively set forth.

We should aim to make our system of accounting practical, complete, thorough and economical. The advantages of modern methods in commercial business, and the introduction of labor-saving devices, should be thoroughly investigated and made use of if they can be used to advantage. We cannot be producers of "gross earnings," but we should be increasers of "net earnings." We should be careful not to duplicate work or expend labor that is unnecessary or yields no return. We should not be carried away with a mass of figures and statistics that have no practical value or serve no good purpose, neither should we go to the other extreme of dismissing as useless and valueless much that may be of vital importance, simply because it increases the work of the accounting department or necessitates the expense of additional clerk hire, when results may be produced which would more than repay the work and expense involved. I believe in an accounting

system of such scope and extent that the grasp of the affairs of the company, as well as the operation of the property, is at all times within the hands of the accounting officer in charge; a system that will furnish any information that may be required or desired, promptly; a system that will make it possible to answer any question which may be asked.

There are two propositions that enter into the work of the accounting department; though different, they are intimately connected with each other. One is "accounting," the other is "railroading." Mr. H. H. Vreeland, president of the Metropolitan Street Railway Company, of New York, at our last annual convention said this about the calling here represented: "I, from my experience, have always looked upon the auditor or accounting officer of a railway as the most important lieutenant and aid of the president or managing officer of the road. I look upon the man at the head of the accounting department as the confidential accounting adviser of the head of the property."

The papers to be presented to this convention deal with practical accounting questions and are along the lines of the work that this association should now take up. The subjects of the papers were selected and the programme of the convention was arranged with this special purpose in view. To the gentlemen who have responded to the demands of this convention we are under many obligations. I desire to express our most sincere thanks and appreciation for their hearty co-operation.

Special mention is due our able and energetic secretary, Mr. W. B. Brockway, for the valuable work he has performed for this organization. To Mr. Brockway's efforts the association owes much of its success.

To the *Street Railway Review* and the *STREET RAILWAY JOURNAL*, and our good friends and honorary members, Windsor and Higgins, we are under many obligations for courtesies extended. The columns of the *Review* and *JOURNAL* have always been open for the publication of anything that would further the interests of this association.

Formal notice has been given, as required by the by-laws, that a change is proposed in Article VII. of the by-laws. This means that the question of changing the time and place of holding our annual conventions is to be voted on at this convention. I earnestly hope that the question will be fully and thoroughly discussed from every standpoint, and that every member present will express his opinion as to what he thinks is best for this association to do, before the matter is put to a vote.

With reference to the next convention, I am reminded of a question of the utmost importance to the association, and one that has given your present officers much concern. I refer to the assignment of papers. The success of our meetings depends in a large measure on the selection of proper subjects for papers and having the papers prepared and presented to the convention. Any member of this association, when asked to prepare a paper, or perform any other duty assigned to him, should appreciate the honor sufficiently and have the interest of the association at heart in such a degree that he would gladly respond when called on and give the association the benefit of his best efforts. This is a duty that every member owes to his fellow-members and the calling he represents, a duty that should not under any circumstances be disregarded or shirked.

In conclusion, permit me to express my appreciation of the honor you have conferred on me, that makes it at once my duty and privilege to preside over the deliberations of the fourth annual convention of this body. To be president of the Accountants' Association is an honor I esteem more than words can express. I thank you for the honor bestowed and for the many acts of kindness and courtesy that I have received from your hands, as well as your valued assistance in many ways. Let me bespeak from you faithful attendance and close attention to the proceedings of the meeting, and especially full discussion on all subjects. I earnestly hope that this convention will be a fruitful source of information and education, as well as a pleasant reunion for us all. Gentlemen, I commit the business of the convention into your hands.

Report of the Secretary and Treasurer of the Street Railway Accountants' Association

BY W. B. BROCKWAY

The report of the work done in this office for a year has become a rather large undertaking, caused by the three divisions into which the office has resolved itself, viz., secretary, treasurer and the department of blanks. In each there has been so much accomplished that it seems better to divide the report so as to cover each section of the work separately. This is without any desire on

my part to imitate the well known Pooh-Bah, but if any such charge should be made, I would promptly lay it upon the happy faculty the association has of being successful and busy, and keeping the secretary busy, too.

In reporting the membership as it is to-day, the prophecy made in last year's report as to the effect of consolidation has been to a large extent verified; but the applications for membership that have been presented have neutralized the loss, so that from a numerical standpoint we are but very little worse off than a year ago.

Applications have been received from the following twenty-one companies:

Indianapolis Street Railway Company, Indianapolis, Ind.
 Charleston Consolidated Railway, Gas & Electric Company, Charleston, S. C.
 Louisville Railway Company, Louisville, Ky.
 St. Joseph & Benton Harbor Electric Railway & Light Company, St. Joseph, Mich.
 Union Traction Company of Indiana, Anderson, Ind.
 Chicago Consolidated Traction Company, Chicago, Ill.
 Manchester Corporation Tramways, Manchester, England.
 St. Louis Transit Company, St. Louis, Mo.
 Portsmouth, Kittery & York Street Railway Company, Portsmouth, N. H.
 San Antonio Street Railway Company, San Antonio, Tex.
 Conestoga Traction Company, Columbia, Pa.
 Chicago Union Traction Company, Chicago, Ill.
 Washington Traction & Electric Company, Washington, D. C.
 Winchester Avenue Railroad Company, West Haven, Conn.
 Cleveland & Eastern Railroad Company, Cleveland, O.
 Connecticut Lighting & Power Company, New York, N. Y.
 Consolidated Traction Company, Pittsburgh.
 Bridgeport Traction Company, Bridgeport, Conn.
 Seattle Electric Company, Seattle, Wash.
 Buffalo Railway Company, Buffalo, N. Y.
 Erie Transit Company, Erie, Pa.

Resignations have been received from the following twenty-five companies:

Southern Electric Company, St. Louis, Mo.
 Nassau Electric Railway Company, Brooklyn, N. Y.
 City & Suburban Railway Company, Washington, D. C.
 Brooklyn, Queens County & Suburban Railway Company, Brooklyn, N. Y.
 Citizens' Railway Company, St. Louis, Mo.
 People's Railway Company, St. Louis, Mo.
 Lindell Railway Company, St. Louis, Mo.
 Missouri Railroad Company, St. Louis, Mo.
 Kokomo City Street Railway Company, Kokomo, Ind.
 Columbia Railway Company, Washington, D. C.
 Hamilton Street Railway Company, Hamilton, Ont.
 Columbus Central Railway, Columbus, O.
 Metropolitan Railroad, Washington, D. C.
 Union Depot Company, St. Louis, Mo.
 West Chicago Street Railway Company, Chicago, Ill.
 Cicero & Proviso Street Railway Company, Chicago, Ill.
 Hawaiian Tramways Company, Honolulu, H. I.
 Oakland Transit Company, Oakland, Cal.
 Fair Haven & Westville Railway Company, New Haven, Conn.
 Milwaukee, Racine & Kenosha Railway Company, Racine, Wis.
 Syracuse Rapid Transit Company, Syracuse, N. Y.
 North Chicago Street Railway Company, Chicago, Ill.
 Brightwood Railroad Company, Washington, D. C.
 Central London Railroad Company, London, England.
 Lowell, Lawrence & Haverhill Street Railway Company, Lowell, Mass.

The statement of growth in membership is:

Charter members, Cleveland, March, 1897.....	25
Additions reported at Niagara Falls, October, 1897.	12
Additions reported at Boston, September, 1898....	32
Additions reported at Chicago, October, 1899.....	34
Additions reported at Kansas City, October, 1900..	21
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Total applied.....	124
Withdrawn.....	28
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Membership Oct. 16, 1900.....	96

This shows a net loss of but four members. But the average number of applications received per year has been thirty-four, while 1900 shows but twenty-one, a drop of thirteen in the average. These figures show plainly the need of definite action on the part of the present members toward the gathering in of every company within reach. It is not so much that a larger showing may be

made that this effort seems necessary as it is to make the association so representative that its deliberations may carry the positiveness which comes from such a larger point of view.

During the year furniture has been added to the equipment of this office, including a second-hand typewriter, a bookcase, a copy-press, etc., costing less than \$60.00. All of this was very much needed.

The financial statement is interesting, showing as it does that the increase in dues has been well received by the membership, and that the necessity of a larger income is appreciated.

The receipts have been as follows:

In bank, Oct. 14, 1899.....	\$19.28
Donated account 1899 deficit.....	160.00
Dues for 1900.....	1,570.00
Dues for 1899.....	10.00
Applications.....	310.00
Interest on deposits.....	7.65
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Total.....	\$2,076.93

The expenses have been as follows:

Salary, secretary.....	\$200.00
Secretary, office expenses.....	75.90
Postage.....	62.00
Office furniture.....	59.25
Printing 1899 Report.....	260.65
Stenographer, Chicago Report.....	110.00
Printing.....	58.05
Department of blanks.....	12.75
Printing 1899 Standard Report.....	129.50
Note paid.....	125.00
Miscellaneous.....	88.59
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Total.....	\$1,181.69
Balance in bank, October, 1900.....	895.24

Had the dues remained at \$10, and expenses for this year as they are—and it is difficult to see how they can be reduced—the result would have been an income of \$1,120, and a deficit of \$61.69. This income includes \$160 contributed at the last convention; without it, the deficit would have been \$221.69. To take into account that the expenses are \$210.05 less than last year will make the wisdom of the increase in dues more clear.

At this point I wish to explain that, with his customary liberality, President Duffy has refused to receive his expenses to New Orleans to confer with the secretary in March of this year, or to Milwaukee to attend the meeting of the national convention of railroad commissioners. In the latter trip F. E. Smith, auditor of the Chicago Union Traction Company, took the same action; and it is through the kindness of these gentlemen that the treasurer is enabled to report a decrease in operating expenses and so large a balance in bank.

For the department of blanks and forms there is to report a considerable increase in the blanks filed by the addition of the issue of twelve companies and the refiling of a number of reissued forms. All of these add to the interest and value of the collection, which has reached such large proportions though your co-operation.

Among the new blanks received is a large set from the Glasgow Corporation Tramways, which, on account of the differences in practice, were rather difficult to fit to our classification of blanks, and have been filed in a separate book numbered 15. An examination of this set will be found very interesting.

Owing to economy of space, instances will be noticed where blanks have been filed on top of others, in all cases showing the full size and composition of each; but at times, by a similarity of papers, the dividing line could not always be easily distinguished. To remedy this, a light black line has been ruled around every blank, giving a result very noticeable to those who examined the collection at Chicago; and at a glance, rather than by close scrutiny, the blanks are separated and compared.

The new collection of rubber stamp impressions, while not representative, is an interesting addition, and assists to the result aimed at by the department.

Some changes are contemplated in the arrangement of the permanent set and the sets used for requests, all helping in what experience has shown is needed to make the collection a positive benefit, and not let it become merely a curiosity.

It is a pleasure to state that the friendship and help heretofore shown by the officers of the American Street Railway Association and the street railway papers has been continued unwaveringly, and the most cordial thanks are again expressed to them and the many others who have assisted in bringing the association to the position it now occupies.

Address on "What Does the General Manager Want to Know from the Accounting Department?"

BY JOHN I. BEGGS

I must apologize for not having given more time and thought to the subject which you expected to hear discussed by Mr. Wyman. It was only a few days ago, or possibly a week ago, when I was requested by your executive officers to prepare a paper upon this subject. I have never prepared a paper in my life, and am almost too old to learn new tricks. Therefore what I shall say upon this subject will be simply the thoughts that are suggested to me as the manager of one of these public utilities.

What the general manager wishes to know from the accounting department, I should narrow and say, "What does the general manager wish to know from the head of the accounting department?" I would not be presumptuous enough to think that I, in the few minutes that I shall occupy, could stand here and tell to you what the general manager wants to know from the accounting department, when so much time has been so well expended by your association for several years past developing and demonstrating just what he should know. The system of blank forms and accounts that you have developed is highly creditable to your association. It will do much to save the industry in which we all are so vitally interested. The first thing the general manager wants to know from the accounting department, in my judgment, is that the accounting department believes in the general manager's policy. He wants to know that he has loyal, enthusiastic, energetic supporters in carrying out what may be the general manager's policy, and that they will aid it conscientiously and fearlessly; and when the head of the accounting department cannot subscribe to the general manager's policy he had better tender his resignation. As a rule the general manager stands for the board of directors, and they are supposed to stand for the stockholders, which is the capital. Unfortunately, they have not always done it, but they should do it, and I think that the executive managements of these public utilities are year by year giving a stricter account to the great body of stockholders. In order to do this we must have conscientious, earnest work both on the part of the general manager and of the accounting department. Unfortunately, the general manager is not always a trained accountant; he is too often not competent to analyze and determine whether or not the accounts and the various statements that come to him are made up intelligently, or to analyze and determine whether or not they have been properly kept. And that, in days gone by, has been responsible for the failure of some of these public utilities, and caused them to be re-financed. They have run aground without knowing it; like the mariner whose compass has become disarranged or does not know how to read it, they are cast ashore; they run against the breakers, and it is the easiest thing in the world, because too often it is to the interest of the general manager and the board of directors to make too glowing a statement of what they are doing, and this is particularly the case during the years of construction or development when they have a capital account to be drawn upon.

Capital account has covered multitudes of managerial blunders and extravagances. Therefore I always take the position that it is best to close up the construction account as quickly as possible. If there is going to be any error made in your accounting departments, gentlemen, let it be on the other side. Have a little more property than you think you have. When a man puts his hand in his pocket and expects to find seventy-five cents, but finds instead a dollar, he feels very good. It is not a very large amount, but nevertheless it is on the right side. He has just a little more than he expected. But if he puts his hand in his pocket and finds he has only fifty cents, he is disappointed; he says, "I certainly thought I had more than that," and such is the case with many of these properties, that they go on deluding themselves; because there is a construction account, they charge into that many things that should have gone into operation. It is one of the reasons why many new enterprises seem to show such phenomenal results. I have seen a statement very recently of a certain line running into the city of Chicago, or nearly so, showing the expenses to be down to somewhere about 30 per cent. Now, we all know how that is produced. Of course, that is not done in order to show what the actual results are. It is produced in order to unload a promoter's property upon an unsuspecting investing public. I only refer to that because that statement has been brought to my attention within a few weeks, being on the market. But very often our properties get into the same condition, because of a lack of intelligence. Therefore the general manager wishes to know from the head of his accounting department—and I shall deal with the head—that there is an intelligent understanding and

an honest practice in the making up of either the daily, the monthly or the annual statements.

As I said at the outset, the general manager wishes to know that the head of the accounting department is in sympathy with and believes in his policy, because a general manager should lay down the policy for his corporation. He is put there for that purpose. Now he must know that his associate who is in charge of the figures believes in that general policy, will help him carry it out, will in every manner co-operate with him, will watch and see that there is consistency throughout every department of the company's business.

Some of our properties are in a little more complex condition than others. Take the property with which I am associated; we conduct a very large electric lighting business in three or four different cities, some part of it under our main company, some under a traction company which we operate. Consequently, it is very difficult at times to feel that the same general practice is observed in each one of the co-ordinate companies, possibly under the name of one, and that the head of each particular department observes the same methods as are observed in every other.

In the street railway business it is highly important that the general manager shall have confidence in the integrity, in the vigilance and discrimination and keen perception of the head of the accounting department, and know that he will watch that there is no injustice permitted even to the humblest employe of the company, and that the trainmen are held to strict account. The idea should not get abroad among your force of conductors that there are too many shortages being reported, or that there is too much carelessness in the accounting department. We make it a rule to have the accounting of the trip sheets and the returns of the various conductors directly under the head of our accounting department. We have but one head of "figure wrestlers," as I call them. We do not have it divided into transportation department, and so on, but all is under one head. I am a great believer in centralizing responsibility, and in having one head responsible, and giving him the highest degree of confidence. One of the most important things in dealing with the conductors on street railways is that they have absolute confidence in those who pass upon their daily returns. They should not, every day or two, be brought face to face with the charge, "You have a shortage to-day of a dollar," or fifty cents, whatever it may be; that creates distrust, and it soon permeates the whole mass of men. They begin to distrust the accounting departments, and to believe that their methods are not accurate. That comes back; it works almost incalculable harm among our men, and we who are managing these properties to-day are carefully studying that there shall be no cause of unrest, of dissatisfaction, among our trainmen. You have seen a number of serious labor troubles among that class of men during the past year. We went through it, four and one-half years ago, one of the first large railway strikes. We have watched it carefully ever since. It very often comes from the accumulation of a multitude of these trivial matters, that give good cause at times for unrest.

These are some of the things we want from the head of the accounting department. I am ignoring your system of blanks entirely. I did not conceive that was what you wanted to hear about, or that it would be a thing of particular value to you, because you are giving labor and conscientious thought to that subject. The blanks are being perfected from year to year, and developing in greater detail. I thoroughly understand that in different corporations there are varying conditions that do not apply to all. Consequently there must be, with your system of accounts, provisions for some flexibility that may suit the peculiar conditions of various corporations, many of which are interested in a variety of things, and have more than one interest to provide for. They must likewise be sufficiently flexible to permit sometimes of what may be the peculiar or unreasonable notions of the general manager. He may have an idea that he wants injected into them certain additional features, or possibly a very good reason from his standpoint, which is not always recognized, perhaps, by the head of the accounting department. The general manager should have the confidence and command the respect of the head of the accounting department to such an extent that notwithstanding it may cause some additional labor to provide these auxiliary accounts, as we might call them, for his information, the work will be cheerfully done. The manager may have better reason for asking for them than appears on the surface, and it may entail, as the head of our own accounting department has sometimes found, a considerable amount of additional labor; but it is not useless; it is for some good cause. I am well aware that all managers have ideas that are different possibly from those of the heads of their accounting departments because of some previous experience they themselves had in the science of accounting. I use the word "science" advisedly, because accounting is a science, and if the broad, fundamental, underlying science of accounting is thor-

oughly understood by the head of the accounting department, it will be much easier for those charged with the operating of the properties.

I had something to say when this association was being organized as to what should be included, having given considerable attention to the various forms of accounting of this and its kindred industry, electric lighting, for a great many years. In fact, I was one of a committee some fifteen years ago to standardize a system of accounting for electric lighting plants in that early day. They had done more, I think, in the line of standardizing their accounts, or at least one branch, electric lighting. I speak more particularly of the old Edison Association of Illumination Companies, which was a close corporation and still is, I believe, but I was the president of it for seven or eight years, and we had a very carefully devised system of accounting whereby we could, with a great degree of accuracy, compare the results of various companies throughout the United States. Though more limited than this association, we demonstrated, at that early day in the electric lighting industry, the great advantage of being able to compare accounts. That is highly advantageous, absolutely essential even, in the street railway business. The general manager wants to be assured that the head of his accounting department is watching his expenditures from day to day, watching that the estimates made of construction, or of some piece of reconstruction, do not seriously exceed the requirements, or if they do, that the fact will be brought to the attention of the general manager in order that a proper remedy may be applied; that the practice throughout the various departments of the corporation is uniform, so he may not have, as is sometimes the case, an employee in one department asking to be transferred to some other department in the business of the same corporation for the reason that the practice is different. Such a condition should not exist, and yet it may exist if the comptroller, or the auditor, or the head of the accounting department, by whatever name he may be known officially, does not bring to the attention of the executive head the facts that exist. Take it in our own corporations, where at times our employees number anywhere from two to three thousand men; it is impossible for the general manager to attempt to know what every specific rate of pay is throughout all departments, and that there is uniformity in the pay-rolls and uniformity in the hours put in in the various departments. All these things come directly under the eye of the head of the accounting department, and where irregularities exist it is highly important that he should report them in order that a remedy may be applied.

It is furthermore important that he keep the general manager advised as to how the receipts are on the various lines. While some general managers try to follow those things, they do not all do so. They would not all be competent, because of a lack of early training in the science of accounting, of determining whether the matter was accurately compiled and put in shape. The manager should see that the various lines are being operated with the smallest number of cars in order to produce given results. If on one line a car is earning two dollars per car-hour—you notice, gentlemen, that I said "car-hour"—and on some other line a car is earning only one dollar per car-hour, and that going along month after month, there is some reason for it. It may be a good one, but nevertheless it is the duty of the accounting department to bring the matter to the attention of the general manager. The accountant may be conversant with the reasons why certain things are so, but as these matters are coming under his eye day after day, if discrepancies exist he should promptly bring them to the attention of the general manager.

The general manager desires, furthermore, to know that the head of the accounting department is taking occasion to correspond with other roads of similar size operated under practically the same conditions, in obtaining copies of their reports, comparing them and bringing to the attention of the general manager features in them which would seem to show that as regards certain features the other lines were being operated more economically than his own. The points wherein we are operating better than the others I do not care to know about. I arrange to have the heads of departments go away two or three times a year to some other city where perhaps there is a very good system of operation and management and a good system of accounting; I am very glad indeed to have the head of my accounting department take two or three short trips during the year, to go to different cities, and observe their methods, and I always say: "I don't want you to come back and tell me a single thing that we are doing better than they are. I don't want to know that. That will take care of itself. But go and find something that they are doing better than we are, and we will try to copy that, and, if possible, improve on it just a little." The managers want to know, and they do not always have the time to investigate for themselves, that this comparison of accounts is made; otherwise, what is the

use of this uniformity, if you are going to close it up or lock it up in a safe? I want any company, the head of any accounting department, allied to this association, or to the Street Railway Association, to feel that it can send to the Milwaukee Electric Railway & Light Company, or any other company in which I am in an influential position, and obtain any data that we have. We do not consider it a burden to give information to you; if we have to put on a clerk to copy the reports, we will do it. I want, likewise, to feel that if we wish to have some information from any member of this association, or of the Street Railway Association, that they will not feel that we are burdening them when we ask for it. In our practical operation I many times take time that I could not command for myself, but I do take it, to go over our system and show its various phases to gentlemen who come from a distance to see what we are doing, and I take pleasure in doing it. The exchange of ideas is valuable, and unless these various statements, these various reports and results that are being realized by the various companies are going to be interchangeable, of what use is this uniformity of accounts? It is for some purpose. It is for the purpose of being able to make fair, intelligent comparisons, that we may know what we are doing. Above all, have the head of your accounting department keep his accounts in such a way that you do not need to fear if at any time your State railroad commissioner, or if perchance there should be a national railroad commission, should order your books closed. Let your accounts be upon the same basis as is adopted by the national banking department at Washington; when an order is given for a statement of accounts, it is not of some day in the future, but always some time in the past, so that there is no opportunity to fix up the books. So our accounts should be. We want particularly to know, or at least I want to know, that if the head of our accounting department and all of his assistants are called hence, that a new set of accountants can go to their desks in the morning and find nothing to clean up for yesterday—that the work is kept up day by day. That is highly essential, and if that were always done, it would not take so long for many managers to get a statement of what their actual condition is. It is highly important to know that there is promptitude with all these accounts, that the work is always right up to date. It will save many errors and blunders. It is one of the besetting shortcomings of many accounting departments that they are always going to do something, going to prepare some statement some time in the future. The future is not theirs. Consequently it is highly important that accounts shall be always up; that if the general manager wants to know something he can send with assurance to the head of the accounting department for such and such a statement and it will be forthcoming as soon as it can be transcribed from the books, or from some other statement, or that he can send the original. Two of the most important things that a general manager wants from the accounting department are accuracy and promptitude.

As I said at the outset, I have to apologize for not having prepared an address such as would no doubt have been prepared by my friend, C. D. Wyman. I am substituting for him this morning. I have been substituting for him for four years. I desire, on behalf of the managers of street railways, to extend to this association my earnest, heartfelt appreciation of the good work your association has done, still is doing, and which I hope it will continue to do. I think no higher compliment could be paid to your association than the co-operation asked for by the steam roads and by other organizations of this kind in their efforts to perfect a standard system of accounts and of forms. This matter of standardizing the forms on which the accounts pass from the various heads of departments into the accounting department is as important as the standardization of accounts. Much of the accuracy of the accounting department will depend upon the comprehensiveness of the forms that go out from the storerooms, from the heads of the various departments, from the man in the shop, as showing the cost of a certain piece of work, and so on down the line. There is quite as much necessity for making these various blanks uniform throughout as there is for the accounts themselves, because if these various blanks are not fairly uniform it will be much more difficult to make uniform the accounts based upon them. I do not know just what forms the association has adopted. I think in our own practice we subdivide to a somewhat greater extent than is provided for in the standard forms of your association. However, we keep the various heads so thoroughly in accord with the standard system of accounts of this association that they are practically the same, with the exception that I subdivide to a greater extent some of the expenses of maintaining equipment. I have the cost of all labor and all material subdivided.

I can keep the cost of material in my mind. When I see a statement that material costs so much, I can check whether or not

that is about right, without asking any additional figures; but they can cover up a multitude of sins, omissions and mistakes in the item of labor. In all work, my suggestion would be that you subdivide and differentiate between the cost of labor entering into any piece of work and the cost of the material entering into it, because the general manager, if he is familiar with his business, knows about the amount of material. If it is putting a set of wheels under a car, I know what those wheels cost. I do not know if the thing comes to me bulked, called wheels and labor; I cannot tell whether the labor has cost \$1.50, which would be about the cost of putting on a pair of wheels, or whether it is \$2.50 or \$3, if it is all covered up in one item. Therefore I urge upon the Accountants' Association the advisability of subdividing the cost of materials as against the cost of labor that is necessary to put that material into use. We subdivide in our own practice. For car bodies, for instance, we keep carefully the cost of painting, etc., as an item by itself. Likewise, the cost of heating, the cost of lighting cars. Many of these things that are coming to him in that way the general manager wants to know, in order that he may be able the better to analyze and determine whether these various items are being kept down to the lowest point consistent with the highest degree of perfection in the maintenance of his construction.

Above all, urge upon your municipality and legislative bodies that they shall call for the publication of your accounts. I for one believe you owe it to them. You are simply trustees for certain rights which they give you in the municipalities. You will quiet much of the criticism we hear regarding public utilities when you make public your accounts. We have had a pretty lively time in the city of Milwaukee for several years, as some of you no doubt know. We have finally got them harmonized to a certain extent by having had passed by our municipal legislature, or Common Council, so called, last winter, an extension of our franchise and the straightening out of certain questions in connection with it, up to Dec. 31, 1935. We are here to-day with a decision from the Supreme Court of Wisconsin, handed down on Friday last, affirming that franchise and quieting all these various questions. It was claimed that we were suppressing our accounts, that our profits were much greater than they ever were, and the Municipal League and other associations went before the Legislature some eighteen months ago, at the biennial session, last winter a year ago, to present a bill requiring us to file our accounts and annual statement with the officers of the State. They expected that we would antagonize and oppose them, and possibly by underhand means defeat it; instead of this I urged the passage of that act. Our accounts should be kept, as I said before, in such a manner that you do not fear the closest possible scrutiny, either as to the underlying policy of the corporation or as to the methods employed in working them out. Once be honest and you will quiet much of the criticism in the various localities in which you are operating. Under the law of Wisconsin to-day, every street railway and electric lighting company must file a statement giving in great detail the results of its operation every year, and we have no hesitation in doing so. We believe that it will do much to bring about a better state of feeling between the general public and the corporation that is serving it. I believe in the broad, general underlying principle that a street railway company is, of all corporations, one in which the general public is most vitally interested, and it has a right to be informed as to your methods of operation and of management. We are public servants, and we are the one class of public servants with whom everyone in the community must come in contact. He may escape everything else, he may escape the tax-gatherer, except once a year, the undertaker, except once in a lifetime, but the street railway company he is coming intimately in contact with several times a day. In our own city we are carrying at the present time an average of one-half of the entire population every twenty-four hours. They are vitally interested, gentlemen. Do not attempt to deny it, but proceed upon the broad, general principle that they have a right to know that the property is being conscientiously operated so as to afford them the greatest possible degree of convenience, of comfort, of safety and of reliability, and to this end the heads of our accounting departments can do much to assist the general manager and relieve him of many of the details of the complex position in which he is placed.

I thank you, gentleman, for your patience; I thank you for the courtesy of calling upon me to fill the gap left in your programme. I only regret that time has not permitted me to have given to the subject more analytical thought, that I might have presented these views in possibly briefer form, and possibly in form that would have produced what I wish to produce, the making of your organization more valuable, if that is possible, to the great interests that we represent.

Report of Committee on Standard System of Accounting

BY C. N. DUFFY, CHAIRMAN

No changes in the present classification of accounts or in the forms of monthly and annual reports suggest themselves to the committee; none have been suggested, therefore we recommend that the classification stand as it was adopted at the Chicago convention in 1899, unless this convention directs otherwise.

Your committee received very few queries from members regarding the classification of accounts. These queries were promptly answered. It is assumed that the classification as it stands, in the absence of any information to the contrary, is satisfactory to all. Your committee would be pleased to hear from the members regarding this question.

With reference to the classification of material and supplies, submitted by this committee to the 1899 convention, in a supplementary report, no official action was taken by the association. Your committee, in referring to this matter now, desires to explain that the classification submitted was not intended for anything more than a suggestion to the convention that would possibly aid in dealing with the important subject of material and supply accounts.

The Standard System of Accounting is now in general use, recognized and accepted as the standard for street railways. One of the most valuable features of the system is that it admits of comparisons between companies. This feature is especially appreciated.

At the convention of the National Electric Light Association, held in Chicago, May, 1900, a paper on "Uniform Accounting" was presented. This paper criticised the Accountants' Association for treating taxes as a deduction from income, stating taxes should be considered a part of operating expenses. This position was indorsed in the discussion of the paper, following its reading. Stuyvesant Fish, president of the Illinois Central Railroad Company, in an article published in the *Street Railway Review*, was quoted as saying that the inter-state commerce classification of accounts did the railroads an injustice and caused them to make misleading reports, because taxes were not treated as a part of operating expenses. All of this is very interesting in view of the action taken by this association on the question of the classification of taxes. Your committee does not care to provoke any further discussion regarding this matter, but begs leave to refer to its position as it explained and sustained it and was sustained by this association at the conventions in 1897, 1898 and 1899. The paper presented to the National Electric Light Association not only classified "taxes" as an operating expense, but "interest on investment," "interest on current liabilities," "investment insurance" (depreciation), and "reserve for sinking fund." These five accounts are all classified as operating expenses, grouped under the heading of "capital accounts." The reason for doing this was, that it was held these accounts should all be included as a part of operating expenses and not as deductions from income, in order that the "true cost" of production could be determined. Your committee does not wish to do anything more than present this matter for your information and consideration, without comment, further than to refer to the grouping of these five accounts under a heading entitled, "capital accounts." The gentleman who presented the paper frankly stated that his stand was open to criticism; for that reason, and because your committee believes that this association should not criticise the position taken by other associations on questions of accounting, it is desired that the matter should not be discussed by this convention.

This association was invited to attend the convention of railroad commissioners of the United States, held in Milwaukee, May, 1900. H. C. Mackay, F. E. Smith and the chairman of this committee attended the convention, responding to the roll-call when our association was called. We were officially recorded in the minutes of the meeting as having been present and representing this association. Nothing transpired at the convention of any direct importance or interest to this organization, except that Ashley W. Cole, chairman of the board of railroad commissioners of the State of New York, a member of the committee on classification of construction and operating expenses of electric railways, reported for the committee that the 1899 convention adopted the committee's report (this report was the classification of accounts adopted by the Accountants' Association.) Mr. Cole stated that some of the States recommended that report to the corporations within their jurisdiction, and the State of New York has had that report printed in pamphlet form and is now sending it to all the electric railway corporations in the State.

Your committee has made a strong effort to induce the Federal Census Bureau to use the Standard System of Accounting of this

association in the work of compiling statistics concerning street railways, in connection with the census report of 1900. We hope to succeed in this undertaking, and feel encouraged from the following statement of the director of the census, made in a letter dated July 24, 1900: "The subject of street railways is a special one, which will not be taken up for about a year. I will have the letters placed so that they will have full consideration when the proper time comes. I am glad to receive suggestions at any time."

The Routine of a Railway, Electric and Gas Lighting Company

BY C. O. SIMPSON

In this paper upon the routine of a railway, electric and gas light company, no attempt has been made to go outside of our own office, but I will touch briefly on some points which have come under my observation in the past ten years, or while in the street railway line. I do not, however, confine myself to the street railway business alone, as there are a great many companies like the one with which I am associated that have the electric light as well as the gas business of the cities in which they are located.

First the railway, starting with the report from the conductor to the accounting department. The office furnishes the train dispatcher the night before with the "portable" registers, and a list showing number of same, and the register readings. The dispatcher gives out registers only to the daylight and six-hour men, as they start out in the morning. All other registers are given out at the office. This list (Form 1) is returned to the office by the dispatcher, not later than 9 a. m., with the name of conductor filled in and certified to by him. This goes to the young man in charge of the car earnings record (Form 2); also the trip sheets (Form 3) and envelopes (Form 4) containing the conductors' remittances after they pass through the cashier's hands. The cash is handled by only one person and goes directly from the conductor to him and from there to bank, which furnishes a duplicate deposit slip which is turned over to the chief clerk for entry on general cash book, after a comparison with the earnings record.

All money, when ready for bank, is put in such shape that it will be accepted by the teller without counting bills or wrapped silver at time of deposit. Currency is put up in \$50, \$100 and \$250 packages; on wrapper is marked company's name, date and amount. Silver is also wrapped and marked accordingly; small change to make up balance of deposit is put in envelope.

Cash tickets are checked up with earning book by auditor every month and burned. Transfers are counted, and after comparing with trip sheet are destroyed.

Conductors' reports are filed daily; that is, each day is fastened together and kept in a convenient place in office until end of month; they are then filed in store room.

A small ledger with index is kept of over and short account. An account is opened with each conductor; the Dr. side is short, and the Cr. side is over. This book is kept where conductors can see it every day, and if they find a shortage they make their remittance that much more, or vice versa, to balance the account, as shown by said ledger.

The cashier also handles all collections of the electric light and gas departments, keeping a separate petty cash book for each, giving as much detail as possible to the bookkeepers in charge of the different department ledgers, and general cash book (Form 5) into which it is condensed, as the ledger is ruled, so that only the amounts are necessary, except in the sundry column.

The electric light register (Form 6) is used entirely as a load book; that is, it shows the number of each candle-power light, motor power, fans, and if on meter, meter readings in kilowatt-hours. The reading of electric meters are recorded on cards (Form 7). These cards are turned over to bookkeeper on the completion of each route for entry on register.

Bills (Form 8) are made from the register and are then carried to the light ledger; each account is numbered, having the same number in both books. The light ledger (Form 9) shows the balance forward each month, if any; amount of bill for the month; total column, rebate, amount paid and date of payment. These books are made to run six months; with the addition of a short leaf they can be made to run twelve months, but, owing to the accumulation of dead accounts and new business, this is hardly satisfactory.

The light ledger contains forty-two accounts or lines to a page, and the register only fourteen, which equals three pages to the ledger, making it easier to balance and check as you go along. The cash column in the ledger is balanced with the general cash

book. With this form of ledger it is not necessary to keep a collection list, as the accounts are compact enough if posted regularly every day, from which the collector makes his delinquent list. We use the card system in connection with the changes; that is, one side of the card is used as an order to the electrician (Form 10); the other side (Form 11) shows the work done on the order, and from this entry is made on the light register. At the end of each month a recapitulation is made of the changes to show the loss or gain in any part of the service.

The names of customers are kept in both register and ledger, alphabetically and in the order of the vowels. When transfer is made to new books at the end of six months, we do not give a numbered place in the ledger to accounts that show balance only, but on one of the back pages of the ledger we keep these delinquent accounts under the heading of "balances," the total being carried under the same heading and given a number in the front of ledger, until finally paid or written off. Advance customers are treated in a similar manner, except that they are given a number preceded by the letter "A." I also wish to add that all churches and Chinamen are put together under letter "C," but are given a regular number.

The gas books are similar to the electric light books, except the register or load book, which only shows the meter reading—past, present and consumption for both lighting and fuel at the different prices per thousand feet. The gas bill is almost a copy of the register book, but, in addition, is ruled to show discount for prompt payment before the 10th of the month, following consumption. The reading of gas meters are recorded in a book printed and ruled for that purpose. The routes are divided into what we call the uptown and downtown routes, and are read by two men, who alternate every other month. The bookkeeper takes these readings direct to the register or load book. The recapitulation of the register or load book compared with the register of output at plant will show the leakage.

We use the "addressograph" in connection with both electric light and gas bills. This machine prints the number, name, address and date of bill in one-tenth the time it formerly took our bookkeepers to do the same work.

We use a bill register (Form 12) in which is recorded all bills due the company for material sold or labor performed. One line is used for each bill, and the book is ruled as follows: Date of bill, number of bill, against whom item, date rendered, amount, date paid, account credited and remarks. Each bill is numbered.

All bills and accounts against the company are paid by voucher (Form 13), which gives all the details. There is provision made for inserting a description of each bill, and in addition to the description on each voucher, the original approved bill is attached, but the latter never leaves the office. If the voucher is paid through the mail, all bills are attached to a slip, the same size as that of a folded voucher, called a "tracer" (Form 14), and remains there until voucher is returned and receipted; all papers are then attached to voucher and filed away.

Vouchers are numbered consecutively, commencing with number one each month. The voucher record (Form 15) is ruled to show first voucher number, month, in whose favor, amount pay roll or voucher, account charged, store stock, operating expenses, sundries account, etc. The recording of a voucher will occupy as many lines as there are accounts to be charged in the distribution, and are charged on the record direct to the operating, construction or other accounts affected. No bill for sundries or material, etc., is vouchered until approved by the purchasing agent and superintendent. It is then made up by the chief clerk, and goes to the auditor and president for their approval before recording or payment. The pay-roll voucher (Form 16) is made up from reports of time (Form 17) from the heads of departments. The distribution is made, and it is entered in the record and filed as a regular voucher.

Unclaimed wages—that is, wages uncalled for after six months—are credited back to the account as charged on pay roll, and record made on pay roll accordingly.

General journal entries are made from a manuscript statement, which is a recapitulation of the several books, such as cash, bills and vouchers, and these statements become a part of the permanent file; therefore it is not entered in detail in the journal. The traffic statement (Form 17) is made from the car earnings book, and gives all data necessary to make up statistics as to the traffic on the road for the month, but only that portion pertaining to the revenue and how earned is journalized. A recapitulation is also made of the bill book, and the entry made charging bills for collection with the total amount of bills and crediting the different accounts, as shown. The recapitulation of the voucher record is made in a little more detail. The operating accounts of the railway and electric light departments are separated, as well as the construction and sundry accounts, and gives the voucher

number and amount of each voucher charged to that particular account. The entry is then made charging each operation, construction and sundry account with the total for the month, and crediting vouchers and pay rolls their respective amounts. The recapitulations of the cash book and light ledger is similar to the others, but more attention is given to the cash book, as it embraces the particulars of receipts and disbursements, and clearness in entering transactions is of great importance even in the general cash book.

There are a number of what we call "regular journal entries," such as the transportation of letter carriers. An entry is made charging the United States Post Office Department (which is an open account on the ledger) and crediting the earnings account with one-twelfth of our yearly contract, and when the quarterly payment is made by the Post Office Department it is credited direct to this account on the cash book. Similar entries are made for the rent of power for the operation of a short line running from Augusta over the Savannah River into South Carolina, which we do not control. Chartered cars are usually paid for in advance, or the day following their use, and are credited direct to the account through the cash book; if not, they are billed and so pass through the bill register. Interest on the bonded indebtedness is charged to "interest on bonds," and crediting "accrued interest on bonds." Semi-annually an entry is made charging the latter account with the semi-annual interest, and crediting interest-coupon account. When remittances are made for this interest to our Eastern representatives, it is charged to their open account, and it so stands on the ledger until the coupons are returned to the company, as they are very seldom all paid and returned at one time, or within thirty or sixty days after due. The journal entry then made, or made from time to time as they are returned, is necessarily in detail, giving the series and numbers of each, charging to interest-coupon account and crediting our Eastern representatives.

We have also an account called "advanced expenses," into which we charge direct from voucher when payment is made for such items as taxes, coal, water for power, etc., which are paid quarterly and annually; or extraordinary heavy purchases of material. An entry is made each month to the respective operating accounts, charging out approximately what would be, or has been used in that month.

The balance of many accounts, as shown by the balance sheet the first of each month, for instance the amount in the debit column to gross electric light and power account, will be the same as the total of the balance sheet of the light ledger which comprises something like 1500 individual accounts. The balance of bills for collection consists of the unpaid bills, as shown by the bill register; the balance to vouchers shows those unpaid at that time; also the pay-roll account.

We use the ordinary check book, as everything is paid by vouchers, the stub of which shows the name and number of vouchers covered by corresponding check, which is all that is necessary for entry in the cash book. Separate check books are used, one for the railway and electric company, and the other for the gas light company, as they are at present separate corporations, but are handled as one as much as possible, to reduce expenses.

Monthly statements include the railway and electric lighting department on one statement, but the earnings and operating accounts of each are shown separate. The gas light company's statements are made separate, but the form and accounts correspond with those of the railway and electric company as much as possible.

The most valuable of all papers, I consider the real estate, deeds and plates representing all the realty of the company, whether used in the operation of the road or not. A separate book is used (size, 10 ins. x 14 ins.), called real estate book, on the left-hand page of which is a plat of the ground, and on the right hand, or as many pages following as is necessary, is a description of same. The index to this book is complete, indexing, perhaps, under six or seven headings, as the property is referred to a great many times, as the tract of some of its former owners or by the company as the "Power House property," "Sand Pit," "East Station," or "West Station." The deeds are kept in a bankers' file and given the same number as per folio in book.

Contracts are also filed in an ordinary bankers' file.

Ordinances are usually published in the daily papers, a copy of which is pasted in a scrap book; if not printed, a written copy takes its place.

Letters are filed in the ordinary files, but, in addition to copying, the stenographer makes a carbon copy of the answer, which is attached to the letter before filing.

The stock ledger and the transferring of stock is very simple. The ledger is ruled, first giving the top of the page space for the

name, address and any other information as to the payment of dividends, etc. The balance of the ruling shows first date, transferred from, or to; certificate number, Dr. shares, Cr. shares, Cr. balance. All stock certificates when canceled have written across the face to whom issued and number of new certificate. This certificate is then attached to the stub bearing the corresponding number.

As is well understood in this association, a frank discussion is invited of the methods and forms I have explained. Any system adopted by a company is more or less a growth evolved from emergencies and circumstances, and side-lights thrown by opinions from different points of view are always valuable.

Report of Committee on a Standard Unit of Comparison

H. C. Mackay, Chairman, F. E. Smith and A. H. Ford, Committee

At the last annual convention of this association, the Unit of Comparison, as treated in the paper presented by H. C. Mackay, was referred to this committee to report at this convention, action having been deferred for the lack of sufficient time to discuss the matter properly and to admit of further unbiased investigation.

It is a matter that, since the adoption of electricity as a motive power, had received very little serious thought; and the discarding of a unit that had for years been recognized as the standard, naturally brought up questions requiring more study and investigation than could then be given them. It is but fair to say that this committee's opinion was divided as to the merits of the different units advocated, but, after studying the matter in all its bearings, we are convinced that the motor car-hour is the best unit yet advocated; and, being the same on all systems, large or small, it cannot be otherwise than practicable. Since that time, it has been put to practical tests, having been adopted by some of the largest systems; viz., Minneapolis and St. Paul, Minn., and Milwaukee, Wis. This test has demonstrated that the motor car-hour is a stable and correct unit, and it has further conclusively shown that the car-mile is an unreliable unit, even between lines of the same system. To illustrate, we submit the following figures taken from actual service and applied here to comparison of earnings:

Line.	Speed per hour	Earnings Per car-mile	Motor car-hour
No. 1	8.3	33.25 cents	\$2.76
No. 2	16.2	28.57 cents	4.63
No. 3	10.7	26.79 cents	2.86

The supposition was (up to the time of comparison on the basis of motor car-hours) that line No. 1 was proportionately the best earning line of the three, but the truth is, it is the poorest. This erroneous result was made to appear true on the basis of car-miles, simply because this line was operated at a lower rate of speed, the smaller divisor naturally leaving a greater quotient:

As applied to operating expenses, we submit other figures:

Car mileage	3,653.00
Motor car-hours	350.00
Earnings per day	\$1,367.50
Operating expenses per day (50 per cent) ..	683.75
Earnings per car-mile .....	.3743
Earnings per motor car-hour	3.91
Operating expenses per car-mile .....	.1871
Operating expenses per motor car-hour	1.955

Reducing the speed of this line 25 per cent, retaining the same equipment and running the same length of day, what is the result? We have, without changing the cost of operation, reduced the mileage made from 3653 to 2740.

The expense per car-mile was \$.1871, and is now \$.2495, an apparent increase of \$.0624.

The expense per motor car-hour was \$1.955, and is now \$1.955, showing no change, as none exists.

Speed, then, is shown to be the factor that prevents the car-mile from being used as a correct basis. Speed does not enter into the motor car-hour. The absence of this variable quantity of speed, together with the fact that labor, the principal item of expense, is computed on the basis of the hour, or multiple of the hour, sustains our position.

It is interesting to note the conclusions of the steam railroads regarding the use of the car-mile as a unit. The following figures were taken from the report of the thirty-third annual convention of the American Railway Master Mechanics' Association. The committee emphasized the unreliability of the car-mile by the following comparisons, showing the cost of operating a simple or ordinary engine to be \$.2449 per car-mile, and the cost of a compound engine to be \$.2883 per car-mile, an apparent difference of 17 per cent in favor of the simple or ordinary type of engine. Yet, by reason of the greater capacity of the compound engine, the

cost per 10,000 ton-miles was \$3.23, as compared with \$4.03 for the ordinary engine, thus showing an actual gain of 24 per cent in the work performed in favor of the compound.

For special comparisons, it is recognized that special units are required, as for example, the output of a power station would be based on the kw-hour, this being more closely relative to the work, but for all general comparisons of earnings or operating, the motor car-hour is advocated.

As to the question whether a standard unit is practicable or not, it would seem that, given a unit of comparison, which is admitted to be identical in every case, the question is not debatable. If the unit is correct, the result or comparison must be correct, as the component parts of all accounts have already been standardized by this association. It has been claimed that the variation in cost of operating, between a high and low-speed line, affects the value of the motor car-hour as a unit. The high-speed line certainly requires more current, and its repairs to electrical equipment are greater, but we are at a loss to understand how this can affect the unit. We could as consistently question the value of the yard as a unit of measurement because one kind of cloth cost 10 cents and another kind 12 cents per yard.

If a manager was shown that the cost of maintenance of electrical equipment of cars was 25 per cent more on his system than on another, it would certainly be to his interest to investigate, to determine whether more improved motors were being used, or if greater care was not being taken in the use of them. Very true, the investigation might develop that the difference in cost was due wholly to greater grades or to excess of travel on his lines, but it would show him the facts, and wherever a difference did exist, would advise him of it. This would be a practical use of a standard unit.

It was contended that the cost of ascertaining the number of motor car-hours would be such as to preclude its use on a large system. As a matter of fact, it is so much more easily determined than is car-mileage, that the cost is naturally less, and the readiness with which it is ascertained is one of the strong arguments in favor of its adoption. Especially is this the case in cities where large numbers of cars are run without reference to schedule time, but wherever and whenever deemed necessary. Experience has shown that reports of mileage made by trainmen are only approximately correct, but the record of the time of the starting and pulling in of a car at the station can be accurately kept and verified by the time of the motormen. The unit of comparison as applied to electric street railways has not kept pace with the rapid changes which have been made in every feature of this industry during the past decade. The unit adopted by the steam railroads, the passenger-mile, was adopted by the street railways, but, owing to the impossibility of determining the distance each passenger was carried, that element was discarded, and, though its usefulness as a unit was impaired, it has continued to do duty as a standard unit to the present time. It applied very well to the old horse car, where the variation in speed was an unimportant factor, but time has wrought its changes, and a new unit to fit up-to-date conditions is deemed necessary.

With the past few years, a new problem has arisen owing to the construction and operation of high-speed electrical suburban and interurban lines. These are but the forerunners of what will shortly be in active and aggressive competition with the steam railroads. These lines will, doubtless, be controlled and operated by the street railway systems of the large cities, or at least in conjunction therewith; hence, creating a necessity for a unit of comparison applicable to both high and low-speed lines.

We believe that the objections raised to the car-mile as a standard unit in the paper presented at the last meeting of this association are logical, and that the motor car-hour meets all conditions better than any other unit yet advocated.

We herewith offer the following resolution for your consideration: "Resolved, That this association recommends the adoption of the motor car-hour as the Standard Unit of Comparison."

Departmental Accounts

BY H. L. WILSON, AUDITOR, BOSTON ELEVATED RAILWAY COMPANY, BOSTON, MASS.

In an unguarded moment I yielded to the request of our worthy president and agreed to prepare a paper on what he has seen fit to call Departmental Accounting. Three weeks ago the task was taken up for the first time, and it at once occurred to me that it was too broad a subject to attempt to cover in the limited time that should be devoted to a convention paper, and I so informed him and begged to be allowed to change it, but while he acknowledged it would be a difficult matter to digest, and as he put it, could be extended to the "length of the Holy Bible," he still in-

sisted on my sticking to this title. If I was only sure that a book of this kind would have as large a circulation as the one he mentioned, I would give up accounting and go into the publishing business.

I will try, however, to give simply a rough outline of the system that we have adopted as the best method of handling labor and material accounts so as to have the maximum amount of quickly available information with the minimum amount of clerical help and expense, and trust that the members present will ask any questions that may suggest themselves, and in that way bring out any important points that may have been overlooked, as this is not submitted as any pet scheme, but simply as the best method that experience has suggested up to the present time.

In the first place I am strongly in favor of having all accounting, so far as possible, done in the main office of the auditor, rather than at the shops or department headquarters. There are several reasons for this, prominent among which are: That there must always be a responsible head to properly direct the efforts of others, and if it is all done in one place a really bright chief clerk may be employed, to whom a proper salary may be paid, who can have a supervision of all details, and any questions that arise can at once be referred to the auditor for his personal attention. Again there are times when the entire force can be put on some special and important piece of work that it is necessary to have completed at once; there are other times during the month when the pressure of work is such that some of the clerks can be engaged in collecting together the less important matters that have been allowed to accumulate during the busy time.

Another and very important reason is that there may be instances where estimates have been given of what certain work would cost, where the expenditures have greatly exceeded the estimate, and where it might be thought advisable by the head of the department to make transfers to other and improper accounts in order to substantiate the original figures.

When information is desired a question can as well be asked in one place as another, and certainly a more prompt and probably a more intelligent answer can be obtained from the place where all accounting is done than it would be possible to get by consulting several separate departments.

If, as is the case of the Boston Elevated Railway Company, there are several departments, any one of which may do certain work properly chargeable to another, it simplifies the accounting to be able to post the details to the proper account direct, and avoid the trouble of making charges and credits back and forth, which would be necessary if the accounting of the departments was done at separate places.

The four departments into which the construction, equipment and maintenance forces are divided are as follows:

Department of Motive Power and Machinery.

Department of Wires and Conduits.

Department of Buildings.

Department of Maintenance of Way.

No claim is made that the system as it is at present arranged is applicable as a whole to all companies, but the fundamental principle, which is the order number system, can certainly be applied to any road.

The method of issuing order numbers varies somewhat in the different departments.

In the shops the method is to have the superintendent or foreman give each class, and in many instances each piece of work performed, an individual number. The first order is numbered one and then they run along consecutively for two or three years or until there is no chance that by beginning over again the numbers will in any way conflict.

When an order is issued a copy of it is sent to the Bureau of Audit so that the auditor may determine from the nature of the work the account to which it should be charged, entry is then made upon cards provided for this purpose which have headings for the Order Number, Account Charged, Date Issued, Date Completed and Description of the work. Below are printed spaces for the Month, for Labor, for Material and Invoices, for Shop Expense and for a Total of the above charges.

These cards are made double or folded over at the top, so that by using a small carbon sheet a duplicate can be made with only the labor of one entry. The advantage of this system is that by separating the card when the order is completed you have an opportunity of making any number of separate and complete lists without in any way interfering with the original files which can still be kept in their numerical order.

If you want to know what the charges have been to any account, what kind of work has been done for any department, an alphabetical list of all work or anything of this kind, it only requires a new deal of this extra pack to have the information in such shape that it can be quickly utilized.

The labor is reported weekly on sheets which have a heading for the Name, for the Date, for the Rate of Pay and for the Occupation; below are provided columns for the Order Number, for the Days of the Week, for the Total Hours and for the Amount. This sheet has some thirty-five lines, and provides in this way for a man who may work on thirty-five different order numbers during any one week.

The pay roll, of course, can be made by simply taking the total hours from the bottom of the sheet, while the charges to the order numbers are made by taking the amounts from the Amount column. These labor charges are abstracted on sheets of the same size as the time blanks, and all are then bound together in book form with these abstract sheets as the front pages, and the entries made upon the cards from this form. The advantage of this is at once plain; you have the card which shows you the date and you can quickly refer to the abstract, and if necessary by referring to the following pages you can at once tell the names of the men who worked upon the order as well as the days of the week and the hours each day that they devoted to this particular order.

The material used each month is reported on a sheet which has provision made in the printed heading to put in the Order Number, and below spaces for Quantity, Kind of Material, Price and Amount. These sheets are abstracted and bound in the same manner as the time sheets mentioned above.

We require all parties of whom we purchase supplies to use bill heads which we provide. These have spaces at the bottom in which to place all approvals and a space for a notation of the account to which the goods should be charged. Before adopting this idea, bills frequently reached my office in such a condition that it was difficult to read them, they being pretty well covered with rubber stamp impressions and signatures.

When charges apply to any department the bill is entered upon an invoice book which has spaces in which to make a copy of the invoice and enter the total amount, and separate spaces headed with the name of each department. These last spaces are subdivided into columns for Amount and Account to Charge.

By abstracting each of these columns you have all the information necessary to make your entries to the proper accounts, and the totals of all will prove the total of the invoice book.

Any general expenses of the shops are charged to an account called shop expense, and this is divided each month among the different order numbers under which work is being done.

The Department of Motive Power and Machinery has several subdivisions, such as Machine Shop, Car Equipment Shops, Car Repair Shops, Armature and Field Winding Shops, seven Power Stations, and has also charge of small maintenance crews in each of the thirty car houses.

I have explained the system of reporting all labor, material, etc., consumed at the shops, and the methods of making returns from the other places are so similar that I will not occupy your time with a description of the minor differences.

Blanks vary somewhat in the headings, but the idea that we have attempted to carry out is to have them all of a nearly uniform size so that they may be bound in the little booklets before referred to.

A large number of them are arranged in manifold books so that there is always an exact copy of what has been sent to the main office, and as each blank is numbered we at once know that something has gone astray if they do not run along consecutively.

By having a large cabinet with drawers arranged for each kind of report, ready reference can be made to any or all original time or material sheets.

In order to make a monthly report of the expenditures, it is of course necessary to compile the information you have on all these abstracts.

This is done on separate sheets for each shop, power station, etc. By having these sheets graduated in size so that the upper one is the narrowest, and each succeeding sheet just one column wider, you have all the totals together in a horizontal line, and a grand total is easily and quickly obtained by simply adding across. The widest or bottom sheet has on the right-hand side a sufficient space for the Names of the Accounts and a place for the ledger folio. In this manner the necessity of writing the title more than once is obviated and all necessity of journalizing is done away with, as these sheets bound together make a more complete and readily accessible journal than is possible to have by any other method.

For the Department of Wires and Conduits a different system of order numbers is used. It might be well to here call the attention to the fact that the company with which I am connected owns no surface tracks or their equipment, yet has in its immediate control and operates all the surface lines in the city of Boston and nearby suburbs under a lease for a term of years from the West End Street Railway Company.

This lease stipulated that the Elevated company should build no surface lines of its own, but that all additions to the surface lines or their equipment should be charged to and become the property of the West End Street Railway Company, and that credit should be given to the latter for any removals that were made.

It was, therefore, necessary to have a very complete and exhaustive record of all property, that could be quickly referred to and easily handled, and books of all kinds were considered, but none of them seemed to cover both of the above desirable elements.

Cards were then taken under consideration, and the great elasticity of this system at once recommended itself.

First index cards were prepared having for headings the names of each street, car house, bridge, etc., on the entire system.

The Electric Line Equipment had always been divided under five general headings: These were Poles and Setting, Overhead Feeder Lines, Overhead Trolley Lines, Underground Cables and Conduits, and Submarine Cables.

Cards were next provided for each separate kind of line equipment, and it was found that to give a complete analysis of the above five accounts would require the use of forty different forms of cards, and for quick reference it was decided to use several colors, as well as number each card on a small tab or projection from the top.

For Poles and Setting thirteen buff cards were used, which are numbered from 1 to 13 consecutively. The first four are used only for the four sizes of iron poles, which are the sole property of the West End Company. The next six are used for wooden poles, which are owned jointly by the West End Company and some other company. No. 11 is used for wooden poles owned exclusively by the company, No. 12 for special poles and bases, and No. 13 for span attachments to buildings.

For Overhead Feeder Lines eight cards were provided. They are blue in color, with tabs numbered from 14 to 21.

The first five of these cards are used to designate the amount and size of different kinds of feed and return wire. No. 19 is used for feed taps, No. 20 for switch boxes, and No. 21 for track connections.

For Overhead Trolley Lines three cards are used, being salmon in color, numbered, 22 which is used for bracket construction, 23 which is used for insulating joints, and 24 which is used for trolley wire.

For Underground Cables and Conduits eight cards were provided. They are buff in color, and are numbered from 31 to 38.

The first two numbers are used for Feeder Cables, the next three for Return Cables, the next for Feeder Cable Connection, the next for record of Conduit and Manholes, and the last for Conduit Connections.

The next eight cards are used for records of Submarine Cable for return wires; the first four, numbered from 51 up, are used for the Feeder Cables, the next four are used for Return Cables, and the last for Cable Houses, Switch Boxes, etc.

In order that the Wire and Conduit Department should report its expenditures in such a way that the Accounting Department could make the charges to the proper locations, a system of order numbers was devised to be used whenever additions to or removals from existing construction were made.

First each kind of equipment called for by the cards was given a number which corresponds with that on the tab of the card, and each street, car house and bridge on the entire system was given an individual number, commencing with 100. By preceding the number designating the street by the number designating the kind of equipment you at once have all the information necessary to tell to what location and to what account the labor and material should be charged.

This method furnishes many thousands of outstanding order numbers, any one of which can be readily selected from the printed list containing less than 600 numbers.

The labor is reported on the same form as that previously mentioned for shops, but the material sheet is somewhat different.

It is impossible for a foreman to always know exactly how much material will be used on any one job, and frequently he is called upon to work on several locations without going back to the stock room, and thus it is necessary to provide some form by which he can draw stock and report what he uses.

This is provided by a manifest, on the face of which is entered the material drawn. The back of this sheet provides for a report of the material used and a report of the material returned. The "Note" printed on the front side of the sheet reads as follows, and explains its use:

"NOTE.—This manifest is to be retained by the person responsible for the material issued upon it until every article is accounted for on the opposite side of this form.

"All material issued upon this manifest which is unused on the last day of the month must be returned to the storekeeper for in-

spection. The storekeeper will receipt for it, remanifest it or stamp this manifest 'Inspected,' as occasion requires."

These manifests are made in duplicate by the manifold system, and a correct copy of the original issue of stock is always in the keeping of the storekeeper.

At the end of the month the reports of the material used are abstracted on the same form mentioned for shop orders and are bound in the same manner.

The Department of Buildings is chiefly occupied with the repairs and renewals of buildings, and in order to answer all questions propounded by the management and by the Bureau of Real Estate a system of order numbers was gotten up for its use. The principle here employed is similar to that of the Department of Wires and Conduits; each kind of work has a classification number, and each building has one or more numbers which designate the building, and in some instances the different portions of the building. The method of reporting labor and material is the same as that used for the shops.

The Department of Maintenance of Way, as its name implies, has charge of the repair maintenance, inspection and construction of track and paving.

Order numbers are issued for any new work or for any extensive renewal or repairs by the civil engineer, who sends a notice to the head of the department and also to the bureau of audit.

The department is divided into eight divisions, called sections, and each carries a supply of the material they are continually using.

Each section's stock is carried under the following thirteen accounts:

- Gravel.
- Paving Stone and Flagging.
- Lumber and Ties.
- Nails and Spikes.
- Rail Fastenings.
- Tie-Rods and Buttons.
- New Rail.
- Old Rail.
- Special Track Work, Frogs and Switches.
- Miscellaneous Material.
- Track-Welding Material.
- Scrap Material.
- Track Wiring Material.

When material is received at a section which is to be included in any of the above stock accounts, the person in charge immediately enters upon a form provided for that purpose the date, the firm's name or section from which it is received, and the quantity and kind of material.

These reports are numbered consecutively, and are sent to the bureau of audit, where all bills are entered on an invoice book which is abstracted each month, and from this abstract charges are made to stock accounts or to jobs direct.

When material is used or sent away, entry is made on a form which gives the date, where used or to whom sent, quantity and kind of material, price, amount, account to charges and account to credit.

These sheets are abstracted twice, once to get totals for the charges and once to get totals for the credits, and are bound and filed away in the usual manner.

When material is received from track taken up, or is returned from any work, it is entered upon a sheet which provides for the date, where from, quantity and kind of material, price, amount, account to credit and account to charge. These are abstracted and bound in the same manner as the Material Sent Away sheets.

All labor is reported on a form which has the usual heading, and provides below for a separation of Maintenance and New Construction charges, as well as the location where the work was done and the particular kind of labor that was performed. These are also abstracted and bound.

We will now suppose we have four kinds of bound books from which we are to make up our monthly report for the department.

We take a report blank and head it with the name of the section. This blank has columns provided for Approved Entries, for Each Kind of Material, for Approved Bills, for Labor, for Total Charges and Credits, and for Net Charges and Credits; and down the right-hand side has accounts to which charges and credits are to be made.

We then take the abstract of the invoice book and enter with red ink on the first line opposite the headings Approved Bills Charged to Stock the total charge to each kind of material; next we enter with black ink in the Approved Bill column all other items on the abstract, putting each one on the line opposite to the account to which it is to be charged.

Next we take the Material Used or Sent Away abstracts, and under the proper material headings and opposite the proper accounts we enter in black ink these items.

Next we take the Material Taken Up or Returned abstract, and with red ink enter under the proper material heading and opposite the proper account all these items.

Next we take the labor abstract and enter in red ink under the proper material headings the charges for labor on account of each stock account, and then enter in black ink in the column headed Labor and opposite the proper account all other charges.

There is one other column on the report sheet of which no mention has yet been made; this is the first one on the left-hand side, and is headed Approved Entries. This was provided to take care of journal entries, as the use of this report obviates the use of the customary journal.

Any entries necessary to transfer one account to another are made on journal blanks, and these are dated, numbered, bound together and abstracted, and from this abstract entry is made upon the report sheet.

By now footing these sheets across, you get the total charges and credits to each account, the black figures being debits and the red figures credits, and by footing the columns of material up and down you get all the debits and all the credits to each kind of material account; in this instance, however, the red figures are debits and the black figures credits.

Only one section has the accounts printed down the right hand side of the sheets; the others all leave off with the column headed Total Charges and Credits, and by placing these sheets side by side you have all debits and credits from all sections opposite the account, and the net debit or credit can at once be ascertained by adding these amounts together, and by carrying the net result into the column headed Net Charges or Credit you have only one amount for each account.

All items appearing in this column are then posted to their ledger accounts, and the footings of all material columns are debited and credited to their proper ledger accounts, and the sheets are the most complete and compact journal it is possible to have, as you can tell at a glance every item that went to make up the total of any account, and what section furnished the labor or material.

When any work of this kind is completed the superintendent of tracks sends a report to the auditor, giving the date that the track was finished.

A detailed statement of all labor and material charged is then made up, and this is sent to the civil engineer, who can at once tell from this report whether or not the proper amount of material has been charged, and he reports back in such a form that the information can at once be distributed on the cards provided for a report of the track mileage.

These cards number some seventeen. The first four are used to designate the different kinds of rail, and have spaces provided for the date, kind of paving, remarks, added, removed and amount.

The last three are used for a record of the three kinds of special track work, namely, girder, T and tram, and have additional columns in which to record the name of the maker and the type of work.

These cards, together with those provided for the electric line equipment, are filed in a cabinet back of the proper index cards, giving the name of the street or car house.

If at any time you wish to verify the records of any street, it is a simple matter to take all the cards for that location, put them in your pocket, and check them on the spot.

In closing, I would say that I have a set of blanks with me which I will be glad to show and explain to any member who wishes to look them over, and if it is thought advisable to publish this paper in the report of this convention it will give me great pleasure to arrange them in such a way that they can readily be referred to.

Material and Supplies Account

BY W. M. BARNABY, ACCOUNTANT, BROOKLYN RAPID
TRANSIT CO.

I wish at the outset to state just what I am going to try and explain, and also to give the explanation with sufficient clearness to be understood.

Material and supplies account is but a branch of the book-keeping of any concern, and the method of keeping is to be determined by the results looked for. Some one has said that "book-keeping was but common sense properly applied." I trust that I can prove the truth of this saying as applied to the keeping of material and supplies account. In the first place what are the results to be obtained?

A correct record of all material and supplies received, showing kinds, quantities, price and from whom bought. A correct record of how used, showing the quantities and values as applied to operation, maintenance or construction, as the case may be.

A record which will show at any time the quantity of any particular stock on hand. A record that will show the various kinds of materials and their value charged to any particular expense or account.

These, I think, are the main results looked for in keeping material and supplies account. As a basis for accounting in this department of book-keeping the stock ledger is the first consideration. This book should contain the record of all receipts and all expenditures of material and supplies, and when inventory time comes around gives the value to material and supplies on hand. A stock ledger laid out with three accounts on a page is suggested, a book of 800 pages, giving some 2400 accounts. This should be opened with the accounts running alphabetically for convenience in locating. This is made so as to give each month practically a separate record. A trial balance can be taken monthly if desired.

The postings to this book are made from the record of materials received and from the consumption sheets which I will explain further on.

After the stock ledger comes the book containing the record of materials received, which, for convenience, we will call Book No. 2, the stock ledger being No. 1.

This book gives a complete record of all stock received, showing from whom received, quantity, price, kind, value, order number, Reg. No., how shipped, etc., in fact a complete record of each invoice. From this book the postings to the stock ledger are made. This book is made on the loose leaf plan, which permits a page, when filled up, to be taken out, allowing the posting to the stock ledger without interfering with the work of the receiving department.

We now come to the taking out of stock, and the method of changing to the proper expense or construction account.

All materials and supplies drawn from the stockroom should be drawn by order on the stock clerk, properly signed by those authorized to do so. The form of order is in duplicate, so that each department has a record of what materials or supplies it has used during the month. The order must also state for what purpose drawn. By taking the classification of expense accounts, as adopted by the Street Railway Accountants' Association of America, and giving the numbers and letters, the accounting part becomes very simple.

Any special expense or construction account can be kept by the mere giving of some special number or letter to indicate it. In this connection, it should be remembered that labor charges should be similarly treated to have uniformity of accounting.

Orders on the stock clerk are charged daily on the consumption blotter, which is made up of a number of sheets properly ruled. The consumption blotter is the record of quantities and values of materials and supplies used daily, the name of the materials or supplies being written in the margin and the quantity and the expense account being indicated. The unit of value is also given, being taken from the stock ledger.

After orders on the stock clerk have been posted on the consumption blotter the amounts thus charged are analyzed; first, as to the amount charged to each expense account; secondly, as to the value of each kind of material charged. The first result is, in turn, posted on blanks which are the final accounting as to expense or construction charged. The various accounts to be charged are written in at the top, and the result of the analysis of the consumption blotter is set down daily under the proper heading. At the end of the month the footings of these sheets give the cost of materials and supplies charged to each expense or construction account. The second analysis of the consumption blotter is transferred to other blanks for the record of amount used daily of each kind of materials or supplies, and from this the postings to the stock ledger are made, the value of the materials used balancing with the total amount charged to expense or construction accounts. This form has an additional value, in that it shows just the quantity of each material or supply used monthly, which is a good help to the stock-keeper in determining how large a quantity he should carry, and also enables him to make out his requisitions on the purchasing agent with intelligence. When more than one stock account is kept and goods are being transferred from one storeroom to another a proper transfer order should be used, which will indicate the kind, quantity and value of stock so transferred, and also indicate from and to what stock account transferred. These orders, which should be numbered, are treated by the stock clerk the same as any invoice, and should be posted in the record of materials and supplies account, and charged out in the regular course.

On the question of putting through material and supplies account bills covering large items, chargeable to construction, such as car bodies, trucks, motors, generators, etc., I think the method of direct charging preferable. At the end of each month the stock clerk should report to the auditor the amount of materials

and supplies received, giving a list in detail of bills passing through his record of materials received, also the value of materials and supplies received through transfer from other stock rooms. This blank gives the quantity on hand on the first of the month, shows all debits and all credits to materials and supplies account, and enables the auditor to check the materials and supplies account, as shown by the stock clerk, with the general books of the company.

In connection with the stock ledger a card system is recommended. Each kind of stock having a card showing the quantity on hand, also stating the number of the bin, shelf or drawer in which it is kept. As the orders are filled by the stock clerk the cards are credited with the quantity taken out, so that the quantity on hand at any time can be ascertained. Some may say that the time involved would not warrant the keeping of such a system of cards, but I can state that a system covering between 5000 and 6000 different stock items can be posted in three hours. The value of knowing that a certain article is needed is obvious to any one familiar with the keeping in repair of car and motor equipments. By such knowledge an emergency order for the particular material or supply needed can be given and a "multitude of friction" thus covered. On this card, in addition to showing quantity on hand, a provision is made to show the quantity of such materials and supplies ordered, but not received, which provides against duplicate ordering.

In the matter of manufactured articles, such as commutator bars, field coils, etc., where the amount made up in a month might be sufficient for a much longer period, and it is desired to charge to the expense account only the amount used, the stock clerk would have to set a value upon the product, debit his material and supplies account, the same as for any purchased material or supplies, and set it upon his stock ledger, and reduce by a like amount his report of such expense accounts for the month. The custom is, I think, to charge direct to expense all material taken out of supplies for such manufacture, as though actually used during the month. Only a few of the larger companies do any manufacturing.

I think I have covered the principal features of material and supplies account. It may be that some of the minor details have escaped in condensing this into such a short article, but if there be any particular point not touched upon which some one is interested in, I trust he will not fail to make it known.

In any system of accounting, accuracy is the keystone, and that particular feature should never be lost sight of.

Storage Battery Cars*

BY M. BROCA, MANAGER OF THE COMPAGNIE DES TRAMWAYS DE PARIS ET DU DEPARTMENT DE LA SEINE,
AND M. JOHANNET, ENGINEER OF THE COMPAGNIE GENERALE DE TRACTION, PARIS

This report considers the following question: What is the progress which has been made in the application of storage batteries to traction? (a) From the point of view of construction and reduction in weight of the batteries; (b) from the point of view of duration and cost of maintenance, and (c) from the point of view of their economical and practical application to tramway traction?

The information obtained furnishes no precise answer to these questions. Since 1892 the method of traction by storage battery has not been in favor. Such favorable results as those which have been obtained at Hanover, Germany, are because of particular conditions, and the general opinion is that storage battery traction should be used only when the overhead trolley cannot be operated, or when particular circumstances force its adoption.

At Paris, special conditions, such as trips of 19 km (12 miles) without recharging the batteries, 4 per cent grades and cars seating fifty persons, have compelled the adoption of heavier cars, 17.5 tons (38,580 lbs.), including passengers, than at Hanover. It is thought that if another system could be used it would be much more advantageous. But the city authorities forbid the use of the overhead trolley, so the systems left are in the order of cost of installation, as follows: (1) Storage battery, (2) surface contact, (3) underground trolley.

The cost of operation is just the reverse, but if the saving in interest on capital invested be taken into account it is certain that there will be some cases in which the storage battery system, if well conducted, is the best.

For this are necessary, (1) centralization of batteries, (2) construction by the company itself of strong plates, (3) slowest charging possible of the batteries, (4) proper study of the arrange-

* Abstract of report read before the International Tramway Congress, Paris, September, 1900.

ment of the batteries in the cars and also of their maintenance, (5) proper disposition of termini and charging stations.

The centralization of the batteries diminishes general expenses and increases the facility of inspection. The construction of plates has been done by us at a price not over f.o.10 (2 cents) above the current price of lead.

These batteries may not appear as good as more expensive ones, but they are more economical if everything is taken into account. In Paris they only run half the distance covered at Hanover, but we succeeded in the mechanical operation, and doubt if it can be done more cheaply.

The slow charging of the batteries is better because it does not impair the duration of the charge. By placing the batteries under the cars and using hydraulic methods of operation, we have succeeded in reducing the time of idleness of the car in changing batteries to forty seconds as the minimum, the maximum never being double that. It is to be noticed also that the battery alone is in idleness only one hour, as against ten minutes or fifteen minutes for the entire car under the rapid-charging method.

The arrangement of batteries and mode of handling adopted by the companies have utilized the existing rolling stock, etc., rather than provided more appropriate material.

The proper distribution of termini and stations permits great economy, easy inspection and efficient recharging of the batteries. The difficulties which have surrounded the question of location tend to disappear as its conditions are better understood.

In conclusion, it is easy to see that, while not partisans of the system of storage batteries, we think it ought not to be condemned in principle, if it is desirable to use electric traction and the overhead trolley cannot be adopted.

It is incontestable that this system requires less capital than the others; a portion of this capital is in the old lead, which has a market value; the system requires no special change in the tracks or even in the cars. It also allows of a better solution of the problem by the use of lighter batteries than the present lead ones, or of another method of storing the current, if it be discovered. The better distribution of load on the power plant greatly decreases the expenses of the generating station.

The facility of renewal is important as well as the fact that the track needs no special adaptation, and that the cars are absolutely independent of one another. In the case of light traffic, too, the storage-battery system may even be cheaper than the overhead trolley. The changes in roadway necessitated by particular circumstances, as the change from a single-track to a double-track line, or vice versa, to permit temporarily of street improvements, etc., must be considered. In short, where the overhead trolley is forbidden, as in Paris, the storage-battery system is a temporary solution.

The replies of eleven companies are attached to the report, of which only three use the storage battery—the Hanover Tramway Company, the Electric Traction Company, of Chicago, and the Compagnie Générale des Tramways, of Paris. The Hanover company is the only one which uses this system completely over any of its lines. The other companies employ a mixed method of traction.

In the Hamburg system, from Aug. 1, 1896, to Aug. 1, 1898, the storage battery cars ran 4,296,442,449 km at a cost of operation of 2.093 pfennig per car kilometer for each car. The mixed service trolley and storage was 8,168,888 km at a cost of 1.109 pfennig per car kilometer.

The Chicago Electric Traction Company ran its cars in 1898 over 35 miles of track, 10 miles of which was double track, at a cost of 43.75 centimes per car mile.

The Compagnie Générale des Tramways, of Paris, has a mixed system of trolley and storage battery, obtaining its power from the French Tudor Storage Battery Company for f.o.10 per car kilometer, and pays the operating expenses itself. This price is high because of the few cars, only five going 50,000 car km in a year. For that reason the company thinks the application of the system only feasible in particular cases.

Railway Power Stations*

BY M. THONET, GENERAL MANAGER OF THE SOCIÉTÉ D'ENTREPRISE GÉNÉRALE DE TRAVAUX, AT LIEGE, AND M. D'HOOP, OPERATING MANAGER OF THE SOCIÉTÉ DES TRAMWAYS OF BRUSSELS

This report is based on replies received to the following question sent to the members of the association:

What is the equipment and arrangement of the apparatus in your power station?

* Abstract of paper read before the International Tramway Congress, Paris, September, 1900.

The object of this paper is to give the various methods employed at central plants and the practical results obtained. The information given by the various companies was too incomplete and uncertain to allow of a comparison of the results secured at the various stations, so the report is confined to particular points of certain plants.

Replies were received from sixteen companies, some operating large systems and possessing power plants of considerable magnitude. Several get their power from electric lighting companies already in operation, but still have been able to give information as to the equipment of the generating plant.

The replies received can be divided under the following heads:

1. Capacity of the plant.
2. Generators.
3. Engines.
4. Boilers.
5. Various apparatus.
6. Working of the plant.

CAPACITY

The capacity in the stations of the companies replying to the inquiry varied from that of the plant at Berlin of 13,500 kw in three power houses, and at Marseilles of 5000 kw in one power house to small plants of two generators (one for reserve) of 100 kw each. In general the capacity was double the power necessary for maximum service. As a general rule, for plants whose average power necessary is from 2000 kw to 3000 kw with a maximum of 4000 kw, the unit to be adopted is one-half the normal output, and three of these units should be installed, one to act as a reserve. The average of the maximum output is usually one-third more than that for normal service; but in some lines it is double.

The general proportion of the average current to the maximum is 1 to 1.5 or 1.7, rarely 1 to 2. In large plants composed of units of small power the number of units in operation is varied according to the variations required during the day.

GENERATORS

These are nearly always direct-connected to the engines, except when of less than 100 kw. They are generally compound, but some companies, with a view to the future use of storage batteries, use shunt machines. Their capacity for over-load is 25 per cent for one and one-half hours without more than 60 degs. increase above the surrounding temperature, but sometimes is 40 per cent over-load for one hour.

Most of the companies do not use storage batteries in parallel with the generators. Out of the sixteen companies reporting, six use storage batteries in this way. A seventh uses them because its machines are gas engines, and reduce variations in the current. In the case of gas motors the use of the battery is indispensable to economical operation.

Most of the tramways do not furnish the lighting current. At Hanover, however, of the six generating plants, four furnish lighting by means of special dynamos.

The Tramway Company of Brussels has two lines—one underground and the other overhead trolley, and consequently has two distinct generating systems.

ENGINES

In general, these are compound, except in France, where the one cylinder Farcot is much employed up to 1000 hp. The systems of distribution are the Corliss and Ryder, and the tendency is toward moderately high speed, with direct coupling. The number of revolutions varies from 65 r. p. m. to 120 r. p. m. in France, and from 95 r. p. m. to 150 r. p. m. in Germany and Belgium.

The engines are generally horizontal with jet condensers, except in Germany, where, for want of room, vertical engines with surface condensers are often used. At Berlin notably vertical engines are used in the Van de Kerckhove stations of the Allgemeine Company, which supplies power to the tramways. They are of 4000 hp, and run at from 100 r. p. m. to 110 r. p. m. The steam pressure in the compound engines is from 8 kg to 10 kg, and in the one-cylinder engines, 6 kg to 7.5 kg.

BOILERS

In Germany the boilers generally used are of the Gehre, Steinmüller, Cornwall, or Babcock & Wilcox type; in France and in Belgium the tubular boiler, the Piedboeuf type, the Babcock & Wilcox water tube, and the Denayer. They are of 10 atmospheres and 11 atmospheres for the Gehre boiler, 7 atmospheres to 8 atmospheres for the tubulars, and 8 atmospheres to 9 atmospheres for the Babcock & Wilcox, etc.

The heating surfaces varies from 150 sq. m to 250 sq. m. The grate surface varies from 2.5 sq. m to 6 sq. m per boiler.

Many companies prefer the tubular boiler for large plants, in order to diminish as much as possible the maintenance of the boilers.

In general there is in reserve a third of the boilers necessary for maximum service.

The Tramway Company of Aix-la-Chapelle and the Compagnie Générale Française des Tramway at Nancy are the only ones which employ special boiler appliances. The first does not describe its apparatus or its functions. The second uses the Dubiau apparatus for accelerating the circulation of the water and increasing the output of the boiler. This apparatus has given a saving in fuel of from 15 per cent to 50 per cent in experiments conducted by the Boiler Inspection Association at Marseilles, Paris, Nancy, Douai, Bordeaux, Berlin, Leipzig, Milan and Vienna.

In general, mechanical stokers are not used, though some companies propose installing them. The boilers are cleaned every two or three months.

Few companies use smoke consumers. The chimneys in general are higher than 40 m, with an inside diameter of 3 m at the base and 2 m at the top.

One company, that at Orléans, owned by the General French Tramway Company, uses gas engines for an overhead trolley system. The engines are two of 165 hp each. The generators are direct-coupled, and have an output of 110 kw. The consumption of fuel in the gas generators averaged during a year 750 grammes of anthracite coal per kw-hour, inclusive of the lighting of the plant, and of 450 grammes per car kilometer, representing about 600 grammes of coal per hp-hour. This consumption is exceedingly low, and very economical compared to that of steam engines, even of large capacity.

VARIOUS APPARATUS

In general the feed water is heated only by the exhaust steam of the supply pumps. The temperature is not, on an average, raised by this means above 45 degs. C. Three stations use Green economizers. Four companies, having nine stations, use apparatus for superheating steam, and the degree of superheating varies from 40 degs. to 115 degs. C. All the apparatus is within the boilers. A single station reports the resultant saving at 3 per cent, which seems much lower than what is to be expected from superheating properly carried out.

No station reports the use of automatic lubricating systems. Condensers are used in all well planned stations where there is not an abundance of water. They are of two kinds. The "tower," rising to a great height and occupying small ground space, and the type more particularly used in France, are based on the breaking up of the water in contact with the atmosphere. This latter apparatus is placed above a basin in the open air and presents the inconvenience of taking up much room.

Only two companies use purifiers of water supply. But this is indispensable when some water is used, if incrustation and corrosion of boilers is to be avoided. A good purifier ought to be automatic, but its action should be watched very closely by taking samples once a day.

THE WORKING OF THE PLANT

The results most favorable for the vaporization obtained from various fuels are those of boilers with interior fire boxes, though little used by electric traction companies on account of their bulk. Their slow steaming properties, as compared with tubular boilers, is also an objection where it is necessary to rapidly follow the variations of load. The consumption of steam, leaving aside one plant not using a condenser, varies from 5.72 kg to 8.67 kg (12.6 lbs. to 19.1 lbs.) per ihp. The establishments using superheated steam give the greatest consumption. The saving in consumption seems to result from the construction of the boiler, and the method of distributing the steam.

The valve engines of the Corliss type are more economical than the slide-valve engines.

In the consumption of oil and lubricants there are enormous differences, both of 1 to 8 for cylinder oil, and of 1 to 20 for other oils. This question has not been sufficiently investigated in several power stations.

It is very difficult to state any conclusions as to running expenses from the figures furnished.

The conclusions to be drawn are that in large companies it is necessary to adopt compound steam engines with direct-connected generators, and to operate condensing. In average establishments it is advisable to add a storage battery to the plant. In small plants, if fuel is dear, the use of gas generators and gas engines give very good results.

The Operation of Secondary Railways*

B. E. A. ZIFFER, PRESIDENT OF SEVERAL RAILWAY LINES
IN AUSTRIA

This paper is based on replies received to the following question sent to members of the association:

What are the advantages and disadvantages of the operation of local or secondary railways by independent companies, compared to their operation by the large trunk railroads to which they are tributary?

The only company to reply thoroughly to this question was the Société Nationale des Chemins de fer Vicinaux, of Belgium. This company, which is owned and controlled by the Government, has seventy-six lines in operation, all narrow gage, having a length of 1641 km. Of these it operates itself only two, aggregating in length 15.65 km. For the others a system of leasing is employed. The operation is given over to contracting companies, thus insuring decentralization and a sharing in the business by private capital. The cession is made by public adjudication, and for an indemnity calculated from special rules generally including a fixed sum, plus a percentage of the gross receipts.

There are three classes of these companies:

1. Companies operating lines of the National company and at the same time other lines on their own account or for third parties.
2. Companies which operate more than one line, but only those of the National company.
3. Companies operating only one line.

There are three methods of operation taken into consideration by M. Ziffer, deduced from his own experience:

1. Operation in trust or by management, which is the most desirable, on account of the freedom of the administrative officers and the absence of complication as part of a great railway system. Its managers can devote themselves solely to the betterment of their road without being influenced by the policy of the road with which it connects.

2. The operation of the road by a railway (private or governmental) to which it is attached or not. This method is only to be recommended when the capital of the secondary line is not sufficient to equip it with proper rolling stock, and with the necessary reserve fund. It is necessary also that the secondary line keep as much control as possible on the organization of the service and rates, and that the operating company share in the stock of the road.

3. Lease of the operation to an entrepreneur or operator. This method is especially desirable, and offers great advantages to both contracting parties.

Of these three systems the operation by a management is the most rational, and gives the best results, because the administration in trust guarantees absolute independence and allows a taking into account of the needs of trade, at the same time guarding the best interests of the project.

Car Heaters*

BY C. DE BURLET, GENERAL MANAGER OF THE SOCIÉTÉ
NATIONALE DES CHEMINS DE FER VICINAUX

This paper is based on replies to the following question: What has been your experience with car heaters?

Since the report on this question at the convention of the International Tramway Association at Cologne, in 1894, no great progress has been made in car heating.

While this problem has been successfully solved for long-distance lines, the situation on tramways and short steam and electric lines is different, the elements to be considered being so various. The large number of windows, the doors at each end, the frequent stops causing the simultaneous opening of both doors, and consequent introduction of a cold current of air, are the principal causes preventing good effects, even from systems of heating better than those now in use. Added to this is the economy necessary on local lines, where the cost of first installation should not be above 12 per cent or 15 per cent of the value of the car.

The Convention of 1894 decided that it was not worth while to heat cars circulating within cities, but it was often necessary to heat suburban trains and cars. This report has been justified by the information gained this year. The heating systems to be

* Abstract of paper read before the International Tramway Congress, Paris, September, 1900.

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considered herein apply only to interurban or suburban tramways. Of these systems there are five:

- (1). Heating by movable apparatus, *i. e.*, warmers of various kinds, etc.
- (2). Heating by stoves.
- (3). Heating by hot air.
- (4). Heating by steam or hot water.
- (5). Heating by electricity.

The first two of these have not been improved. Their disadvantages have often been pointed out. The system of heating by stoves is the simplest and most economical. The system of movable apparatus is more costly than that by stove. On a number of Belgian lines the cost for stoves was about f.35 per car, and the cost for fuel, coke or anthracite did not exceed 25 centimes for fifteen hours' service.

In heating by hot air the air is obtained from a fire either outside or within the car, with a system of conducting tubes to circulate the air. The cost of installation in one case (the Italian Northern, of Milan) was f.350 per car, the expense of operation 5 centimes per car-km. The system requires much care on the part of the train hands to keep the temperature within proper limits. At Utrecht heating by gas has been tried, but at a rather high cost of maintenance and operation, 80 centimes per day.

Heating by steam or hot water can be done in two ways.

(a). By distinct apparatus for each car.

(b). By taking the source of heat from either the locomotive or a boiler in the baggage car.

The first method has been applied to hot-water heating, but not to steam heating in the knowledge of the writer. All of the hot-water systems are of the thermosiphon type, and only vary as to the arrangement of distributing pipes. The cost of installation is as high as f.350 per car; of operation, 33.4 centimes per car day. The fuel employed is coal or charcoal. This system gives good results, the expenses are low, inspection easy, and it demands no special set of workmen. The greatest objection is the danger of freezing in the pipes. In spite of precautions, such as wrapping the pipes, etc., ice often forms in the tubes, necessitating their being taken apart.

The second system of this class, continuous heat by steam or hot water, has not been described by any of the companies asked. The Société Nationale des Chemins de fer Vicinaux of Belgium has made some experiments, which, however, have not been entirely satisfactory, because of the mixed composition of its trains. The results have been satisfactory as regards the temperature secured. With a pressure of 30 lbs. per sq. in. the temperature was raised 10 degs. to 12 degs. C. above that of the outside air. There was no freezing of tubes, etc. The cost of installation was f.350 per car. In this system, however, the same dangers of freezing as in the first system are present, in fact are even greater, because the source of heat, the locomotive, is often detached from the cars.

Only one company reports the use of electric heaters, the tramway company of Hanover, which used them on its suburban cars. The cost of installation was M.40 per car, and of operation about 10 pig. per car-hour, or about f.12 for a service of sixteen hours.

None of the systems examined has shown any real advance on what has been done previously, probably because of the peculiar conditions of the problem, and their variation from line to line. Therefore, it is not possible to formulate any conclusions, and the matter can well be left open for consideration at future meetings of the Union.

Power Distribution for Electric Railways*.

BY M. VAN VLOTEN, ELECTRICAL ENGINEER AT BRUSSELS

This paper is based upon answers received from members of the association in reply to the question: "What is the best system of power distribution for long electric railways?"

This problem is very complex, and the question is too general for any solution, except in well determined cases. We will therefore be content with the examination of the systems employed or proposed at present, *viz.*:

- (A). Distribution by direct current.
- (B). Distribution by alternating current.
- (C). Distribution by alternating and direct current at the same time.

(A). *Distribution by direct currents:*

(1). Ordinary distribution at 550 volts or 600 volts, and single central station: This is the most general system for city and suburban electric railways, but is not well suited to lines having long extensions, because the low voltage used makes the loss excessive when the power is transmitted any considerable distance.

* Abstract of paper read before the International Tramway Congress, Paris, September, 1900.

The advantages all lie in those resulting from the use of a single central station, as ease of surveillance, reliability of operation, continuous-current motors, etc. The disadvantages are the cost of distribution, increasing rapidly with the distance, and danger of electrolysis. In ordinary cases this system is not advisable for lines longer than 8 km or 10 km from the power house or central station.

(2). Same distribution, but with two or more central stations: Compared with the former, the advantages of this system are: Important reduction in outgoing and return feeders, reduction in line losses and in the dangers of electrolysis. The disadvantages of several power stations are increased cost of installation and operation, less facility of surveillance, etc.

(3). Same distribution as in No. 1, but with boosters: Its advantages are those of the single central station, and sensible reduction in copper. The use of boosters allows an extension of the zone of action of the power house without any change in the station equipment. Its disadvantages are higher net cost per watt-hour, and greater complications at the power station. In most cases this system has many advantages, except with very long lines or with very heavy traffic.

(4). Distribution by the three-wire system, the rails serving as a neutral conductor. The advantages of this system are reduction of the weight of copper in the distribution, single central station, etc. But this system has not met with general adoption, because of the difficulty of maintaining equilibrium between the two sides of the system, difficulties with insulation at crossings, turnouts, etc.

(5). Distribution at high tension, with secondary stations reducing the voltage to 550 volts or 600 volts.

(a). Parallel system: This is little used, because of inherent troubles in high-voltage direct-current motors and generators, and the transmission lines are more expensive to install the higher the voltage. It is also more difficult to maintain the insulation of cables as the voltage increases.

(b). Distribution in series (Thury system). This system is suited for long distances (30 km to 40 km and upward). It consists of distributing power by direct-current generators, and having at the points of use direct-current motors, which, in turn, drive standard 500-volt to 600-volt railway generators. The generators and motors are series-wound and are connected in series. As there are several generators and several motors on each circuit, the voltage at the terminal of each is reduced to reasonable limits. The final distribution is on the ordinary multiple-arc system. The advantages of this system are reduction in the weight of copper in the transmitting lines, economical transmission and adaptability of the receiving stations, either for electric lighting or distribution of power. It has the great advantage of every distribution in series that the current has to pass through all the generators and receivers. This system is not well adapted to use by tramways, being more applicable to power transmission and electric lighting.

(6). Traction by storage battery.

(a). Ordinary system: This system is suited to lines having a light traffic. It has great advantages from the point of view of economy of installation, absence of dangers of electrolysis, facility of using any track, etc.

Its disadvantages are: Greater weight of car, etc.; less reliability of operation, increased number of charging stations, unless the system is limited to lines of 15 km to 20 km, because of the limited capacity of the batteries.

(b). Mixed system, trolley and storage batteries. This system permits the operation of lines longer than 15 km or 20 km. Its value depends on the extent to which the trolley system can be used, but this consideration aside, it does not present any marked advantages over the preceding.

(B). *Distributions using polyphase currents.*

One-phase alternating-currents are not suitable for electric traction, because the one-phase, asynchronous motors do not start under a load, and demand a relatively high weight of copper for the conductors, and finally the output of the alternators and transformers is low, etc. Two-phase motors are also impracticable, as they necessitate the use of four conductors. The system to be considered, therefore, is the three-phase.

The systems under B can be divided into two kinds. (a) Systems in which the car motors are supplied directly with the line potential, and (b) where transformers are used. The former is little used, because of the difficulty of insulation, greater danger to the public, self-induction of the rails, disturbance in telegraphic and telephonic communications, etc. By the second system these difficulties are removed almost entirely.

(C). *Distributions by the alternating direct-current system.*

This system can be divided into (a), that in which the initial current is generated at a high potential, and (b), where low-voltage generators are used, and the current is stepped up to the transmission voltage. The advantages of both lie in the use of direct-

current motors, with distribution at high potentials. The disadvantages are the cost of the transforming machinery and the loss in efficiency and simplicity.

In concluding, I will present a table taken from an article in the *Electrotechnische Zeitschrift*, by M. Huber, giving certain costs of each of the different systems, as applied to a road 20 km in length, operating five trains of 20 (metric) tons each, each requiring about 20 kw. The figures given are only those in which the systems differ from each other. Those costs which are common to all are omitted.

Type of System	Electrical Equipment of Power Station	Copper in Trolley and Feeders	Transformers	Sub-Station Apparatus	Transmission Line	Total Cost	Interest and Depreciation. Copper at 6 per cent; Machines at 10 per cent.	Annual Wages of Employees at Stations	Sum of Interest, Depreciation and Annual Wages
<i>Power Station in Middle of Line</i> Direct current.....	70,000	45,000	.....	.....	.....	115,000	9,700	3,600	13,300
Alternating current..	70,000	41,000	24,000	.....	.....	135,000	11,860	3,600	15,470
<i>Power Station at End of Line</i> Direct current.....	70,000	180,000	.....	.....	.....	250,000	17,800	3,600	21,240
Alternating current..	70,000	44,000	24,000	.....	.....	138,000	11,040	3,600	15,640
<i>Power Station at End of Line</i> Alternating direct current.....	100,000	28,000	.....	80,000	10,000	218,000	20,280	7,200	27,480
<i>Power Station 10 km from Middle of Line</i> Alternating direct current with sub-station at middle of line.....	70,000	45,000	.....	100,000	25,000	240,000	21,100	7,200	28,300
Purely alternating system.....	70,000	41,000	24,000	.....	25,000	160,000	13,370	7,200	18,770

All figures are cost in francs.

The Rating of Motors*

BY M. MACLOSKIE, CONSULTING ENGINEER OF THE COMPAGNIE INDUSTRIELLE DE TRACTION IN FRANCE

This paper is based upon the following questions: Is a standard rating for electric motors and generators possible? What should it be based upon? Can the same rating be applied to other electrical machinery used on electric railways?

The reporter reverses the order of the questions, and answers the last first. That is, he thinks it possible to adopt a single method of rating applicable to all electric railway apparatus. For example, for car controllers the criterion is the maximum current-carrying capacity, either with or without resistances. The same is true of the circuit breakers, etc., although, as all of this auxiliary apparatus is usually purchased and always used, together with the car equipment, its rating can be determined by that of the motor.

As to the second part of the question, when the basis of rating has been settled, it would seem a simple matter to prepare tables, from which the output of motors working under practical conditions can be given.

Considering now the basis of rating, the writer believes the present basis, *i. e.* horse-power, to be unsatisfactory, for the reason that such a rating does not always convey an idea as to the length of time at which the motor can carry its load. For this reason certain manufacturers have suggested a rating based on the output, when the heating of the motor during one hour's operation reaches a given value.

The following rule is, therefore, proposed: The nominal power is to be rated by the work expressed in kilowatts, furnished to the motor under a regulation which fixes the rise in temperature, as measured by a thermometer, either on the fields or the armature, to not more than 750 deg. C. above the temperature of the surrounding medium, which should be from 10 degs. to 20 degs. C.

The writer then discusses the question of speed, efficiency, etc.,

* Abstract of paper read before the International Tramway Congress, Paris, September, 1900.

and finally recommends a designation for motors, made up of three facts, which, for convenience, can be designated as A, B, and C.

A is the current, in milliamperes, required to produce 1 kg of tractive effort at the periphery of wheels 800 mm in diameter. This factor varies to a certain extent with the speed, and is larger as the speed increases.

B is the current, in amperes, required to compensate for all mechanical and electrical losses in the motor. It is, in effect, a measure of the efficiency, but should, of course, be considered in connection with its relation to A, and to the weight of the motor. In modern motors B is not far from the weight of the motor, multiplied by A and divided by 5000. For very heavy motors this rule is only approximate.

C is the kilowatts input of the motor under such a load that operating continuously under it for one hour the temperature of the motor does not rise 75 degs. C. above the surrounding air, as described above.

The author recommends these data to be written in the order C, A, B. He gives as constants for several well known motors, the following:

G. E. 1200 A = 125, B = 30.

G. E. 2000 A = 161, B = 45.

G. E. 51 B-6 C = 70, A = 162, B = 29.

Effect of Introducing Electricity on Tramways*

BY E. VON PIRCH

Abstract of report submitted by Director E. von Pirch, of Barmen-Elberfeld, based on replies received to the following questions:

What results were obtained from the introduction of electricity on your lines in regard to (1) the traffic; (2) the operating expenses; (3) the net profits?

The replies received showed that the change was only made in a number of large cities by horse car lines and roads operating locomotives, and the overhead trolley was the system generally chosen. The replies, however, are sufficiently exhaustive to permit of general conclusions to be drawn.

The following advantages of electric over horse service were brought forward:

(1) On account of the greater average speed, the number of cars doing the same service could be decreased and the number of trips per day increased; the same holds true for the employees. On account of the greater speed also the cars are finding more favor with the public.

(2) As trailers can be used, the elasticity of the electric system becomes an admirable feature, as it is in a better position to care for the largely increased traffic on Sundays and holidays.

(3) The electric draw-bar pull makes it possible to traverse roads which on account of their heavy grades could not be traversed by horse cars.

(4) The cost of operation of electric cars where dense traffic exists in thickly populated districts, and even where cost of current is high, is less than that of horse cars, which cost is even lessened when trailers are used.

(5) On account of the above advantages lower fares can be charged without endangering the profits of the company.

(6) On down grades no power is wasted.

(7) No time is wasted in hitching up and unhitching horses.

(8) The streets are kept cleaner, the pavement is abused to a less degree, and the traffic is not so much interfered with.

(9) It is easier for an electric car to surmount difficulties encountered on the road while work is being done on the same.

(10) As the horse car must be made light on account of the pulling capacity of the horse, the weight need not be considered with an electric car, which can be designed with a view to giving comfort to the passengers. In fact, larger and heavier motor cars and trailers can be used, not beyond the capacity of the motors, without materially increasing the operating expenses.

It has also been found that the electric service possesses the following advantages when used on small trains with small headway, when compared to locomotives: It is cheaper, can surmount heavy grades, and does not annoy the public with smoke, steam and noise.

Actual statistics submitted in reply to the above questions show the following distinct advantages:

(1) Increase in traffic, and therefore more passengers per km traveled. This was shown at Havre, Marseilles, Barmen, Hamburg, Leipzig, etc.

* Abstract of paper read before the International Tramway Congress, Paris, September, 1900.

(2) Extension of the system from the city to neighboring towns, especially over hilly roads where horse and steam cars are out of the question.

(3) The cost of operation is reduced and the net profits are increased, as shown at Aachen, Barmen, Hamburg, Leipzig, etc.

(4) The possibility to reduce fares and introduce and extend the system of transfers.

(5) The installation of more comfortable and larger cars, without materially increasing the operating expenses.

Among the special considerations which affect the decision as to the introduction of electricity the following should be mentioned: Money to be paid to the city to pay for pavement of streets; the cost of current; the voluntary or compulsory use of a costly electric system; the conditions imposed by the franchise and matters relating to the capitalization; æsthetic conditions imposed by the authorities which require expensive construction; the duration of the franchise; taxes to be paid to the city, etc.

It has, in fact, been aptly stated by a well known railway man that the electric service is only advantageous where the distances traveled are great, the traffic large, where the franchise extends over a long period, and where the system to be used and the condition of the road have been carefully considered. On an even roadbed, and without the above conditions being fulfilled, the electric system cannot easily compete against the horse.

We arrive, therefore, at the following general conclusions: The overhead electric system possesses advantages over the horse car system only when the trains run frequently, over long lines with heavy traffic, especially where many grades are present, provided that the franchise extends over a long enough period and when it imposes no impossible conditions.

Representatives of Electrical and Street Railway Papers at the Kansas City Convention

James H. McGraw, *STREET RAILWAY JOURNAL* and *American Electrician*, New York.

Henry W. Blake, *STREET RAILWAY JOURNAL*, New York.

J. B. Bennett, *STREET RAILWAY JOURNAL*, New York.

James R. Cravath, *STREET RAILWAY JOURNAL*, Chicago.

C. S. McMahon, *STREET RAILWAY JOURNAL*, Chicago.

W. K. Beard, *STREET RAILWAY JOURNAL* and *American Electrician*, Philadelphia.

J. M. Wakeman, *Electrical World and Engineer*, New York.

J. V. S. Church, *Electrical World and Engineer*, Chicago.

Frank E. Colbert, *Electrical Review*, Chicago.

Stephen H. Goddard, *Electrical Review*, New York.

Charles W. Price, *Electrical Review*, New York.

George A. Barnes, *Street Railway Review*, Chicago.

Charles B. Fairchild, Jr., *Street Railway Review*, Chicago.

Fred. Kenfield, *Street Railway Review*, New York.

H. J. Kenfield, *Street Railway Review*, Chicago.

Daniel Royce, *Street Railway Review*, Chicago.

Henry H. Windsor, *Street Railway Review*, Chicago.

Charles H. Perrine, *Tramway and Railway World*, Chicago.

Charles Sanford Clarke, *Western Electrician*, Chicago.

W. Forman Collins, *Western Electrician*, Chicago.

C. E. Kammeyer, *Western Electrician*, Chicago.

William E. Keily, *Western Electrician*, Chicago.

T. E. Crossman, stenographer, Street Railway Association, New York.

A. B. Weaver, stenographer, Accountants' Association, Buffalo.

Fire Destroys Car Houses at Cleveland

The car houses of the Cleveland & Eastern Railway Company at Gates Mills were destroyed by fire a few days ago, entailing a loss of \$100,000. Seven new cars, recently received from the manufacturer, and valued at \$5,000 each, were lost, also two steam locomotives, formerly used by the company. The power house, which adjoins the car houses, was saved after a desperate struggle with the flames.

Accident in Paris Underground Road

Two trains of the Metropolitan Underground Railroad, of Paris, collided Oct. 19, and twenty-nine persons were injured. The accident occurred between the Exposition Station, on the Champs Elysées, and the Place de la Concorde. A train entered the Place de la Concorde Station, backed out again, and the train following, owing to a misunderstanding of signals, crashed into the rear carriage. Luckily, both trains were going slowly. Nevertheless, the

shock smashed the end of the car, shattered the windows of both trains, and extinguished the electric lights. There was great excitement, the darkness in the tunnel adding to the general alarm.

Ladies at the Kansas City Convention

Mrs. W. S. Dimmock, Council Bluffs, Ia.

Mrs. John M. Roach, Chicago.

Mrs. F. L. Roach, Chicago.

Mrs. John Ehrhardt, Cleveland.

Mrs. W. G. McDole, Cleveland.

Mrs. Ira A. MacCormack, Cleveland.

Mrs. W. J. White, Cleveland.

Mrs. W. H. Harris, Cincinnati.

Mrs. J. B. Hogarth, Denver, Col.

Mrs. G. Van Ginkel, Dallas, Texas.

Mrs. Robert S. Goff, Fall River, Mass.

Mrs. H. F. MacGregor, Houston, Texas.

Mrs. James M. Jones, Indianapolis, Ind.

Miss L. R. Klott, Jersey City, N. J.

Mrs. Walton H. Holmes, Kansas City.

Mrs. C. F. Holmes, Kansas City.

Mrs. L. E. James, Kansas City.

Mrs. W. A. Satterlee, Kansas City.

Mrs. J. W. Carter, Kansas City.

Mrs. W. G. Becker, Kansas City.

Mrs. W. E. Kirkpatrick, Kansas City.

Mrs. D. W. Dozier, Kansas City.

Mrs. Charles Grover, Kansas City.

Mrs. Edward Butts, Kansas City.

Mrs. H. C. Schwitzgebel, Kansas City.

Mrs. E. C. Foster, Lynn, Mass.

Mrs. E. R. Carrington, London, Ont.

Mrs. Frank G. Jones, Memphis.

Miss McLean, Memphis.

Miss Holst, Memphis.

Mrs. James F. Wattles, Merrimac, Mass.

Mrs. F. S. Donnell, Ottawa, Ill.

Mrs. W. L. Jenks, Port Huron, Mich.

Mrs. J. R. Graham, Quincy, Mass.

Mrs. Albert M. Patten, Topeka, Kan.

Mrs. J. M. Smith, Toronto, Canada.

Mrs. E. J. Spencer, Venice, Ill.

Mrs. A. H. Stone, Worcester, Mass.

Mrs. A. A. Anderson, Youngstown, Ohio.

Mrs. H. H. Vreeland, New York.

Miss Hoff, New York.

Miss Wells, New York.

Miss Crosby, New York.

Mrs. F. E. Donohoe, New York.

Mrs. Henry J. Davies, Cleveland.

Miss W. E. Cooke, Chicago.

Mrs. Henry D. Cooke, New York.

Mrs. W. P. Cospier, Chicago.

Mrs. James Connolly, St. Louis.

Mrs. Charles S. Clark, Philadelphia.

Mrs. R. S. Deming, Chicago.

Mrs. T. J. Callinan, Chicago.

Mrs. Victor Angerer, Philadelphia.

Mrs. Theodore P. Bailey, Chicago.

Mrs. W. B. Allen, Jersey City, N. J.

Mrs. H. M. Grier, New York.

Mrs. John M. High, New York.

Mrs. W. R. Gatton, Chicago.

Mrs. W. H. Cord, Chicago.

Mrs. J. G. McMichael, Chicago.

Mrs. Peter D. Milloy, Jersey City, N. J.

Mrs. R. T. Lane, Cleveland.

Mrs. A. L. Haasis, Jersey City, N. J.

Mrs. S. M. Johnson, Schenectady.

Mrs. A. A. Hilton, St. Louis.

Mrs. John C. Robinson, Philadelphia.

Mrs. H. A. Russell, Schenectady.

Mrs. H. L. Thompson, St. Louis.

Mrs. S. J. Minton, Schenectady.

Mrs. R. E. Mills, Bridgeport, Conn.

Mrs. Frank K. Mills, Cincinnati.

Mrs. J. G. Nitchy, Kansas City.

Mrs. F. H. Newcomb, Brooklyn, N. Y.

Mrs. E. P. Morris, New York.

Miss M. Biergman, New York.

Miss A. Biergman, New York.

Mrs. D. F. Webster, Sedalia, Mo.

Mrs. W. F. Waller, Sedalia, Mo.

Mrs. F. W. Kinmouth, Sandy Hill, N. Y.

LIST OF MEMBERS OF THE ASSOCIATION IN ATTENDANCE AT THE CONVENTION

Akron, Ohio.—L. E. Beilstein, general manager Northern Ohio Traction Company.

Asbury Park, N. J.—S. F. Hazelrigg, general manager Atlantic Coast Line Electric Railroad Company.

Atchison, Kas.—J. A. Bendure, general manager Atchison Railway, Light & Power Company.

Atlanta, Ga.—Ernest Woodruff, president; J. R. Gordon, director, Atlanta Railway & Power Company.

Augusta, Ga.—D. B. Dyer, president; C. O. Simpson, secretary and treasurer, Augusta Railway & Electric Company.

Birmingham, Ala.—J. B. McClary, general manager; D. B. Dimick, electrical engineer; George H. Harris, chief engineer, Birmingham Railway & Electric Company.

Boston, Mass.—Charles S. Sergeant, vice-president; Henry L. Wilson, auditor, Boston Elevated Railway Company.

Bridgeton, N. J.—H. J. Crowley, vice-president; B. Frank Hires, general manager, Bridgeton & Millville Traction Company.

Brockton, Mass.—Elwin C. Foster, general manager Brockton Street Railway Company.

Brooklyn, N. Y.—Clinton L. Rossiter, president; Eugene Chamberlin, superintendent of equipment; William Robbins, Jr., division superintendent; Newton W. Bolen, division superintendent; Giles S. Allison, general sales agent, Brooklyn Heights Railroad Company.

Brookfield, Mass.—E. P. Shaw, Warren, Brookfield & Spencer Street Railway Company.

Buffalo, N. Y.—C. A. Coons, superintendent Buffalo Railway Company.

Camden, N. J.—Walter E. Harrington, general manager Camden & Suburban Railway Company.

Chester, Pa.—John A. Rigg, president; Joseph C. Lugar, superintendent, Chester Traction Company.

Chicago, Ill.—H. M. Sloan, general manager Calumet Electric Street Railway Company; Robert McCulloch, general manager; T. C. Penington, treasurer; C. N. Duffy, auditor; C. E. Wilson, chief engineer; M. O'Brien, master mechanic; John Sills, assistant master mechanic; C. E. Lund, draughtsman, Chicago City Railway Company; John M. Roach, president; T. A. Henderson, general superintendent; F. L. Roach, Chicago Consolidated Traction Company; E. R. Gilbert, general manager Chicago Electric Traction Company; John M. Roach, president; J. Millar, master mechanic; George Voigt, electrician, Chicago Union Traction Company; William Walmsley, superintendent South Chicago City Railway Company.

Cincinnati, Ohio.—W. H. Harris, Cincinnati Street Railway Company.

Cleveland, Ohio.—John Ehrhardt, assistant secretary; C. B. Easty, master mechanic, Cleveland City Railway Company; Ira A. MacCormack, general manager; W. G. McDole, auditor; E. C. Faber, general passenger agent; W. J. White, Cleveland Electric Railway Company.

Colorado Springs, Col.—Frank C. Lawton, superintendent Colorado Springs Rapid Transit Railway Company.

Columbia, Pa.—Frank S. Given, general manager Canostoga Traction Company.

Columbus, Ohio.—Michael S. Hopkins, general superintendent; P. V. Burington, secretary and auditor, Columbus Railway Company.

Council Bluffs, Ia.—W. S. Dimmock, general manager; W. G. Denny, foreman of shops, Omaha & Council Bluffs Railway & Bridge Company.

Dallas, Tex.—G. Van Ginkel, president Dallas Consolidated Electric Street Railway Company.

Danville, Ill.—Samuel L. Nelson, general manager; Harry Evans, Danville Street Railway & Light Company.

Dayton, Ohio.—Charles L. S. Tingley, secretary and treasurer People's Railway Company.

Denver, Col.—J. B. Hogarth, Denver City Tramway Company.

Des Moines, Ia.—A. G. Maish, secretary; W. G. Owens, superintendent; E. R. Emmons, J. E. Welch, Thomas Marlow, Des Moines City Railway Company.

Davenport, Ia.—James F. Lardner, general manager; John G. Huntoon, general superintendent; John D. Fish, electrical engineer, Tri-City Railway Company.

Detroit, Mich.—A. L. Parker, second vice-president Detroit, Rochester, Romeo & Lake Orion Railway Company.

Fall River, Mass.—Robert S. Goff, president Globe Street Railway Company.

Findlay, Ohio.—C. D. Kinney, vice-president and treasurer; Charles F. Smith, manager, Findlay Street Railway Company.

Fond du Lac, Wis.—T. F. Grover, president Fond du Lac Street Railway & Light Company.

Hamilton, Ont.—C. K. Green, manager; J. B. Griffith, purchasing agent, Hamilton Street Railway Company.

Harrisburg, Pa.—Mason D. Pratt, engineer Harrisburg Traction Company.

Hazleton, Pa.—C. A. Bragg, Lehigh Traction Company.

Hoboken, N. J.—W. S. Hall, general superintendent North Hudson County Railway Company.

Houston, Tex.—H. F. MacGregor, vice-president and general manager Houston Electric Street Railway Company.

Indianapolis, Ind.—James M. Jones, second vice-president; W. F. Milholland, treasurer and assistant secretary; Edward P. Burch, consulting engineer, Indianapolis Street Railway Company.

Jackson, Miss.—Frank G. Jones, Jackson Railway, Light & Power Company.

Jersey City, N. J.—E. D. Hibbs, auditor; G. F. Chapman, general superintendent; A. W. Pratt, roadmaster, North Jersey Street Railway Company.

Johnstown, Pa.—H. C. Evans, director Johnstown Passenger Railway Company.

Joliet, Ill.—Samuel G. De Coursey, president; F. E. Fisher, general manager; A. S. Kibbe, engineer, Joliet Railway Company.

Kalamazoo, Mich.—J. B. Foote, chief electrician; R. L. Rand, general superintendent, Michigan Traction Company.

Kansas City, Kas.—W. H. Gabriel, vice-president; Herbert W. Wolcott, secretary; E. E. Comb, manager; H. E. Gabriel, assistant manager; H. S. Neefe, superintendent; W. H. Hammond, passenger and claim agent; C. K. Stieg, electrical engineer, Kansas City-Leavenworth Railway Company.

Kansas City, Mo.—W. O. Hands, general manager; Charles E. Jack, auditor; H. De Coursey, East Side Electric Railway Company; Walton H. Holmes, president; C. F. Holmes, general manager; L. E. James, vice-president; D. B. Holmes, counsel; W. E. Kirkpatrick, secretary and treasurer; J. A. Harder, auditor; W. A. Satterlee, superintendent; J. W. Carter, assistant superintendent; H. C. Schwitzgebel, purchasing agent; D. W. Dozier, chief engineer; W. G. Becker, master mechanic; Charles Grover, electrical engineer; Edward Butts, line engineer, Metropolitan Street Railway Company.

Knoxville, Tenn.—Robert Kinsell Howard, superintendent Knoxville Traction Company.

Lebanon, Pa.—Dr. Walter A. Rigg, director; K. A. Fichthorn, director, Lebanon Valley Street Railway Company.

Lowell, Mass.—E. C. Foster, general manager Lowell, Lawrence & Haverhill Street Railway Company.

Louisville, Ky.—T. J. Minary, president; T. H. Minary, assistant superintendent of construction; Samuel G. Boyle, secretary and treasurer, Louisville Railway Company.

London, Ont.—C. E. A. Carr, general manager, secretary and treasurer; E. R. Carrington, London Street Railway Company.

Lynn, Mass.—E. C. Foster, general manager Lynn & Boston Railroad Company.

Memphis, Tenn.—Frank G. Jones, vice-president and general manager Memphis Street Railway Company.

Meriden, Conn.—N. H. Heft, president Meriden Electric Railroad Company.

Meridian, Miss.—John Kamper, Meridian Street Railroad & Power Company.

Merrimac, Mass.—James F. Wattles, director; Charles S. Clark, director, Haverhill & Amesbury Street Railway Company.

Milwaukee, Wis.—John I. Beggs, general manager; T. E. Mitten, general superintendent; G. J. Sunny, special agent, Milwaukee Electric Railway & Light Company.

Nashville, Tenn.—F. W. Child, director Nashville Street Railway.

New Orleans, La.—W. B. Brockway, assistant secretary and auditor New Orleans & Carrollton Railroad Company.

New York, N. Y.—Herbert H. Vreeland, president; Dr. J. J. Higgins, physician, Metropolitan Street Railway Company.

North Adams, Mass.—W. T. Nary, superintendent Hoosac Valley Street Railway Company.

Norristown, Pa.—John A. Rigg, president; Samuel D. Missimer, chief engineer, Schuylkill Traction Company.

Oil City, Pa.—James H. Forbush, superintendent Oil City Street Railway Company.

Omaha, Neb.—W. A. Smith, general manager; F. A. Tucker, general superintendent, Omaha Street Railway Company.

Ottawa, Ill.—F. S. Donnell, president Ottawa Railway, Light & Power Company.

Ottawa, Ont.—J. E. Hutcheson, superintendent Ottawa Electric Railway Company.

Pasadena, Cal.—W. H. Smith, general manager Los Angeles & Pasadena Electric Railway Company.

Peoria, Ill.—L. E. Myers, general manager; N. C. Draper, superintendent, Peoria & Pekin Terminal Railway Company.

Philadelphia, Pa.—John A. Rigg, president; C. C. Long, electrical engineer, Holmesburg, Taconey & Frankfort Electric Railway Company; John A. Rigg, president; George Hoeger, superintendent, Roxborough, Chestnut Hill & Norristown Railway Company.

Pittsburgh, Pa.—George S. Davison, general manager Monongahela Street Railway Company; Charles Fitzgerald, superintendent; Robert T. Todd, general master mechanic, consolidated Traction Company; C. S. Mitchell, auditor United Traction Company.

Port Chester, N. Y.—G. Stanley Heft, electrical engineer Port Chester Street Railway Company.

Portland, Maine.—W. R. Wood, president; E. A. Newman, general manager; C. C. Pierce, general electrician, Portland Railway Company; William E. Dow, assistant superintendent; George E. Raynes, starter, Portland & Yarmouth Electric Railway Company.

Port Huron, Mich.—A. Dixon, president; W. L. Jenks, treasurer; H. A. Dixon, manager, City Electric Railway Company.

Quincy, Ill.—W. B. McKinley, secretary; L. O. Williams, superintendent, Quincy Horse Railway & Carrying Company.

Quincy, Mass.—John R. Graham, president and general manager Quincy & Boston Railway Company.

Reading, Pa.—John A. Rigg, president; Samuel E. Rigg, superintendent, United Traction Company.

Rochester, N. Y.—J. H. Stedman, manager of transfers Rochester Railway Company.

Rockford, Ill.—R. N. Baylies, president; T. M. Stephenson, manager, Rockford Railway, Light & Power Company.

Salt Lake City, Utah.—Walter P. Read, superintendent Salt Lake City Railroad Company.

Saratoga, N. Y.—E. A. Noyes, president; F. P. King, general manager, Saratoga Traction Company.

Schenectady, N. Y.—J. R. Lovejoy, director; W. Gibson Carey, director, Schenectady Railway Company.

Seattle, Wash.—Charles F. Wallace, engineer Seattle Electric Company.

Sioux City, Ia.—J. Henry Ricker, secretary; E. O. Holmes, superintendent; C. M. Feist, master mechanic, Sioux City Traction Company.

Spokane, Wash.—L. R. Notbohm, superintendent Washington Water Power Company.

Springfield, Ill.—C. K. Minary, manager; T. H. Minary, electrical engineer, Springfield Consolidated Electric Railway Company.

Springfield, Ohio.—John H. Miller, general manager Springfield Railway Company.

St. Joseph, Mich.—W. Worth Bean, president St. Joseph & Benton Harbor Electric Railway & Light Company.

St. Joseph, Mo.—W. T. Van Brunt, vice-president and general manager; J. H. Van Brunt, superintendent; T. C. Smallwood, O. T. Kass, St. Joseph Railway, Light, Heat & Power Company.

St. Louis, Mo.—Thomas M. Jenkins, general manager; Herbert O. Rockwell, assistant to general manager; Nathan Smith, electrical engineer; Charles S. Butts, E. J. Smith, T. C. Kimben, St.

Louis & Suburban Railway Company; George W. Baumhoff, general manager; R. M. Douglass, superintendent; Frank J. Suda, assistant auditor; Frank J. Duffy, paymaster, St. Louis Transit Company.

Syracuse, N. Y.—Edward G. Connette, vice-president and general manager Syracuse Rapid Transit Company.

Terre Haute, Ind.—G. C. Tripp, treasurer; M. C. George, electrician; B. N. Grosvenor, master mechanic, Terre Haute Electric Company.

Topeka, Kan.—Clifford C. Baker, president and treasurer; J. G. Slonecker, secretary; Charles Blood Smith, director; J. H. McCahan, superintendent of construction; Albert M. Patten, C. W. Hixon, Topeka Railway Company.

Toronto, Ont.—J. M. Smith, general manager; M. Powers, Toronto Railway Company.

Trenton, N. J.—John A. Rigg, vice-president; Peter Hurley, superintendent, Trenton Street Railway Company.

Venice, Ill.—Fred E. Allen, president; E. J. Spencer, secretary, Venice, Madison & Granite City Railway Company.

Washington, D. C.—George H. Harrier, vice-president; William F. Ham, treasurer, Columbia Railway Company.

Waterbury, Conn.—Charles M. Heminway, cashier Connecticut Lighting & Power Company.

Webb City, Mo.—A. H. Rogers, president; E. J. Pratt, electrical superintendent, South West Missouri Electric Railway Company.

Westwood, Mass.—John R. Graham, Norfolk Western Street Railway Company.

Wilkesbarre, Pa.—John A. Rigg, president; T. A. Wright, superintendent, Wilkesbarre & Wyoming Valley Traction Company.

Wilmington, Del.—John A. Rigg, president; A. V. Arrow-smith, director, Wilmington City Railway Company.

Willoughby, Ohio.—Charles W. Wason, president Cleveland, Painesville & Eastern Railroad Company.

Worcester, Mass.—A. H. Stone, treasurer Worcester Consolidated Street Railway Company.

Youngstown, Ohio.—A. A. Anderson, general manager and treasurer Mahoning Valley Railway Company.

Representatives of Companies Not Members of the Association

Belleville, Ill.—Robert Skeen, electrician; B. S. Hume, St. Louis & Belleville Traction Company.

Carrollton, Mo.—Frank V. Crouch, president Carrollton Electric Railway Company.

Cedar Rapids, Ia.—Royal H. Holbrook, chief engineer Cedar Rapids & Marion City Railway Company.

Chicago, Ill.—George B. Henington, Illinois & Rock River Railway Company.

Cleveland, Ohio.—H. B. Isler, William Lintern, Cleveland, Elyria & Western Railway Company.

Detroit, Mich.—J. M. Mulkey, Toledo & Monroe Railway Company.

East St. Louis, Ill.—M. M. Stephens, C. C. & East St. Louis Electric Railroad Company.

Leavenworth, Kan.—C. L. Hughes, cashier Leavenworth Electric Railroad Company.

Lincoln, Neb.—H. C. Hartley, Lincoln Traction Company.

New York, N. Y.—F. W. Toppa, secretary Bay State Traction Company.

Piqua, Ohio.—C. S. Bidwell, general superintendent Miami Valley Railway Company.

Sandy Hill, N. Y.—F. W. Kinmouth, superintendent Glens Falls, Sandy Hill & Fort Edward Street Railroad Company.

San Diego, Cal.—James Restine, chief electrician San Diego Electric Railway Company.

Sedalia, Mo.—W. F. Waller, receiver; D. F. Webster, Sedalia Electric & Railway Company.

Selma, Ala.—W. R. Hall, Selma Street & Suburban Railway Company.

Washington, D. C.—J. Colvin, superintendent Washington, Arlington & Mt. Vernon Railway Company.

Waupaca, Wis.—Irving P. Lord, president Waupaca Electric Light & Railway Company.

Leavenworth, Kan.—O. D. Henry, superintendent; K. K. Chapin, inspector; W. H. Hammond, H. S. de Neefe, Kansas City & Leavenworth Railway Company.

Rockford, Ill.—T. M. Ellis, general manager Rockford Railway, Light & Power Company.

St. Louis, Mo.—J. Boyle Price, purchasing agent St. Louis Transit Company.

EXHIBITS AT THE CONVENTION

THE CUTTER ELECTRICAL & MANUFACTURING COMPANY, of Philadelphia, represented by V. C. Gilpin, exhibited with McGill, Porter & Berg, its Western agents. The central and most interesting feature was an enormous I. T. E. circuit breaker for 5000 amps. at 600 volts, built for the Metropolitan West Side Elevated Railroad, of Chicago. This breaker had a large copper leaf area of contact, but made final break through carbon plates.

THE SPEER CARBON COMPANY, of St. Mary's, Pa., was well represented by its exhibit with McGill, Porter & Berg, its Western agents, and by J. S. Speer.

THE COMPRESSED AIR COMPANY, of New York, occupied a large space at the Convention Hall, and was well represented by H. D. Cooke, president of the company, well assisted by William E. Selleck, general manager of the Western department, and H. A. Hudson, both of Chicago. The company had for distribution a quantity of interesting literature, relating to the use of compressed air for street railway service, and had many inquiries to answer in regard to the operation of compressed air motors in New York, Chicago and Rome, N. Y. It was easy to answer these inquiries very satisfactorily, and much interest was expressed by the delegates present in the new motive power.



GENERAL VIEW OF CONVENTION HALL

THE J. G. BRILL COMPANY, of Philadelphia, occupied one of the large parlors on the mezzanine floor, in which were shown handsome models of the company's several kinds of trucks, photographs of cars and descriptive matter. The company intended, up to within a short period before the convention, to make a regular exhibit, as usual, at the Convention Hall. The works of the company, however, at Philadelphia have been so full, during the past months, with orders from all parts of the world, that it became evident that a set of trucks could only be diverted to Kansas City for exhibition purposes by delaying delivery on some important order. As the managers did not feel like disappointing any customer in this way, they finally decided to exhibit models and photographs only. These answered very well, however, to illustrate the principles underlying the Brill trucks, while the appearance of the latest cars built was fully shown by photographs. Many inquiries were made for John A. Brill, vice-president of the company, and much regret was expressed that he was unable to be present. As stated elsewhere, Mr. Brill was obliged to be in Virginia. The company was well represented, however, by G. Martin Brill, S. M. Curwen, W. H. Heulings, Jr., George M. Haskell and D. B. Dean, the company's Western manager. Mr. Dean has until recently been connected with the Terre Haute Car & Foundry Company, and is well known and popular in the trade.

M'GILL, PORTER & BERG, whose headquarters are in Chicago, had a large exhibit of the various lines which they handle in common with some of the companies for which they are agents. I. T. E. circuit breakers, National car heaters, Speer carbons, Morris rail bonds, Morris hydraulic splicing press, Woods patent car gate, New Haven car registers, Hunter car signs, Syracuse changeable headlights, Orient incandescent lamps, Monarch paint and M. P. & B. trolley wheels, rope, insulating tape, trolley harps and trolley wheel bushings were among the numerous things filling their large exhibit space. These people distributed a crop of butterflies that stuck wherever they lit, and created quite a sensation opening morning. This enterprising Chicago firm is doing a fine business in its territory, as was shown by the crowd of visitors always found at its headquarters, and the menu it offered its customers was an original piece of work. Max A. Berg and E. R. Mason, of Chicago, were in charge.

THE STAR BRASS WORKS, of Kalamazoo, Mich., had an able and well known representative in the person of George E. Pratt, now its Eastern representative at Philadelphia. It also had a finely arranged exhibit of Kalamazoo trolley wheels and harps. These wheels are cast of pure copper by a patent process, and are softer than the wire, though tough and ductile. They have a grease chamber around the graphite bushing, which does away with the

necessity of oiling, except at infrequent intervals. Records of various wheels were shown, one 6-in. wheel running 35,000 miles, and one 4-in. wheel running 23,000 miles. The factory is now very much crowded, being 18,000 trolley wheels behind orders.

CHISHOLM & MOORE MANUFACTURING COMPANY, Cleveland, Ohio, maker of the American standard rail-joint, exhibited samples of this well known and tried boltless joint, under charge of W. E. Ludlow, one of the directors of the company. This company is also one of the prominent makers of chain hoists, traveling cranes and pneumatic tools, of which Mr. Ludlow had a number of photographs to show to those interested.



HEADQUARTERS OF THE STREET RAILWAY JOURNAL

THE INTERNATIONAL REGISTER COMPANY, of Chicago, exhibited its well known stationary and portable fare registers, also a new type double register, having separate trip registers, as well as totalizers, and operated by a single rod. The mechanism of this machine is constructed almost wholly of cold rolled steel, no cast iron parts whatever being used. The striking feature of this machine is the very large, distinct trip figures, which make it especially desirable for long cars, now so generally coming into use. The aluminum dials first introduced by this company, are now recognized as the best material for register dials. The representatives report the factory filled up with orders for several months ahead, and the prospects for new business better than ever. They were represented by A. H. Woodward, president; W. H. Brown, secretary and treasurer, and Charles E. Pratt, superintendent.

THE GRIFFIN WHEEL COMPANY, Chicago, had a large central space, in which it exhibited a number of different types of wheels and axles. This company has made axles for several years,

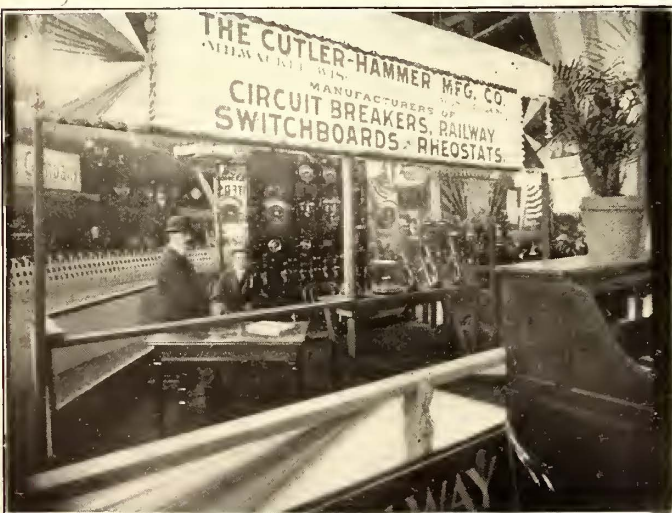


EXHIBIT OF THE CUTLER-HAMMER MANUFACTURING CO.

but through its representatives called special attention to that fact this year. The exhibit consisted of three pairs of 33-in. wheels on axles, one 36-in., curved arm standard pattern, one 33-in. reverse dish wheel, one 33-in. double plate wheel, with 2 $\frac{3}{8}$ -in. tread

for heavy interurban work, two 30-in. wheels with 2 $\frac{1}{4}$ -in. tread, one 22-in. pony wheel for maximum traction trucks, with 3-in. tread, one 18-in., and one 18-in. pony wheel, and a number of chilled test pieces. C. K. Knickerbocker and George D. Casgrain represented the company. The company's Kansas City foundry was also a practical exhibit for those of the delegates who visited it.

THE KNELL AIR BRAKE COMPANY, of Battle Creek, Mich., which has recently become a successful competitor in the street railway air brake field, was represented by Anthony H. Metzelaar, general manager, and R. F. Hoffmaster, treasurer. The exhibit consisted of this company's geared axle-driven air compressor, with cylinder, 4-in. diameter by 7 $\frac{1}{2}$ -in. stroke, and auxiliary air brake appliances. This compressor is winning its way through its simplicity, which is a subject of much favorable comment. The compressor is driven by a center crank, the crank being driven by a pair of gears from the axle at a slower speed than the axle itself. The pinion on the axle is split, so that it can be put on and taken off without disturbing the wheels. The system has an automatic cut-off, which lets the compressor discharge into the air whenever the air pressure reaches the amount for which the cut-off is set. This company puts on a compressor of such a size that most of the air is pumped while the car is coming to a stop after the brakes are applied, thus utilizing waste energy.

THE MORRIS ELECTRIC COMPANY, of New York, with Elmer P. Morris as representative, exhibited with McGill, Porter & Berg, its Western agents. National car heaters and Morris rail bonds are among the better known goods. A hydraulic press for compressing a copper sleeve to make a sleeve joint between wires was one of the novelties. The Wood patent car gate and Hunter car sign were also shown, together with Morris car trimmings and bell rope.

THE H. W. JOHNS MANUFACTURING COMPANY, New York, had a very interesting exhibit to the progressive electrical man, especially in the way of fuses and heaters. The Sachs enclosed Noark fuses, which have a chemical filling which becomes an insulator when the fuse blows, and destroys the arc, were shown for amperages from 250 milliamperes to 600 amps. in a single tube, for low voltages, and for from 110 volts to 20,000 volts. These fuses all have an indicating fine wire shunt on the outside to show whether the fuse is blown or not. Other electrical goods of interest shown by this company were vulcabeston for controller guards, brush holders and other places requiring heat resistance in an insulator, electric heaters, overhead mica molded insulators, Philadelphia type, section insulators. The newest product shown was an Edison fuse plug, provided with a Sachs enclosed fuse, the fuse part being easily replaceable without destroying the plug. Enclosed fuse car cut-outs in 200-amp. and 400-amp. sizes were prominent. This company reports a big rush in all departments, type C panel heaters being especially in great demand. A. Hall Berry, manager electrical department; Joseph Sachs, engineer; D. T. Dickson, Philadelphia branch; J. W. Perry, Philadelphia; H. D. Bayne, Pittsburgh, and S. H. Finney and W. R. Kendall, of the Manville Covering Company, Western agents, were present.

THE MERCANTILE LUMBER & SUPPLY COMPANY, of Kansas City, whose exhibit was in charge of H. W. Jacques, manager, and W. W. Graham, sales agent, makes a specialty of finishing wood poles and ties, but is also agent for the Carborundum Company, of Niagara Falls, N. Y.; the Star Headlight Company, of Syracuse, N. Y., and the Streeter Brake-Shoe Company, of Chicago, all of whose products were shown.

THE STREETER BRAKE-SHOE COMPANY, of Chicago, was represented by George W. Evans, Eastern sales agent, who had an exhibit with the Kansas City agent, the Mercantile Lumber & Supply Company.

THE STAR HEADLIGHT COMPANY, of Utica, N. Y., was represented by its Kansas City agent, the Mercantile Lumber & Supply Company, which had an exhibit.

THE TAYLOR ELECTRIC TRUCK COMPANY, Troy, N. Y., was unfortunate in not being able to get the wheels for its truck exhibit in time, but had a fine display of truck frames, nevertheless. John Taylor, manager of the company, was in charge, assisted by Robert N. Kasson. All the trucks embodied recent improvements for supporting extra long and heavy cars. An 8-ft. wheel base, single truck, a set of Empire State radial trucks, a set of the company's regular swing motion double trucks, a set of extra heavy trucks of the same pattern, especially designed for heavy service and high speeds, attracted favorable comment from visiting master mechanics.

THE M'GUIRE MANUFACTURING COMPANY, Chicago, placed one of its combination snow plow and sweepers just across the street from the convention hall, and it was one of the first familiar objects to greet the eye of the delegate. Inside the hall the company had its new double truck No. 39, adopted by the Chicago Union Traction Company for long cars. It is very simple, having a four-part steel frame and locomotive finish. It had also on the floor a maximum traction truck, and a Columbian single truck, and in the Westinghouse exhibit a Pittsburgh type single

twelve-heater equipment for a 25-ft. cross-seat car. Special attention was called to the fact that the heat is distributed over the entire length of the heater on all three points of the controlling switch, and this was illustrated by lamps placed in the heaters. The United Traction Company, of Albany, loaned a heater from a six-heater equipment for this exhibit that had been in use eight years, from 1892 to 1900, and was in perfect condition, the coils retaining their shape, and with but a very thin coating of oxide formed on the wire.



SOME IMPORTANT EXHIBITS

truck, equipped with motors. In addition to trucks and sweeper the company, of course, showed its Royal Flush fender, New Columbian car heater and elastic brake hanger. Vice-President W. J. Cooke, who never misses a convention, and T. J. Callinan were in charge of the exhibit. Mr. Cooke distributed a neat aluminum cover memorandum tablet, showing a McGuire double truck in relief on the back cover.

THE CONSOLIDATED CAR HEATING COMPANY, Albany, N. Y., had its Chicago representative, W. P. Cosper, in attendance, and also Cornell S. Hawley, New York, and William H. Fulton, mechanical inspector, Albany. The exhibit comprised heaters suitable for all forms of standard and special street car seats, including the regular panel heater for side seats, and a

THE NATIONAL LEAD COMPANY, makers of "Phoenix" babbitt metal and National Lead Company warranted half and half solder, had a handsomely arranged booth and a large corps of representatives. Walter H. Baker, J. C. Younglove, George T. Faxon, J. R. Boyd, Arthur Benzel and George E. O'Neil were present. A large bell of Phoenix babbitt metal was mounted at one end of this company's space, and occasionally sent forth a considerable volume of sound. "Collier," "Southern" and "Red Seal" brands of pure old Dutch process white lead were also among this company's famous products exhibited.

THE WHEEL TRUING BRAKE-SHOE COMPANY, of Detroit, Mich., exhibited its brake-shoe in charge of J. M. Griffin, president. This shoe is simply an iron frame of the same form as

a brake-shoe, filled with an abrasive composition. The shoe is put on in place of the ordinary iron shoe whenever a flat wheel occurs, and is kept in service until the flat spot has been ground off. Over 200 roads use this shoe, including the Boston Elevated, Milwaukee Electric Railway, Denver Tramway and the principal roads at San Francisco, Washington and Kansas City. It seems to have solved the flat wheel problem for the roads using it, and now that the difficulty originally experienced in securing a suitable abrasive composition has been overcome, the factory is running night and day to fill orders.

J. R. M'CARDELL & COMPANY, of Trenton, N. J., had on exhibition one of their tower wagons, built for the St. Louis Transit Company. The wagon was in charge of J. R. McCardell, who exhibited to the delegates present the ease with which the working platform can be raised and lowered, and set at any position desired.

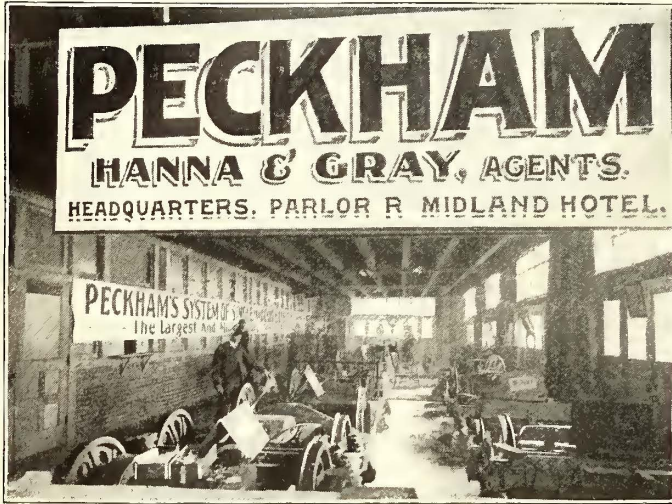


EXHIBIT OF THE PECKHAM TRUCK CO.

compish the same result. The company was ably represented by James Watson, John E. Ward and E. H. Gold.

MUCH REGRET was expressed at the absence of John A. Brill, who has always been a regular attendant of former conventions. Mr. Brill has not been in very good health, and is spending a few weeks at Hot Springs, Va.

F. W. DARLINGTON, president of the Darlington Electric Fountain & Supply Company, of Philadelphia, was present at the convention, and had some circulars relating to his electric fountains. The circular contained an illustration of the fountain installed at Willow Grove Park, at Philadelphia, by Mr. Darlington.

THE PENNSYLVANIA STEEL COMPANY made no exhibit, but was represented by Charles S. Clark, of Boston; Mason D. Pratt and C. W. Reinoehl, of Steelton; F. W. Edmunds, of Chicago, and J. G. Miller, of St. Louis.



EXHIBIT OF THE B. & R. ELECTRIC CO.

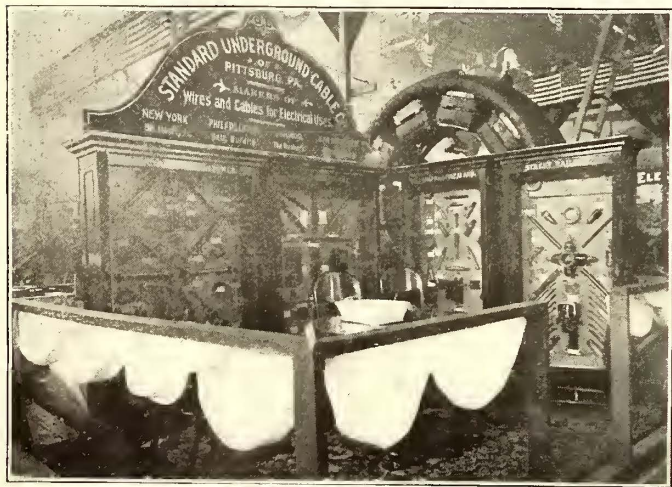


EXHIBIT OF THE STANDARD UNDERGROUND CABLE CO.



EXHIBIT OF THE CHRISTENSEN ENGINEERING CO.

THE GOLD STREET CAR HEATING COMPANY, of New York, had an attractive booth, in which was exhibited a full line of its electric heaters, principally for street railway service, but also including a number of designs for waiting rooms and other buildings. The special feature of the exhibit, and one which attracted much attention, was a new type of heater with wrought iron casing. This heater embodies all of the interior constructive features of the old heater, but the exterior case is quite novel. It is made of No. 14 sheet iron, reducing in this way the weight of a car equipment at least 100 lbs. over the old cast-iron equipment. The importance of this saving in weight to a railway company can easily be estimated. The use of this material also makes a very attractive case, in fact one more ornamental than the older cast-iron form. The company also showed a new three-point switch, capable of carrying and breaking 35 amps. at 500 volts. A novel feature of this switch is that it can be turned in either direction. This saves unnecessary wear on the points, as the handle can be turned backward through one point to reduce the heat, instead of turning it continuously in a forward direction through zero to ac-

J. H. STEDMAN, of Rochester, was a prominent and popular attendant at the convention, and with an extra number of good stories. He also did some good business in his transfer tickets.

THE JOHN A. ROEBLING'S SONS COMPANY, of Trenton, N. J., had no exhibit, but the able representation by Marston R. Cockey, of New York; G. W. Swan, of New York, and U. G. Tingley, of Trenton, N. J., together with the reputation of the company, made an exhibit unnecessary.

THE ELECTRIC RAILWAY EQUIPMENT COMPANY, of Cincinnati, exhibited its new slow-starting controller handle in the Ridlon Company's space. P. F. Harten looked after the device, and explained it to possible customers. It is a controller handle working on the principle of a ratchet, and allowing the motorman to go only one notch at a time.

THE FRANK RIDLON COMPANY, 200 Summer Street, Boston, was represented by its popular vice-president, Charles N. Wood. The Wilson trolley catcher, of which about 7000 are in

use, was a center of interest. The Kilbourn track sanding device and the slow-starting controller handle of the Electric Railway Equipment Company, of Cincinnati, as well as the Conant rail-bond testing device for testing rail-bond conductivity in terms of rail lengths by the Wheatstone bridge and telephone receiver method, were other leading features, besides which was the Beverly vestibule brake handle. P. F. Harten, of the Electric Railway Equipment Company, of Cincinnati, was also in attendance at this booth, in the interests of the controller handle.

THE GARTON-DANIELS COMPANY, of Keokuk, Ia., showed the "Automotoneer," in a perfected form, applied to a type K controller. This device enforces a pause on each notch of a controller, and may be adjusted to allow the starting of a car in seven, ten or twelve seconds, as may be desired. It will effect a

pany for presenting a continuous surface to the trolley wheel. Among the photographs of doors installed the one of a door 36 ft. wide and 20 ft. high attracted unusual notice.

THE LEA ELECTRIC MANUFACTURING COMPANY, of Elwood, Ind., had an exhibit of Lea inclosed arc lamps, with W. M. Porter, general sales agent, in charge. The feature of this exhibit that attracted most attention from street railway men was the arc headlight.

THE CREAGHEAD ENGINEERING COMPANY, Cincinnati, made its usual extensive exhibit of overhead line material, flexible brackets, malleable iron fittings for iron and wood poles, cross arms, malleable pins, etc. Its exhibit was tastefully arranged, and a series of large photographs showed its material in



EXHIBITS OF CONTINUOUS RAIL JOINT CO., STANDARD PAINT CO. AND HAROLD P. BROWN

reduction in maximum demand for current, and will save repair bills and accidents, as it requires the proper handling of the controller. In an emergency stop, where the motors are to be reversed, this device prevents the motorman throwing the handle too far, which almost invariably throws the circuit-breaker, or burns out a fuse, so that the operator loses control of his car. Much interest was shown in this device. This company also exhibited a full line of its standard lightning arresters, which have attained such a remarkable record. A station panel, carrying three 600-amp. kicking-coils and three arresters, was also shown. A telephone extension ringer, that is being placed on the market by the Garton-Daniels Company, attracted considerable attention, as it differs from others on the market in being self-restoring. The company was represented by J. V. E. Titus, secretary, and V. J. Van Horn.

THE G. P. MAGANN AIR BRAKE COMPANY, of Detroit, Mich., represented by its manager, E. C. Rutherford, presented a very tastefully arranged booth in the convention hall,

use in all parts of the world. G. R. Scrugham, superintendent of the company, was in charge.

THE BIERBAUM & MERRICK METAL COMPANY, Buffalo, N. Y., had a handsome little display of "Lumen" bronze bearings and trolley wheels. The trolley wheels of this company have soft steel flanges and copper bearing grooves. E. P. Sharp, manager street railway department, was present.

THE PARROTT VARNISH COMPANY, though not an exhibitor, sent its St. Louis railway representative, R. E. Mills, 610 Holland Building. This company does a large business in car varnishes.

THE HAM SAND BOX COMPANY, of Troy, N. Y., was represented by R. H. and A. W. Ham, who showed the company's new spiral spring steel hose, which can be put at any angle without buckling. Snow or ice that may gather therein are easily re-

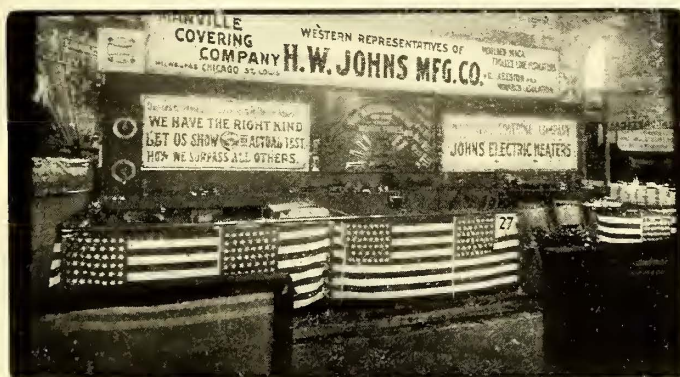


EXHIBIT OF THE H. W. JOHNS MANUFACTURING CO.

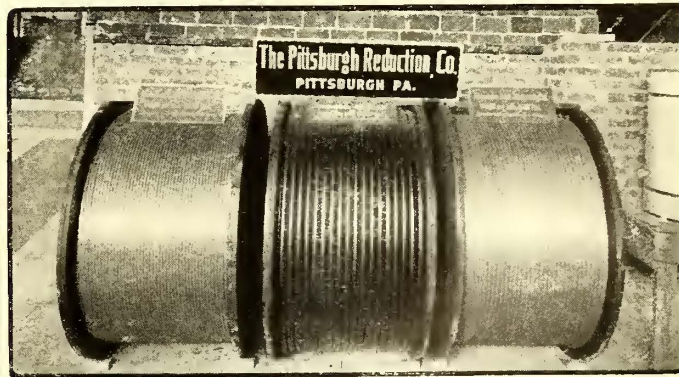


EXHIBIT OF THE PITTSBURGH REDUCTION CO.

using principally as its exhibit for this convention the cars on the Kansas City-Leavenworth Railway, on which lines its brakes have been in operation for the past year, and which have given the greatest satisfaction. By the kindness of the Kansas City-Leavenworth road, verbal invitations were issued to members of the American Street Railway Association for a trip over the road, and a great many availed themselves of this opportunity of examining the G. P. Magann Storage Air Brake System, which has been so much to the front for the past several years.

THE KINNEAR MANUFACTURING COMPANY, of Columbus, Ohio, represented by F. C. Schmidt, secretary, had a sample of its rolling car house door on exhibition. This sample showed the special trolley arrangement employed by this com-

pany moved by pulling the spring down to the track or rail, and quickly letting it go. This is a feature peculiar to the Ham sand box. The company also showed three of its latest boxes, Nos. 5, 6 and 7, and demonstrated their practical use. The company is doing an enormous business abroad; during the past eighteen months it has shipped, among others, 1290 boxes to the Glasgow Corporation Tramways, 4000 to the Electric Railway & Tramway Carriage Works, Preston, England; 100 boxes to E. H. Cadiot & Company, Paris; 160 boxes to the Gloucester Railway Carriage & Wagon Company, etc. Among the other big roads ordering these boxes during the past year in America are the Brooklyn Heights Railroad Company, 700, and the American Railways Company, 100. The various car builders have used, within the past year, over 1500 boxes.

THE BETHLEHEM STEEL COMPANY, which, at the meeting of the association in St. Louis, exhibited a large hollow-forged steel shaft, that is now one of several operating the power plant of the Northwestern Elevated Railroad in Chicago, and which, last year, at the Chicago meeting, had an exhibit of hollow-forged steel shafts operating almost every power plant in that city, called attention to the fact that Kansas City is not behind in progressiveness, by pointing to the hollow shafts in the Kaw River power house. It has been said that the enormous units now installed in the power plants of the Metropolitan Traction

THE MAYER & ENGLUND COMPANY, of Philadelphia, Pittsburgh and New York, were represented by C. J. Mayer, William A. Armstrong, Jr., and H. G. Lewis. These gentlemen had many friends at the convention, and all users, of whom there were many, spoke in the highest terms of the apparatus supplied by them.

THE WALWORTH MANUFACTURING COMPANY, of Boston, was represented by Herbert L. Rideout. This company is a well known manufacturer of brass and iron goods and piping tools. The articles on exhibition were high-pressure gate valves



VIEWS TAKEN AROUND CONVENTION HALL

Company and the proposed stations of the Manhattan Elevated Railroad in New York City, and the Boston Elevated Railroad in Boston, are made possible by the use of this type of shaft. By no other method of manufacture could a shaft be made that would be sufficiently strong and light. H. F. J. Porter, who represented the company, showed not only to the members of the association, but to many of the supply men, who are manufacturers, steel chips which have been cut from castings and forgings at his works at speeds which seem to be incomprehensible. Some of these chips have been cut at a speed which would be attained in turning wood. The introduction into shops of the tool steel which does this work is destined to revolutionize not only the machine tool industry, but machine shop practice as well.

and special blow-off cocks, also the Van Stone joint, a well approved method of applying flanges to pipe for high service. The exhibit also included a steam and air whistle. The Walworth Manufacturing Company is a big contractor for installing power house piping, as the many street railway contracts carried out by the company testify. The company also manufactures the Walworth "Klingfast" pipe vise and the Walworth vise, the Ashley patent right and left nipple holder, Walworth die plates, Miller's patent reversible ratchet die plates, Smith's patent friction drill stocks, and the Stillson adjustable pipe wrench.

F. H. NEWCOMB, of Brooklyn, N. Y., the well known maker of uniform caps, showed a full line of caps, which the company

claims are in use by 50 per cent of the roads in this country. In addition to the work in this country, Mr. Newcomb says that he is preparing to reach tramways abroad, as letters show that these

the Nichols protected heel switch, which is attracting considerable attention among street railway men. The ductility of the manganese steel is demonstrated in the shape of bent pieces of that remarkable metal, and the solidity of this work was shown by sections through the body of the pieces as they are cast together in the method of their manufacture. The whole exhibit was made especially attractive through its arrangement, and through the exhibition of numerous and large photographs, showing the company's works, also some remarkable special work layouts, as put together in the yard, blue prints of the company's working plans, etc.



EXHIBIT OF THE NEW HAVEN CAR REGISTER CO.

goods can be supplied from America to advantage. Mr. Newcomb gave out as a souvenir a dating stamp, good for six years, and showing a New York Central & Hudson River Railroad conductor's cap.

FISKE BROTHERS REFINING COMPANY, of New York, the well known makers of "Lubroleine," were represented by E. H. Chapin, who very ably looked after the interests of his company. Mr. Chapin was, as usual, one of the most popular representatives, owing to his ready wit and his quick repartee. Mr. Chapin gave out as a souvenir a very pretty little mirror, with celluloid back, and a pin cushion around the edges.

THE STANDARD PAINT COMPANY, of New York, had an attractive space, in which were shown "P. & B." electrical compounds, paints, waterproof insulating tapes, armature varnish, insulating papers, motor cloth and ruberoid roofing. The company gave as a souvenir a very nice, useful combination blotter pad, and was well represented by J. C. Shainwald, Western manager, and by J. F. Hicks, of Chicago.

THE HALE & KILBURN COMPANY, of Philadelphia, was represented by its Western manager, H. T. Bigelow, of Chicago. The company showed a large number of seats, including the "walk over" seats, upholstered in various materials, also longitudinal seating, with combination construction. The seats, with patented grab handles, attracted much attention.

WILLIAM WHARTON, JR., & COMPANY, Incorporated, of Philadelphia, had, as usual, an attractive booth at the convention, filled with the latest improvements in track work. The company was represented by Victor Angerer, of Philadelphia, and J. C. Robinson, of Boston. Although the company manufactures all kinds of special track work for street railways and steam railroads as well, particular stress was evidently laid in the exhibit on its manganese steel special work, which is growing more and more in favor, on account of its phenomenal wearing qualities. Examples of this wear were exhibited in the shape of a wornout frog, which had sustained the traffic of 1,657,000 cars on a curve of 44-ft. radius, the head of the rail having been almost entirely worn away, while the manganese steel center of the frog is still in fair condition. The manganese steel center of another frog was also exhibited, which had 2,570,000 cars over it on a straight run, and it is remarkable how comparatively little wear it showed. Samples of the company's standard manganese steel center girder rail work, and also solid manganese steel work for T-rail track were shown, besides the well known Wharton unbroken main line switch and

THE DUFF MANUFACTURING COMPANY, of Allegheny, Pa., was represented by J. Barrett, manager and vice-president. The company exhibited a full line of lever, track and oil-well jacks.

THE JOSEPH DIXON CRUCIBLE COMPANY, of Jersey City, N. J., which makes such a variety of graphite products, suitable for electric railways, had a full representation, both in men and products. Sam Mayer and Dudley A. Johnson, of the Chicago branch; Wm. B. Allen and E. A. St. John, Western salesmen, and A. L. Haasis, Eastern salesman, made it pleasant for visitors. Graphite resistance rods, graphite for dash-pots, graphite brushes, filament winders (on which incandescent lamp filaments are baked), graphited wood grease for stopping noise of gears, and at the same time affording a lubricant that will not ooze out of the gear casing, graphite curve grease, dynamo lubricating graphite, graphite commutator dressing, graphite motor brushes and graphite paint for trolley poles were all included in the exhibit. A souvenir pencil, with puzzle attachment for the button hole, afforded food for reflection by the studiously inclined.

THE GARL ELECTRIC COMPANY, of Akron, Ohio, had a display of especial interest to interurban roads. This company has a block signal system for single-track roads which can be used either as a visual or audible signal—when the latter, a blank cartridge explodes in the signal box whenever two cars approach each other within a mile. Combined with this block system is a portable telephone, which can be used for communication with the main office over the signal wires. The main office can also signal a train to stop at any signal in case of a change of time. This company makes a sectional fish pole for telephone connection from the ground to a telephone line wire, or pair of

wires, anywhere along the line. Intercommunicating telephone sets and automatic fire alarms completed the exhibit. Max Schumacher,



EXHIBIT OF THE CURTAIN SUPPLY CO.



EXHIBIT OF WM. WHARTON, JR., & CO.

secretary and treasurer, and M. Garl, superintendent, were in attendance.

HANNA & GRAY, of Chicago, attended the convention as representatives of the Peckham Truck Company, Jewett Car Company and the St. Louis Car Wheel Company. The firm was represented by both Mr. Hanna and Mr. Gray, and had many compliments for the most elaborate souvenir given at the convention. This was a very elaborate reference and report book for railway officials, and was compiled through the courtesy and with the assistance of prominent members of the Street Railway Accountants' Association of America. The book consists of many pages, printed on thin bond paper, and ruled off with spaces for entering the principal data and records of street railway operation. Space is left for similar data of succeeding years, so that five to ten or more years' operation can be compared. The book is arranged in three parts, or main divisions. The first main division is the "Condensed Comparative Yearly Report for Twenty-one Years." This report has ten main headings and fifty-one sub-headings, by years, for twenty-one years. The second main division is the "Yearly Table of Operating Expenses for Five Years." This shows each operating expense account by years, for five years, through eight different propositions. The third main division is the "Monthly Report for Five Years." This report has twenty-four main headings, and 180 sub-headings, showing the details by months, total for six months, increase or decrease for six months, total for one year, and increase or decrease for one year, for five years. The table of contents is arranged to conform to the arrangement of the book and not indexed alphabetically. The books were bound in leather in two ways, one for pocket and one for desk use. The value of it to the practical railway manager is shown by the fact that President Duffy, of the Accountants' Association, referred to it in most commendatory terms in his annual address to the association, as being a most creditable undertaking. In spite of the evidently high cost of producing this book, Mr. Hanna stated that his firm did not intend to ask payment for it, but had them made exclusively for presentation to railway officials interested. In addition to this book the company had on exhibition in a parlor of the Midland Hotel some handsome models of Peckham trucks, a sample St. Louis car wheel and some attractive photographs of Jewett cars.

THE CHRISTENSEN ENGINEERING COMPANY, of Milwaukee, had a very large exhibit, all of it operative, and showing the apparatus working. The quick-acting air brake and automatic compressor equipment, which is going on each car of the Boston Elevated (multiple unit system) was shown, and also a school equipment (for teaching the action of the brake), consisting of a double-truck car equipment for city and suburban service, with independent motor compressor. There was also a compressing apparatus, together with air hoist and air jacks for handling motors under trucks, etc. N. A. Christensen, G. S. Hastings, F. C. Randall, W. J. Richards, J. S. Hamlin, J. S. Leet, J. R. Sutton and A. Beveridge comprised this company's convention force.

THE STANDARD UNDERGROUND CABLE COMPANY had on exhibition the four large, handsome cabinets of samples which attracted much attention at the National Export Exposition at Philadelphia, and for which that company received medal and blue ribbon as being the most complete exhibition of its kind ever seen. There was shown in that display everything that is made in the way of wires and cables, together with all the accessories and appurtenances that enter into the underground and overhead construction work as installed by the company. Being pioneers in underground cable work in America, their present methods are the result of years of experience and experiment. J. R. Wiley, of Chicago, Western manager, one of the best known electrical men of the West, most ably looked after the company's interests at the convention.

THE OHIO BRASS COMPANY'S exhibit was particularly artistic and complete. A large variety of flexible pole brackets were shown for both iron and wood poles. There probably has never been a more complete exhibit of line material presented at any convention. There were many novelties of design, including a new 3-in. globe strain insulator, a giant double Brooklyn strain insulator and a number of forms of round top hangers, among which the new type N attracted the most attention, because of neatness, compactness and strength. As usual, the company presented a large variety of fixtures for figure 8 wire, and was prepared with late designs for the new grooved wire. Special interest was shown in twin hangers for double trolley wire, both type D and cap and cone forms. A new third-rail insulator permitted fractions of movement of the rail up and down to prevent breaking of the insulators, while perfectly supporting the rail. O. B. bell metal bearings for armature work, in which the concern takes particular pride, and line section switches and track brush holders were leading features. The Monarch track scraper and emergency hose bridge were shown in a separate space. C. K. King,

secretary; R. A. Byrns, manager New York office; George O. Mead, engineer, and A. L. Wilkinson, were present.

THE R. D. NUTTALL COMPANY, of Pittsburgh, Pa., manufacturers of Nuttall's gears and pinions, Union standard trolleys, etc., was represented by F. A. Estep, president, and by C. J. Mayer and William A. Armstrong, of Mayer & Englund Company, of Philadelphia; Charles N. Wood, of Boston; Garson Myers, of Chicago, and by the B. & R. Electric Company, of Kansas City, Mo. The company had a good-sized exhibit on the east gallery. The exhibit attracted wide attention and the representatives present were as well known and popular as any at the convention.

EUGENE MUNSELL & COMPANY AND THE MICA INSULATOR COMPANY, of New York, Chicago and London, were represented by Charles E. Coleman, manager of the Chicago house. Mr. Coleman distributed a very handsome leather bill folder, together with a medal similar to the gold medal awarded the Mica Insulator Company at Paris.

WENDELL & MacDUFFIE, of New York, were represented by both members of the firm, who were passengers on the New York special, and made their headquarters at the Midland Hotel, where all callers were liberally entertained.

THE AMERICAN IMPROVED RAIL-JOINT COMPANY, of Chicago, was represented by President A. S. Littlefield and D. J. Evans, secretary of the company. This company has done a large amount of work in Kansas City, and reports a satisfactory business for the year.

THE MULTIPLEX REFLECTOR COMPANY, of Cleveland, made an exhibition of its new headlights through its Chicago agent, the W. R. Garton Company.

THE ST. LOUIS CAR WHEEL COMPANY, of St. Louis, showed some of its special type of car wheels. The samples shown had a deep chill, very strong spokes and heavy flange, and are claimed to be making new mileage records.

THE STERLING-MEAKER COMPANY, of New York, was represented by its treasurer, E. F. Wickwire.

COL. E. J. SPENCER, of St. Louis, secretary of the Venice, Madison & Kansas City Railway, was at the convention, accompanied by Mrs. Spencer.

THE MERRITT ELECTRIC AIR BRAKE COMPANY, 22 Broad Street, New York, exhibited its air compressor controlling switch.

HUFF'S STREET RAILWAY SWEEPER was shown at the convention in the form of a model, which attracted considerable attention.

THE ATLAS RAILWAY SUPPLY COMPANY, of Chicago, exhibited its joints for T-rails, and various forms of girder, and also samples of its surfacer and primer for railway cars. The representatives expressed themselves as well pleased with the attention their goods received. J. G. McMichael, president; R. B. Kent, superintendent, and E. W. Ash were the gentlemen present from this company.

THE BULLOCK ELECTRIC MANUFACTURING COMPANY, of Cincinnati, was represented by its genial general salesman, Frank G. Bolles, who distributed some unique souvenirs, which were as much or more sought after than any at the convention.

COLONEL GILES S. ALLISON, New York, made an exhibit of the new self-recording register made by the St. Louis Register Company, the Cael car door fixture, and models of Tripartite steel poles. Colonel Allison also represented the street railway department of Valentine & Co., New York, and also the sales department of the Brooklyn Heights Railroad Company.

THE RAND AVERY SUPPLY COMPANY, of Boston, was represented by its secretary, James F. Wattles, whose souvenir was in great demand.

THE SPEER CARBON COMPANY, of St. Marys, Pa., showed a very complete line of its well known carbon brushes. The company was represented by Manager Speer, who reports that the large new plant of the company is running day and night exclusively on brush work.

LYTLE J. HUNTER, of the Hunter Illuminated Car Sign Company, Cincinnati, was there as usual. A sample revolving sign attracted the attention of every street railway man that saw it. This type of sign was first exhibited at the St. Louis convention, and

since then it has become the standard on quite a large number of roads. The company was also represented by E. L. Hawkins, who was well pleased over his first convention work.

THE TRIPARTITE STEEL POLE COMPANY, of New York, was represented by Col. Giles S. Allison, the general sales agent of the company. This new type of sectional pole, in which there are no bolts or rivets, was favorably commented on by the majority of those who saw the model which the Colonel exhibited.

LOUIS E. MYERS, Chicago, entertained his friends at Suite K, Midland Hotel. On Wednesday and Thursday Mr. Myers conducted parties of interested street railway men on inspection trips to various pieces of track work installed by him.

THE NEW HAVEN CAR REGISTER COMPANY had a very large and attractive exhibit at the front of the west gallery. All the officers of the company were present, as follows: Willis M. Anthony, president; F. Coleman Boyd, vice-president and general manager; John S. Bradley, secretary and treasurer; also H. E. Beach, representative. The company showed a full line of its well known single, double and triple square registers, and also its new single and double registers, which were a marked feature of its exhibit. A new machine was a double register for co-operative use by two companies operating the same car over two roads. One half of the register is locked when the other half is in use, so that there is no chance for confusion. Another special register shown had an independent reset for tickets and cash fares to suit peculiar conditions on some roads. Other special registers are also made by this company, to meet the requirements of special conditions. This company makes the only triple machine on the market, and a sample of this was shown in operation. This machine is operated by one rod and one set of cord fixtures. The bells are different for each class. The registers show registered number of trips as well as direction, which feature detects any attempt a conductor might make to tamper with the machines. The company took great pride in showing a register mechanism put up for use as a counting machine in a factory, where it has registered over 10,000,000 during the past year, or more than it would be called on to register in 100 years' street railway service. The condition of this machine demonstrated that there is practically no wear out to the New Haven fare register in practice. The company also made a full display of its line of supplies, consisting of register rods, and rod and cord fixtures, leather and woven bell and register cords, the New Haven special waterproof trolley cord, conductors' punches and badges of all kinds. The entire exhibit attracted much attention and was one of the best of the convention.

JOSEPH W. CRAMER, of Kansas City, inventor of a car fender designed to be carried close to the track, had a model on exhibition.

THE BAKER-VAWTER COMPANY, Chamber of Commerce, Chicago, maker of loose leaf ledger and account books, had a display of interest to accountants. Its loose leaf systems are a great help to book-keeping, and the accountants showed considerable interest in the forms. C. H. Smalley, Barton T. Bean and Thomas H. Waller were present.

THE METAL SALES COMPANY, Cleveland, Ohio, manufacturer of the renowned anti-friction metal, also niccolite challenge rolling mill metal, had a display of its anti-friction metal for armature bearings, and a sample of its new patent mandrel for pouring armature bearings. F. R. Marks, G. A. Burke and Charles S. Watson were in attendance, and were able to give many practical points to delegates on care and wear of bearings.

THE OHMER CAR REGISTER COMPANY, Dayton, Ohio, had no display at the convention hall, but W. B. Farnham, treasurer, and J. H. Stedman, secretary, represented the concern.

THE NATIONAL CARBON COMPANY, Cleveland, Ohio, made a small display of its new "Columbia" brushes, dry cells for use on street car signal-bell circuits and high grade carbons for inclosed arc lamps. A pair of brushes were shown which had run three months on a car in Cleveland with but $\frac{1}{8}$ in. wear. Henry J. Davies, secretary, was the company's representative at this convention.

THE COLUMBIA MACHINE WORKS, Brooklyn, N. Y., makers of car trimmings, bearings, gear cases, controller parts, fuse boxes, ratchet brake handles and trolley wheels, had a small space, from which W. R. Kerschner distributed a handsome souvenir card-case.

THE FULLER-WARREN COMPANY, Milwaukee, Wis., exhibited its self-feeding car stove under charge of H. B. Dewey, contracting agent.

JOHN T. McROY, Chicago and New York, who has been a regular attendant at street railway conventions for some years, was on hand, as usual, with an exhibit of vitrified conduit in long lengths.

THE SYRACUSE CHANGEABLE ELECTRIC HEADLIGHTS, manufactured by the Crouse-Hinds Electric Company, of Syracuse, were shown by McGill, Porter and Berg, of Chicago.

THE DUNLAP ELECTRIC ILLUMINATED FOUNTAIN in Heim Park, built by C. A. Dunlap, of Providence, R. I., was inspected by quite a number of visitors.

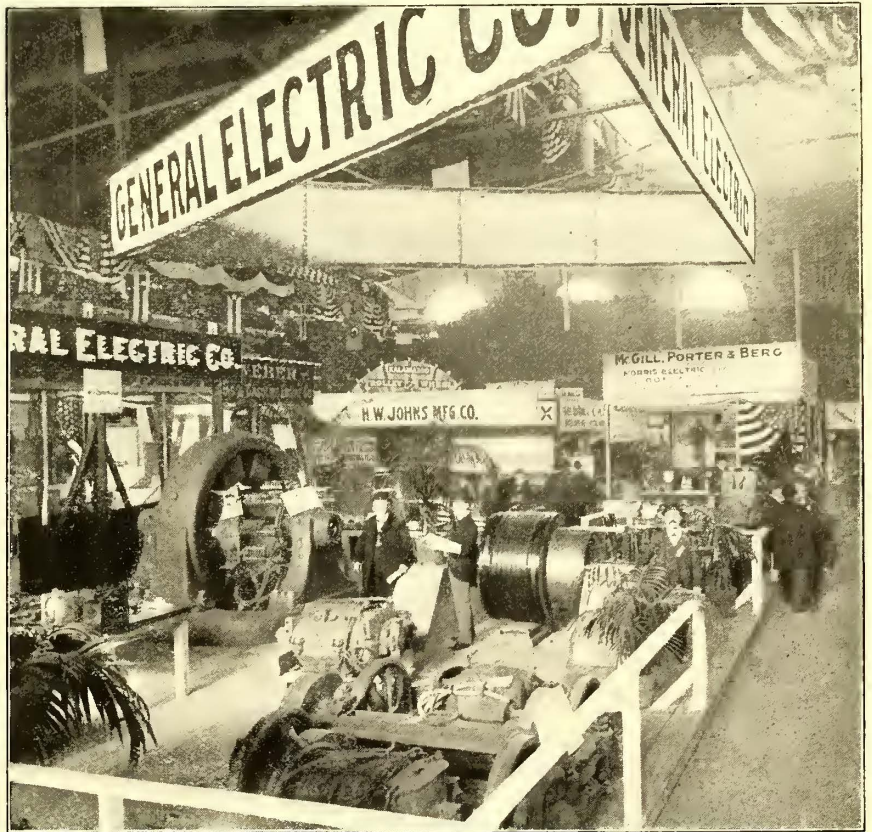


EXHIBIT OF THE GENERAL ELECTRIC CO.

THE JEWETT CAR COMPANY, Jewett, Ohio, was represented by Hanna & Gray, of Chicago.

GEN. OTTO H. FALK, vice-president of the Falk Company, of Milwaukee, made his first appearance at a street railway convention, but was very much in evidence and made a great many friends.

ROSSITER, MACGOVERN & CO., New York, entertained its friends in its headquarters at the Midland Hotel. Frank MacGovern, who has been making an extensive trip in Europe, returned in time to reach the convention. The company was also represented by J. A. Stewart.

COLONEL A. C. WOODWORTH, manager of the Consolidated Car Fender Company, of Providence, was one of the passengers on the New York special. While this company's exhibits have heretofore been a feature at the conventions, the company made no exhibit this year, but expects to make an extra fine one in New York.

THE NEW PROCESS RAWIIDE COMPANY, of Syracuse, made no exhibit, but was represented by that genial good fellow, A. C. Vosburg.

THE BROWNELL CAR COMPANY, of St. Louis, Mo., had its interests looked after by its president, F. B. Brownell. The special private car built by this company, which was running on the streets of Kansas City for the conveyance of special parties, was a magnificent piece of workmanship, and was admired by all who were fortunate enough to see it. It was luxuriously fitted up as a parlor car, provided with ice chest, water cooler and everything practicable that could be thought of to add to the comfort of the passengers. While there were no cars exhibited at the hall, this car served as more than a substitute for the Brownell Company.

THE BABCOCK & WILCOX COMPANY, of New York, had W. H. Wells, of Chicago, at the convention.

THE ROCHESTER CAR WHEEL COMPANY, of Rochester, N. Y., made no exhibit, but F. D. Russell and George C. Morse, of Rochester, looked after this company's interests. As a souvenir the company had a pocket rule.

THE AMERICAN ELECTRICAL WORKS, Providence, R. I., were, as usual at Western conventions, represented by F. E. Donahoe of Chicago.

J. G. WHITE & CO., New York, are constructing the Toledo & Monroe Electric Railway from Toledo to Detroit. C. G. Young, who has charge of the construction of this road, was a convention visitor.

THE PRICE BRAKE of the Peckham Truck Company was in regular service on one of the Metropolitan cars, and visitors desiring to see its operation were furnished with its time-table so that



EXHIBIT OF THE JOSEPH DIXON CRUCIBLE CO.

they might catch the car without waste of time. The working of this brake has been highly satisfactory in Kansas City, and was inspected by many of the convention visitors.

GEORGE O. NAGLE, formerly superintendent of the Chicago City Railway, was also a visitor at the convention, meeting old acquaintances.

ADAMS & WESTLAKE, Chicago, made an exhibit in connection with the Curtain Supply Company.

J. M. MULKEY, manager and one of the leading stockholders of the Toledo & Monroe Electric Railway, attended the convention.

THE WESTERN ELECTRICAL SUPPLY COMPANY, St. Louis, Mo., was represented by Charles Scudder, jr.

THE FUEL ECONOMIZER COMPANY, of Matteawan, N. Y., was represented by President Green and by numerous installations of the economizer in plants in Kansas City.

J. M. ATKINSON & CO., Marquette Building, Chicago, has recently put out a new circuit breaker especially adaptable to street railway use. W. E. Pimlott, of that firm, inventor of the breaker, was a convention visitor.

THE BURNHAM & DUGGAN RAILWAY APPLIANCE COMPANY, Boston, Mass., advertised and exhibited its serrated car wheel for use on snow and ice with sweepers, snow plows, etc. This type of car wheel has found many friends among Eastern roads which have tried it for winter use.

THE OKONITE COMPANY, of New York, made no general exhibit, but their goods were in evidence in other exhibits. Superintendent George T. Manson, of New York, represented the company, and was one of the New York special passengers.

THE FALK COMPANY, of Milwaukee, had headquarters at the Midland. Some of the most important engineering work in the street railway field has been done by this company in Kansas City, and particularly the changing of the double cable track on Grand Avenue, between Eighth and Ninth Streets, which was one compound curve, extending the entire block, to simple curves at Eighth and Ninth Street corners, with straight track connecting. The company has also done a large amount of cast-welding track and other work in Kansas City. The company was very ably represented by Gen. Otto H. Falk, vice-president, and Clement C. Smith, second vice-president, of Milwaukee, and by Wendell and MacDuffie, of New York.

THE PECKHAM TRUCK COMPANY had a large exhibit at the hall, and also a parlor at the Midland Hotel, where some very fine models of trucks were shown, and visitors were entertained. Hanna & Grey, Western agents, joined with the company in making the exhibit. At the convention hall the chief exhibit was the Peckham system of double trucks for high-speed elevated and suburban service. One single truck was shown, namely, a Peckham extra long cantilever extension truck, built for the Omaha Street Railway. The double trucks consisted of one "Standard" maximum traction, style 14-D-3; one extra strong maximum traction, style 14-D-5; one pair extra strong maximum traction, style 14-D-8; one short wheel base, style standard, 14-B-3; one short wheel base, style special, 14-B-6; one short wheel base, style "Boston Special"; one short wheel base, style "Kansas City Special"; one extra long wheel base, No. 26. The same general lines are followed in all the Peckham maximum traction trucks, all having swing bolsters and motors suspended outside of the wheel base. The brake mechanism



EXHIBIT OF THE INTERNATIONAL REGISTER CO.

can be operated with either large or small wheels leading. In the case of the extra strong 14-B-5 and 14-D-8, inside brakes are used, which have extra strong angle bar cross section, connected to the side frames, so as to prevent the trucks from getting out of square. The Peckham half elliptic spring traction adjuster can be attached if desired, although the center bearing bolster can be so located as to apply the necessary weight to the small wheels to prevent them leaving the rail. The Peckham Truck Company was one of the first to use the short wheel-base truck now so common, these types having center bearing swing bolsters and motors supported outside of the axle. The short wheel base permits the truck to turn between the car sills, so that the distance of the car body to the ground may be reduced, and only one step is needed. Several modifications of this truck are made by the company, those on exhibition being one Standard construction, style 14-B-3, one Kansas City Special, designed for the use of the Metropolitan of Kansas City, having certain features specified by its master mechanic. Two hundred of these trucks have been ordered, and seventy-five are in service. One Boston Special, designed expressly for the Boston Elevated Railway, was shown; 250 of these being in service. These trucks may be used with either one or two motors, and when used with one motor the brakes are adjusted so as to apply the necessary power without sliding the wheels. The high-speed suburban truck which this company had on display was its No. 26, with the Peckham patent bridge trussed side frames, which are capable of supporting a load of 100 tons per truck. Edgar Peckham, president, and W. M. Wampler represented the company.

THE PACKARD LAMP COMPANY, of Warren, Ohio, was represented by W. D. Packard and W. N. Anthony.

THE WEBER RAILWAY JOINT MANUFACTURING COMPANY, New York, was represented by J. C. Barr, of New York, and E. W. Penfield, engineer, and Fred A. Poor, assistant

engineer, Chicago. The exhibit comprised T and girder rail-joints, compromise joints, and also the insulated joints so extensively used for block signal work. Photographs were also shown from various roads using the Weber joint.

GEORGE W. KNOX, electrical railway engineer of Kohler Brothers, railway contractors, of Chicago, was one of the familiar figures at the convention.

THE ELECTRICAL INSTALLATION COMPANY, of Chicago, had overhead construction on the Metropolitan Street Railway lines as an exhibit, and Superintendent Brett attended the convention.

THE AMERICAN VITRIFIED CONDUIT COMPANY, B. S. Barnard, exhibited samples of conduit duct in various forms, multiple and single, curved and straight.

THE MONARCH FIRE APPLIANCE COMPANY, represented by Gen. C. H. Barney, manager electrical department, made an exhibit, and also a demonstration in front of the hall at noon Oct. 18. A fierce bonfire was built up until it seemed that the boxes of which it was made must surely be consumed. The fire went out the instant a little "Kilfyre" was thrown on it. This is a dry powder compound, and from the tests is of wonderful efficacy in extinguishing fires. This company has a long list of installations, many of them in well known factories.

THE CHARLES SCOTT SPRING COMPANY was represented by D. S. Roche, Philadelphia.

THE STIRLING COMPANY, of Chicago, sent its sales agent, H. R. McCullough.

THE EDWARD P. ALLIS COMPANY, of Milwaukee, needed no exhibit in the hall, but was represented by its work in Kansas City and William E. Dodds.

THE ELECTRIC STORAGE BATTERY COMPANY, of Philadelphia, had its interests looked after by Frank H. Clark, Western manager, of Chicago.

THE CENTRAL UNION BRASS COMPANY, of St. Louis, had its interests looked after by T. C. White, manager of its electrical department.

THE AULTMAN & TAYLOR MACHINERY COMPANY, of Mansfield, Ohio, makers of Cahall and B. & W. type boilers, had no exhibit, but E. C. Darley, general Western agent at Chicago, sent James W. Gardner, and Alexander H. Lewis, of the Cincinnati branch, was also present.

THE LACLEDE CAR COMPANY, of St. Louis, had its vice-president and general manager, Edward I. Robinson, in attendance.

THE SPEAR & MILLER COMPANY, of Chicago, had a small exhibit of its brake shoes, in charge of J. H. Miller. This brake shoe is used by the Metropolitan of Kansas City. It has a composition center made of iron turnings and asphalt, which, it is claimed, increase the coefficient of friction and double the life of the shoe.

THE VOSE SPRING COMPANY was represented by Gustave Suckow.

THE AMERICAN CAR COMPANY had no exhibit, but President Sutton was in attendance.

THE ST. LOUIS CAR COMPANY sent Assistant Manager Vogel to look after its interests.

H. S. COOPER, consulting engineer, New York and Ithaca, was among the visitors.

CLARENCE BROOKS & COMPANY, 249 Chestnut Street, Newark, N. J., had an exhibit of varnish and paint samples, in charge of A. R. Johnston.

THE B.-R. ELECTRIC COMPANY, a Kansas City supply house, presented an exhibit of the goods for which it is agent, including Ohio Brass Company, Hazard Manufacturing Company, R. D. Nuttall Company, New York & Ohio Company, and the Cutter Company.

THE MILLOY AUTOMATIC TROLLEY CATCHER & ELECTRIC SUPPLY COMPANY, 59 Park Place, New York, showed its automatic trolley catcher, which has an advantage over those in common use in that it not only holds the rope when the trolley leaves the wire, but draws it back 26 ins. so the trolley cannot hit a span wire. It is reset in a second's time. Peter D. Milloy, general manager, explained the device.

THE GOULD STORAGE BATTERY COMPANY, of New York, sent a representative in the person of Rufus N. Chamberlain.

GUY M. GEST, general contractor, Cincinnati, Ohio, has laid over 160 miles of Camp vitrified conduit the past year, and had an exhibit showing a sample of conduit laid in concrete and illustrating the perfect alignment and smoothness of the ducts in charge of T. E. Wood. This exhibit was of especial interest to electric railway men contemplating the laying of underground conduits.

THE CONTINUOUS RAIL-JOINT COMPANY OF AMERICA, Newark, N. J., was well represented by R. F. Braine, general manager; H. M. Montgomery, Chicago agent; W. E. Clark, agent; F. C. Schmitz and J. G. Miller. These gentlemen received visitors in a commodious space in which were found samples of this company's various forms of T and girder rail joints, and decorations in the shape of the familiar and striking continuous-rail-joint poster (showing a black and white section of the joint on a red mat), which accompanies every shipment of these joints all over the world.

ADOLPH HUBER, 917 Franklin Avenue, St. Louis, is the inventor of a sample street railway switch-operating device, which he showed by model. The switch is thrown by the engagement

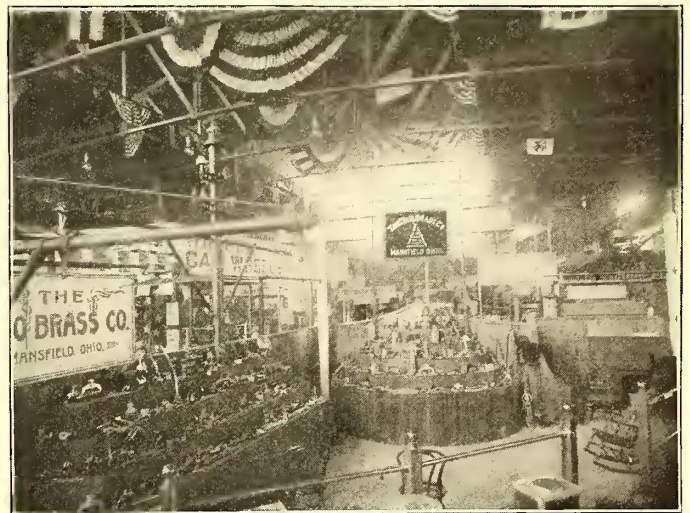


EXHIBIT OF THE OHIO BRASS CO.

of a roller under the car with a cam between the tracks. Mr. Huber has labored to simplify the car mechanism as much as possible to make the cost of equipping all the cars on the line with switch throwers as low as possible.

THE WEBER GAS & GASOLINE ENGINE COMPANY, of Kansas City, exhibited two engines, one for ordinary power purposes and the other with hoisting attachment.

THE UNITED STATES ELECTRIC SIGNAL COMPANY, of Watertown, Mass., has worked on the problem of block signals for single-track roads with turnouts for two years, and presented a system operated by an instrument on the trolley wire. A car, upon entering a block between turnouts, throws signals at both ends of the block (a red signal in front and a white one behind), and the signals cannot be cleared until a car runs out of the block at the other end. Dr. Frederick E. Withee, secretary, and R. J. Ruddick, the inventor, who represented the company, found many interested inquirers.

THE EXHIBIT OF JOHN T. McROY was a most interesting one. He showed the only conduit that is made in 6-ft. lengths. He also showed the many styles of vitrified clay conduit made by his company. Fifty car loads of this conduit are being put in— in Kansas City—by the Electric Light Company and by the Kansas City Electric Traction & Subway Company. Big shipments of this conduit have recently been made to the Kinloch Telephone Company, of St. Louis, and the St. Louis Car Company, and to the Des Moines Edison Light Company. John T. McRoy looked after his own interests, and was ably assisted in doing so by his Western manager, O. C. Pixley, of Chicago.

THE CHARLES SCOTT SPRING COMPANY, of Philadelphia, was ably represented by D. S. Roche, who, owing to the many conventions that he has attended, has many friends, who are glad to meet him again. Mr. Roche gave out as a souvenir a very useful little memorandum book.

COL. JOHN BLAIR MACAFEE, of Philadelphia, the well known contractor and vice-president of the Railways Company General, was looking as handsome as ever, and was, as usual, warmly greeted by his many friends.

THE NEW YORK & OHIO COMPANY, of Warren, Ohio, manufacturer of incandescent lamps and transformers, was represented by W. D. Packard.

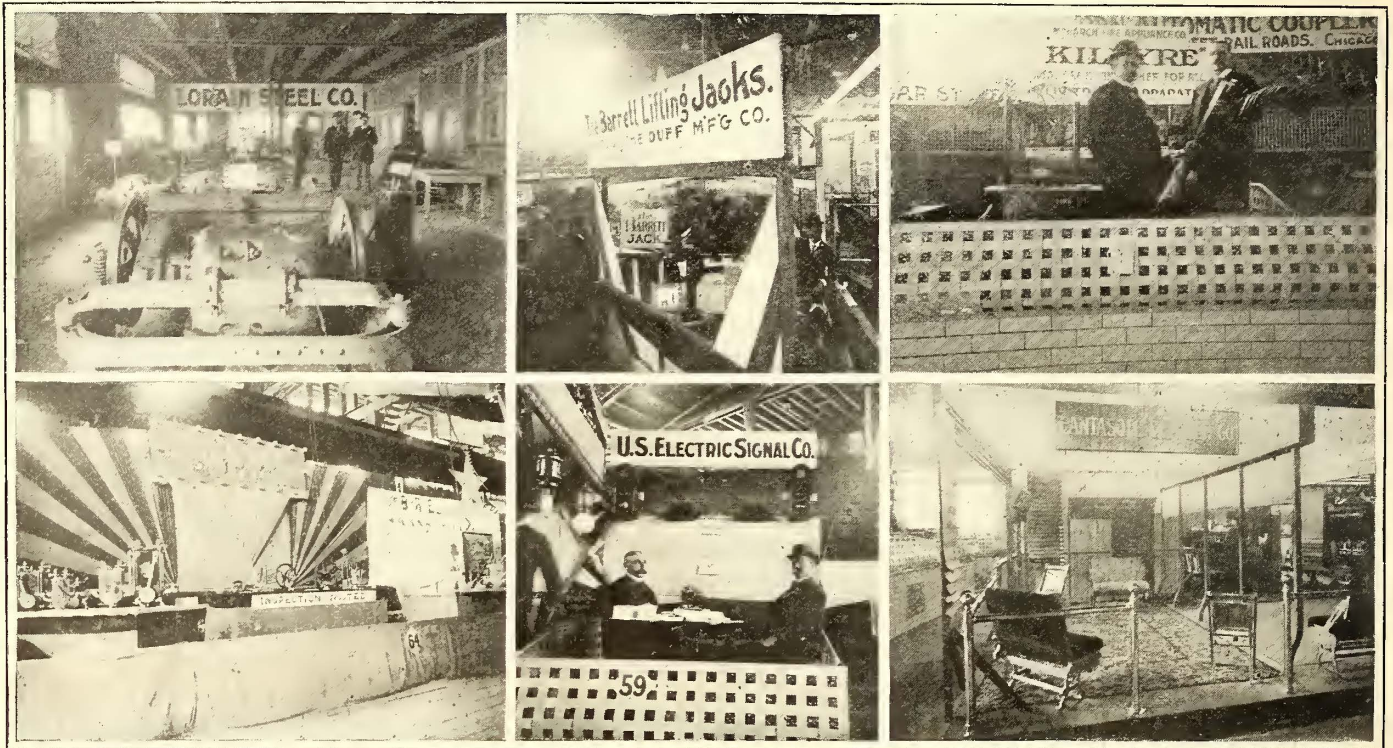
HAROLD P. BROWN, of New York, was present, assisted by Messrs. Holwood, McClure and Immoche. Mr. Brown had all his plans made to have a bond-testing outfit working to show the conductivity of the various bonds, but the special low-voltage dynamo was lost in transit, so he had to be content with showing samples of bonds with plastic alloy contact, and some defective bonds of ordinary type. Mr. Brown came to the convention this year with a voltmeter which is the most delicate portable instrument ever turned out of the Weston factory, the full scale being but 0.15 volt. A very interesting piece of literature has been reprinted by Mr. Brown in pamphlet form, viz.: a report of investigation on the contacts of different metals carried on with high-power microscopes by the Ecole d'Electricité at Paris, under

THE PARTRIDGE CARBON WORKS, Sandusky, Ohio, were represented by their manager, James Partridge, and presented an exhibit of carbon brushes. A handsome souvenir paper knife was given to visiting supply and street railway men.

THE H. N. STRAIT MANUFACTURING COMPANY, of Kansas City, exhibited the Monarch standard scales made by it.

THE PHOENIX METALLIC PACKING COMPANY, 7 South Jefferson Street, Chicago, had a fine exhibit of its lubricator pump. These pumps are driven from the engine, and the length of pump stroke can be accurately regulated to the feed required. A number of pumps with independent feed are included in one device. J. S. Ward, vice-president and general manager, and C. H. Thompson were present.

THE AMERICAN STEEL & WIRE COMPANY is too well known to make much of an exhibit necessary at the convention, but it occupied a small and handsome booth near the hall entrance in which rail bonds and sections of cables, both weather-proof and rubber-covered, were displayed. E. J. Pirtzcker and H. L. Thompson, of the electrical department, Chicago, took care of visitors.



VIEWS OF SIX IMPORTANT EXHIBITS

the auspices of the French government. The results showed that in all cases the contact between two hard metal surfaces is of the roughest kind, and that a skin of oxide intervenes between copper and iron contacts. This report is instructive reading, and will be sent to those interested in such matters.

THE CUTLER-HAMMER MANUFACTURING COMPANY, of Milwaukee, Wis., represented at this convention by C. G. Norwood, has recently entered the street railway field. The exhibit pertained entirely to street railway work. It consisted of a switchboard of 500-kw generator panels, a number of the new type circuit breakers in actual operation, an automatic booster controller also in operation, and other switchboard appliances. The circuit breakers known as the W. T. L. differ from all other circuit breakers on the railway market in having a time element. They were described in the October JOURNAL. Special attention at the convention was called to a 500-amp breaker exhibited that was connected across 500-volt bus-bars at Milwaukee Oct. 15. In series with this breaker was a resistance of 0.89 ohm. The breaker was then caused to open the circuit 200 times in rapid succession. This resistance was then decreased to .44 ohm, and the breaker opened twenty-five times in rapid succession. The voltage across the line remained at 590. A system of automatic booster control, something entirely new, was presented for inspection. It consists of a device which automatically throws the booster in and out of circuit as the load demands. The controller was in actual operation, and drew considerable attention. A laminated leaf switch of a most novel character was also shown.

THE CHEATHAM ELECTRIC SWITCHING DEVICE COMPANY, 1212 Frankfort Avenue, Louisville, Ky., has an electric track switch operator thrown from a trolley wire contact. Eight of these have been in use on the Louisville Railway for a number of months, and are said to be giving good service. The plan adopted by the company in some places is to take the switch-boy hire and do the switch-boy work with the device until the switch is paid for, a plan which should be satisfactory to both the company and street railway.

THE PITTSBURGH REDUCTION COMPANY, of Pittsburgh, Pa., the principal aluminum manufacturer of the world, made an interesting exhibit of the uses of aluminum for electrical conductors. There were present at the convention: Arthur V. Davis, general manager; Alvah K. Lawrie, general sales agent, and John A. Rutherford, manager of the Cleveland office of the company. The principal part of the exhibit consisted of reels of aluminum cable, both bare and insulated. The cable on the reels varied in size from 400,000 circ. mils to 1,000,000 circ. mils, although the company showed short samples of sizes, both larger and smaller than the above mentioned. There was a very complete exhibit of the different styles and methods of joining aluminum cables, showing that this question, which has supposedly presented some difficulties, has been completely solved. The different styles of joints included the ordinary type of soldered sleeve joints, soldered spliced joints, and mechanical and spliced joints which require no solder. There was also shown the new compression joint, the patent rights for which the company has just acquired, by

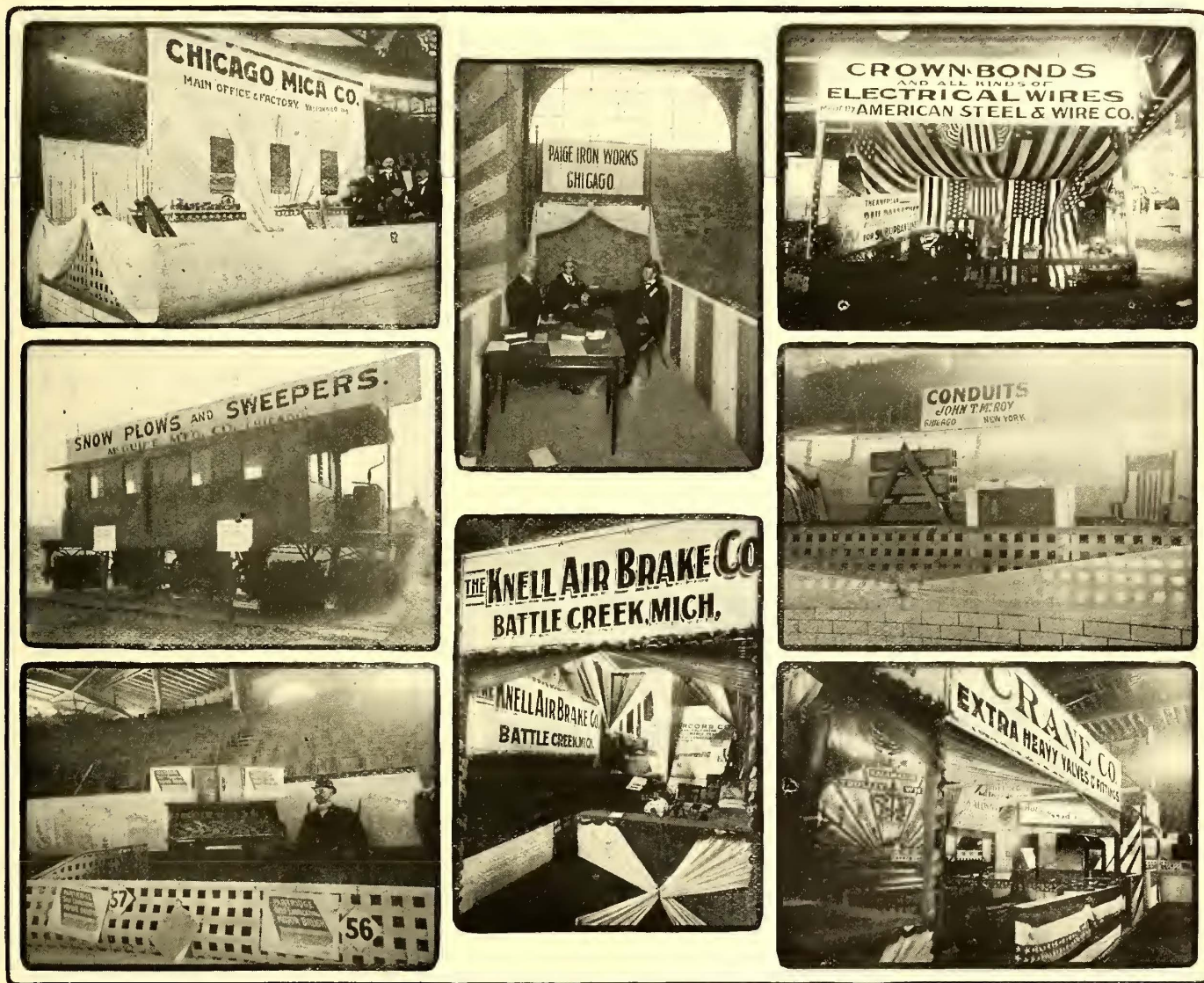
which process a sleeve is cold-welded, by extreme pressure, onto the cable, so that the wires of the cable and the sleeve form practically one solid mass of metal. As the principal object of the exhibit was to show the different sizes and styles of aluminum street railway feeders, there were exhibited also reels of telephone and telegraph wire and reels of wire and cable of the sizes commonly used for high-tension power transmission. There were also exhibited reels and samples of insulated wire for electric lighting purposes. This was General Manager Davis's first street railway convention, which, together with recent developments in the use of aluminum for electrical conductors, would seem to point to the fact that it will find an important place in electric railway work in the near future.

THE AMERICAN STREET RAILWAY PAVING & IMPROVEMENT COMPANY, Springfield, Mass., was represented

THE W. R. GARTON COMPANY, of Chicago, had a small space in which Multiplex reflectors and General Equipment circuit breakers were shown. Mr. Garton himself was present, adding to his already long list of acquaintances, and W. H. Card also represented this company. Mr. Garton distributed a neat aluminum paper knife and rule for a souvenir.

THE CURTAIN SUPPLY COMPANY, Chicago, made its usual exhibit of car fixtures and curtains. W. H. Forsyth and A. L. Whipple were in charge.

THE PANTASOTE COMPANY, 29 Broadway, New York, had a very handsome exhibit, and showed several new designs in silks and woven fabrics. Pantasote has been long known to the trade, and needs no explanation to convention goers, and is looked upon and recognized by the railway world at large as one of the



VIEWS IN AND AROUND THE CONVENTION HALL

by C. F. Smith, manager, and exhibited its system of cast-iron paving blocks, whereby a girder rail may be practically transformed into a grooved rail. These hollow cast-iron blocks slip over the tram of the rail, and weigh, in the heaviest types, 27 lbs. per yard of rail. Two years ago 9000 ft. of this rail was laid in Springfield, and is reported to have been an excellent investment.

POMEROY & FISCHER, New York, importers of varnishes and colors, had a handsome little display. Joseph Pomeroy was present at the convention.

THE PAIGE IRON WORKS, of Chicago, were represented in the person of E. S. Nethercut, its engineer, who distributed literature relating to the company's work from a booth under the west gallery. A handsome pamphlet illustrating the special work put in for the various elevated roads of Chicago was the most interesting publication offered, and one in which the company justly takes pride,

best and most practical curtain materials on the market. The exhibit was in charge of J. M. High and H. M. Grier.

THE AMERICAN CAR & FOUNDRY COMPANY, of St. Louis, had headquarters at both the convention hall and hotel. It exhibited under the direction of Scott H. Blewett, general sales agent, a number of car wheels and sections of car wheels; also parts of broken wheels showing their interior construction. From this company there were also in attendance T. F. Bixby, district manager St. Louis plant; James Connolly, general superintendent of foundry, St. Louis plant, and J. L. Dillon, sales agent. The manner for showing the character of the chill in the tread of the wheel and the strong fibrous iron in the plate and spoke commends itself to those who use street car wheels. A piece of metal is broken from the wheel and the general character of the wheel is preserved, although this piece has been taken from it. These wheels are mounted on a mandrel, and the entire circumference of the wheel can be brought under the eye of anyone examining

it. The company's plants are located at Buffalo, N. Y.; Berwick, Pa.; Chicago, Ill.; Detroit, Mich.; Huntington, W. Va.; Indianapolis, Ind.; Jeffersonville, Ind.; Milton, Pa.; St. Charles, Mo.; St. Louis, Mo., and Terre Haute, Ind.

WINNE & KELLOGG, Chicago, general Western agents for Adams Cook's Sons "Albany Grease," and also dealers in high-grade lubricating oils, engineers' and mill supplies, had one of the boxes at the Convention Hall, where Ben B. Kellogg met the street railway men and distributed a handsome souvenir in the shape of a thermometer.

THE AMERICAN BRAKE SHOE COMPANY, of Chicago, was represented by F. W. Sargent, of the Sargent Company, Chicago, and Arthur Gemunder, of the Ramapo Iron Works, Hillburn, N. Y. The two latter named companies and Parker & Topping, St. Paul, Minn., are the selling agents for the American Brake Shoe Company. This company's "Diamond S" brake shoe, as is well known, is made of bundles of expanded metal, around which cast iron is poured. The combined output of the company's plants exceeds 100 tons of brake shoes per day, which is of itself a sufficient proof of the merit of the article.

THE DEARBORN DRUG & CHEMICAL WORKS, of Chicago, were represented by R. F. Carr and C. A. Stanfield, who



EXHIBIT OF THE WESTINGHOUSE CO.

exhibited extreme samples of scale formation from steam boilers and samples of water tube valves and connections, showing the different stages of galvanic action pitting and corrosion produced from different boiler feed-waters. There are very few cases of feed-waters that do not require some treatment, and the Dearborn Drug & Chemical Works, in their well equipped laboratories in Chicago, make a thorough mineral analysis of feed-waters, and scientifically treat same according to their different conditions. They have taken this subject out of the hands of the incompetent fakirs, and are to-day furnishing many of the large street railway and lighting interests of this country. They have branch offices at St. Louis, Denver, St. Paul and San Francisco. Their laboratories are always open to the public for any general analytic testing work. The company also has an extensive business in lubricating oils and greases, furnishing oils which most economically lubricate under special conditions of steam pressure. When carefully used, the highest grade oils prove by far the cheapest. The representatives gave as souvenirs to the ladies a bottle of perfume, a product of the company's laboratories, and to the gentlemen a mechanical puzzle. The company's booth was handsomely decorated in green, light blue and red.

THE AUTO APPLIANCE COMPANY, of Chicago, showed a new automatic car coupler which interested street railway men. Thomas I. Duffy was in charge.

THE W. T. VAN DORN COMPANY, of Chicago, was represented, as it has been for many years past, by W. T. Van Dorn. Mr. Van Dorn's couplers are now standard on every elevated road in the world, and no other automatic coupler than the Van

Dorn is in use on the street railway cars of this country. Mr. Van Dorn has recently patented a device for preventing derailment of fast trains, and another for cleaning the hot-air pipes of furnaces for heating dwellings. Recent tests of the latter prove it to be a remarkably successful invention.

THE ST. LOUIS REGISTER COMPANY, of St. Louis, was represented by Giles Allison, of New York, and William Kirchoff, the inventor. J. W. Allison, of St. Louis, was also present for a short time. This register was fully described in the JOURNAL for October last. It attracted universal attention, and the company was more than pleased with the favorable comments by street railway officials. This new register is the result of years of study and experience. The name is already well known, and the self-recording feature must undoubtedly create a demand for it.

PIERCE, RICHARDSON & NEILER, of Chicago, were present in the person of R. H. Pierce and R. E. Richardson. The members of this firm are consulting engineers of the Metropolitan Street Railway Company and the Kansas City Electric Light Company, a consolidation of all the light companies of the city, and of which latter company Mr. Richardson is general manager.

THE MEYERCORD COMPANY, of Chicago, showed delegates and visitors its decalcomania transfers for lettering, striping and decorating cars. The company has recently built and equipped a new factory in Chicago to care for its enormous business. Among its customers are many of the street railway companies and car builders. The company showed a photograph of a large interurban double-truck car, which had been striped, lettered, decorated and varnished with one coat of varnish, the whole being completed in nine hours. Henry C. Clasen was in charge of the exhibit.

THE CRANE COMPANY, of Chicago, made its usual exhibit of high-pressure valves and other steam appliances.

THE NORTH AMERICAN RAILWAY CONSTRUCTION COMPANY, of Chicago, was able to direct visitors to much street railway construction by this company in Kansas City, where it has at this time a new contract upon which it is working. The president of this company, A. S. Littlefield, was one of the best known men at the convention. D. J. Evans, of this firm, was also in attendance.

THE MODOC SOAP COMPANY, of Cincinnati, was represented by C. C. Grace. This company's liquid car cleaner is used by nearly all of the steam railroads in America and by many street railways. It cleans the car without injuring the varnish, is a varnish food, and it is claimed that it will much prolong the life of the finish of the car body. The company made no exhibit, but its genial representative made many friends for his product, as well as for himself.

THE GREEN ENGINEERING COMPANY, of Chicago, made no exhibit at the Convention Hall, but its traveling grate could be found at several of the Metropolitan power houses. W. M. Green, president, and George H. Klumph, Western manager, were present. The company has sold an immense number of grates this season, having made some of the largest installations ever made in this country.

THE STANDARD RAILWAY SUPPLY COMPANY, of Chicago, was present in the person of its president, Garson Myers, for many years well known to convention goers. Mr. Myers also represented the Crucible Steel Company of America, Pittsburgh, Pa., manufacturers of railroad springs, forgings and track tools.

THE CHARTER OAK STOVE COMPANY, of St. Louis, showed one of its street car heaters.

THE VAN DORN & DUTTON COMPANY, of Cleveland, was represented by W. A. Dutton. This company's shops are and have been for many months past so filled with work as to necessitate running both day and night to keep up with orders.

THE WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY had a very prominent position near the center of the hall, and its space was one of the most prominent and attractive in the building. The largest machine exhibited by the company was a 650-kw generator, being one of four built for the St. Louis Transit Company. The armature was shown separately. At one side of the space was a five-panel switchboard, being a duplicate of that shown by the British Westinghouse Company at the recent

British Tramway and Light Railway Exposition at Islington. On the other side of its space the company also showed two No. 68 motors mounted on the McGuire truck, and other apparatus. A new railway motor catalogue was issued, and a pamphlet on the new motor rating adopted by the company, based on the current carried continuously for ten hours with a temperature rise not exceeding 75 degs. C. The handsome booth was draped in yellow and black bunting and carried a large sign in red lamps bearing the name, "Westinghouse." The miscellaneous apparatus shown included Wurts lightning arresters, switches, circuit breakers, fuse blocks, voltmeters, ammeters, etc. Representing the company were F. H. Taylor, N. W. Storer, G. Berentsen, W. H. Wells, W. M. Probasco, P. N. Jones, R. S. Brown, C. S. Powell, C. A. Bragg, J. R. Gordon, C. B. Humphrey, G. Pantaleoni, H. C. Ebert, F. C. Newell, C. F. Medbury and E. Dyer.

THE ELECTRICAL INSTALLATION COMPANY, of Chicago, had a most practical exhibit in the fact that the company had done a large amount of construction work in Kansas City. The company attached signs to some of this work, stating that it had been erected by the Electrical Installation Company. Fred H. Fitch, vice-president, and James A. Brett, general manager of the company, were present in its interests.

THE CHICAGO MICA COMPANY was represented by Charles W. Cobb.

C. C. GRACE attended the convention in the interests of the Modoc Soap Company.

HEYWOOD BROTHERS & WAKEFIELD COMPANY, of Boston, had no exhibit, but was represented by J. D. Guillow.

L. E. MYERS, contractor and engineer, of Chicago, was present representing the Peoria & Pekin Terminal Railway. Mr. Myers has done a large amount of construction work in Kansas City.

EDWARD B. KITTLE AND HENRY G. ISSERTEL, JR., attended the convention in the interests of the Sprague Electric Company.

THE KRAUSHAR LAMP & REFLECTOR COMPANY, of St. Louis, was represented by C. Kraushar.

C. S. LEHMAN and George E. Watts, of the Columbia Incandescent Lamp Company, were in Kansas City in the interests of the Columbia lamp.

THE STAR BRASS WORKS, of Kalamazoo, Mich., had for their representatives at Kansas City C. A. Peck and Lloyd Roberts.

THE NEW JOHN STEPHENSON COMPANY was well represented at the convention by its general manager, P. M. Kling. Mr. Kling has attended many conventions and has many friends among the delegates, who congratulated him upon the re-entrance of the Stephenson Company in street car construction, and seemed well pleased that he had been selected as general manager of the company.

A TRIP to Fort Leavenworth by trolley, which was taken by a number of the delegates, afforded the Magann Air Brake Company an opportunity of showing the operation of its air brake system. Mr. Rutherford, of the Detroit office, who was in attendance at the convention, accompanied the party, and was the recipient of many congratulations upon the excellent showing made by the brakes.

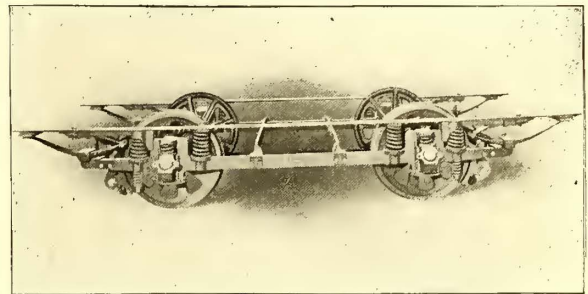
THE JACKSON & SHARP COMPANY, of Wilmington, was represented by J. Monteith Jackson.

THE GENERAL ELECTRIC COMPANY occupied a large space nearly in the middle of the convention hall, tastefully decorated. In the rear the name of the company appeared on a sign, studded with incandescent lamps. The exhibit consisted of a rotary converter, a transformer set, railway motors and controllers and supply material. The rotary converter, which was placed in the center of the exhibit, was a 600-kw, three-phase, 550-volt machine for railway purposes. There were three 250-kw air blast transformers to be used with this rotary converter, which occupied three of the corners of the space. A Peckham truck mounted with two GE-67 motors stood in the fourth corner. Occupying other parts of the space were a GE-54, a GE-67, a GE-57 and a GE-73 railway motor, these representing respectively 25 hp, 38 hp, 50 hp and 75 hp. Three controllers were shown: K-6, K-10 and B-19. K-6 is designed for four motors from 30 hp up to and including 40 hp each, or two motors from 60 hp up to and including 80 hp each. K-10 is designed for two motors up to and including 35 hp each. B-19 is an electric brake controller designed for four motors up to and

including 35 hp each, with brake connection for four motors. A variety of railway line material and supplies was also shown. The exhibit space was 1500 square feet, and the exhibit was erected and was in charge of R. A. Swain, of the Chicago office of the General Electric Company. Other representatives present were J. R. Lovejoy, general manager of the light, railway and power department; J. G. Barry, assistant manager New York department; J. H. Armstrong and C. G. Priest, of Schenectady; J. C. Kalish, of Buffalo; R. H. Beach, of New York; C. C. Pierce, of Boston; T. H. Bailey, of Chicago, and E. H. Mullen, of New York.

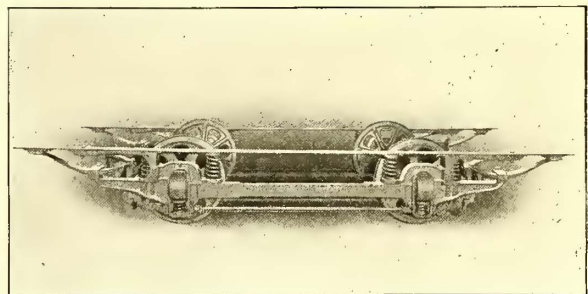
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The Exhibit of the McGuire Manufacturing Company

The McGuire Manufacturing Company, of Chicago, made one of the best exhibits to be seen at the Kansas City convention, and was very liberal with its souvenirs in the shape of a memorandum book with aluminum covers, a card of the company on one side and an engraving of its No. 39 truck on the other. The first



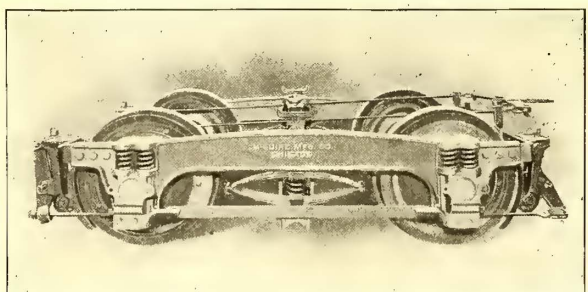
SOLID STEEL COLUMBIAN TRUCK

thing that caught the attention of the visitor was their sweeper, which occupied a position directly in front of the main entrance to the hall. This sweeper was one of fifteen sold to the Metropolitan Street Railway, of Kansas City, and was very generally examined and most favorably commented upon by all who saw it. It was the



A 1 SUSPENSION TRUCK—PITTSBURGH TYPE

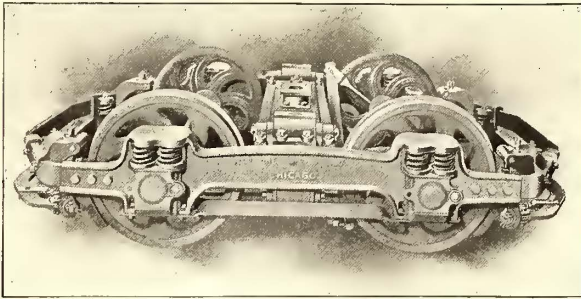
only exhibit of this kind on the ground. The long distance and the great cost of handling a machine of this kind, that weighs 24,000 lbs., makes it an expensive exhibit. There are over 500 of these machines in service throughout the country, and it is acknowledged to be a fully up-to-date sweeper. In the Westinghouse exhibit was



NO. 35 DOUBLE TRUCK

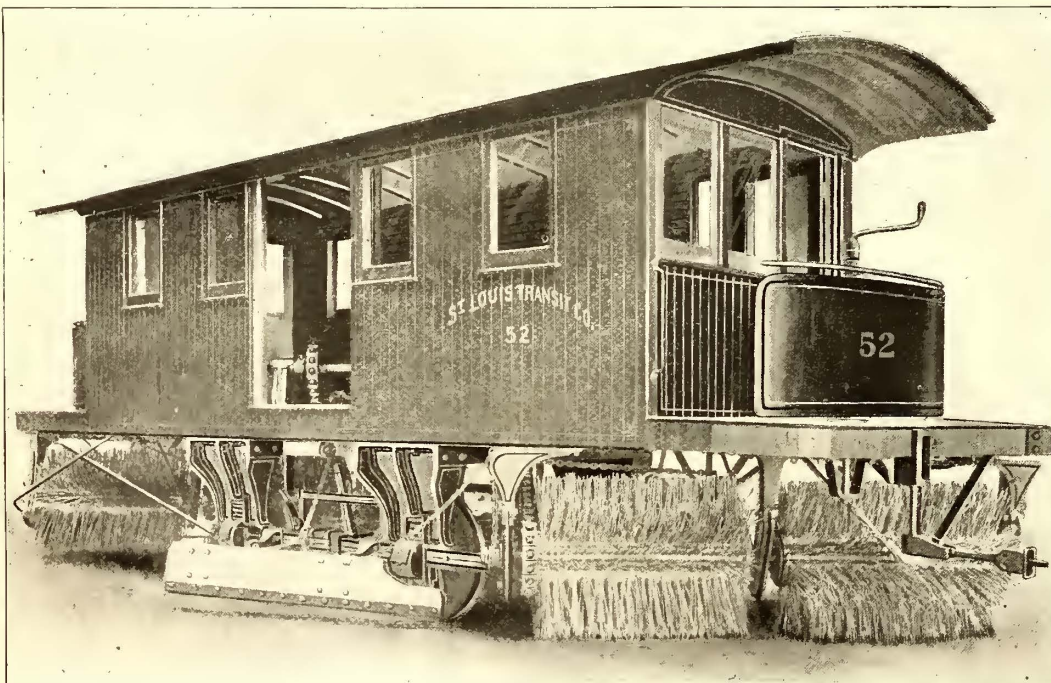
shown the McGuire A1 suspension truck (Pittsburgh type), equipped with the Pittsburgh standard motor. This exhibit was very carefully examined by a great many people on account of the record of this entire equipment. There are over 800 of this type in

use in Pittsburgh alone. It is the standard also in Havana, Cuba, and in many other places. It may be mentioned here that the service in Pittsburgh is one of the most severe in the country, because of its many high grades. Some of the hills over which these lines run being as high as 12 per cent grade, they call for the most efficient brake arrangement and general stability of construction. The main exhibit of the company was under the galleries. The first truck was its No. 39, and was one of the hundred now being built



NO. 39 MOTOR TRUCK

for the Chicago Union Traction Company, of Chicago, where it is the standard, as it is in many other important places throughout the country, particularly the Indiana Railway, of South Bend, where they are required to make a schedule time of forty miles per hour, sometimes reaching fifty miles per hour. This truck has cast-steel sides and bolsters, and is built as nearly on Master Car Builders' lines as it is possible for an electric truck, the motors being hung outside of the axles. Its short wheel base—4 ft.—permits it to swing inside of the sills, bringing the car body within 26 ins. of the rail, necessitating but one step. The next truck in the



COMBINED SNOW PLOW AND SWEEPER

exhibit was their maximum traction truck. This truck is also made of cast steel with swing bolster and of the adjustable traction type. It is so constructed that as much as 75 per cent of the load may be put on the driving wheels if desired, with a cam and roller attachment which shifts a part of the load to the rear wheels on curves, completely overcoming the objection to most of the maximum traction trucks. There was also exhibited one of the solid steel Columbian trucks, which is the standard on so many of the railways throughout the country. The McGuire Manufacturing Company was the first to build solid steel frame trucks, and has been imitated by all the truck manufacturers who have acquired any standing. This truck is so designed and constructed that its carrying capacity can be adjusted to any required load. The frame consists of solid steel sides of any required wheel base, and has eight spiral and four three-quarter elliptic springs. The pedestal, spring cups and spring caps are all cast in one piece, forming the end of each side frame, and is welded to rolled steel pieces 2 ins. x

4 ins., by which the length of the wheel base is regulated. The minimizing of parts is carried to its fullest extreme in the construction of this truck frame. All these different trucks are equipped with standard brakes, which include the McGuire Company's elastic brake hanger, a very popular feature of their trucks. This device absolutely prevents kicking, chattering or rattling of brakes, and automatically takes up its own wear and lost motion. The Royal Flush fender came in for a very generous inspection, as nearly every railway man is very much interested in this subject. This fender seems to do everything that the more expensive types will do, and has the advantage of being a simple and low-priced fender, which is a taking feature. Mr. McGuire christened the fender "Royal Flush" because he says he thinks it is hard to beat. It also exhibited its latest types of Columbia car heaters, one of which sits over the seat and the other sits in the seat. This is a very handsome piece of car furniture and is being very generally used throughout the country. In Chicago alone over 900 of them are in service. In connection with its fender exhibit, a section of platform showing their spring guard, which is now being used by many roads, was shown. The North and West Side roads of Chicago have them on all their equipment. Several of the lines in Dayton and other places are using them, and report most favorably upon their operation. There was also an exhibit of brake handles. Take it all in all, this was one of the most creditable exhibits at the convention. The company was represented by W. J. Cooke, vice-president of the company, and T. J. Callinan. Mr. Cooke reported that they made a great many sales of sweepers, trucks, fenders and stoves, an unusual occurrence at a convention.

A Useful Automatic Lubricator

A device which will be found of great convenience for oiling reciprocating parts of engines, pumps, air compressors, etc., is being manufactured by J. L. Robertson & Sons, New York. It consists of a large cup, filled with grease instead of oil, the base of which is screwed firmly into the cross-head, connecting rod, eccentric strap or other part to be lubricated. The grease is fed to the bearing by means of a piston, which, while the engine is in motion, slowly forces it out of the cup. This piston is operated by a small pendulum at the side of the apparatus, which by means of a pawl and ratchet, worm gear and screw moves it forward at an adjustable speed. As the part to which the lubricator is attached moves backward and forward the pendulum continues to oscillate, but when the machinery comes to rest the feed automatically stops. By means of an auxiliary thumb-nut at the top a much faster expulsion of the grease can be attained. The lubricator is simple in construction, easily applied to the engine, and readily filled when empty. It can be

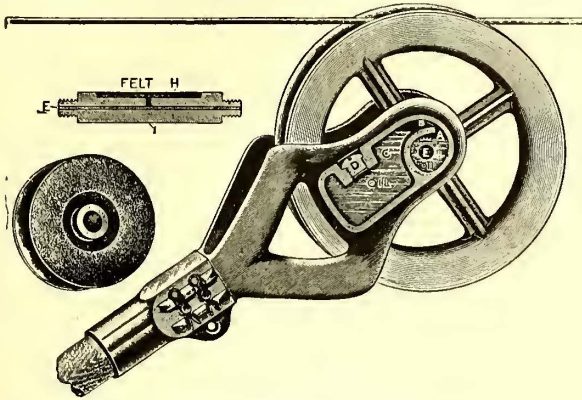
applied to any kind of machinery having reciprocating parts, and in any position, and is made in various sizes to meet all requirements. The inventor is G. U. Merrill, Paterson, N. J., but the manufacturing company is placing the automatic lubricator on the market.

An Improved Self-Oiling Trolley Harp

During the three years that the trolley harp shown in the accompanying engraving has been on the market the manufacturers have made many improvements in its construction. It is now one of the most efficient and durable of the self-oiling harps, and is so simple that its operation is practically perfect. It is made in both brass and aluminum, the latter metal giving most satisfactory results and allowing the use of weaker springs than the heavier metal.

As shown by the illustration, there are two chambers to receive

the oil, the one around the axle being much the smaller. The larger reservoir contains the supply of oil, which is fed to the auxiliary reservoir every time the trolley is lowered. From there it flows through the central passage that is bored in the axle or spindle on which the wheel revolves. A piece of felt in a slot on the axle prevents too free a flow and gives a good distribution of the oil.



SELF-OILING TROLLEY HARP

There is sufficient oil placed in the harp at each filling to last from ten to thirty days.

The long bearing of the trolley wheel gives a true and even running, and thus reduces the wear. All the oil is used in lubrication, and the ordinary trolley oiler at the end of the road is dispensed with. The wheel running smoothly and with perfect lubrication, there is much less noise than with ordinary wheels, and the device is less liable to leave the trolley wire. For this reason it has been in use on some of the large heavy traffic, high-speed roads of the country with great success.

The self-oiling trolley harp above described is known as the "Excelsior," and is manufactured by the International Specialty Company.

Two Large Engines at the Paris Exposition

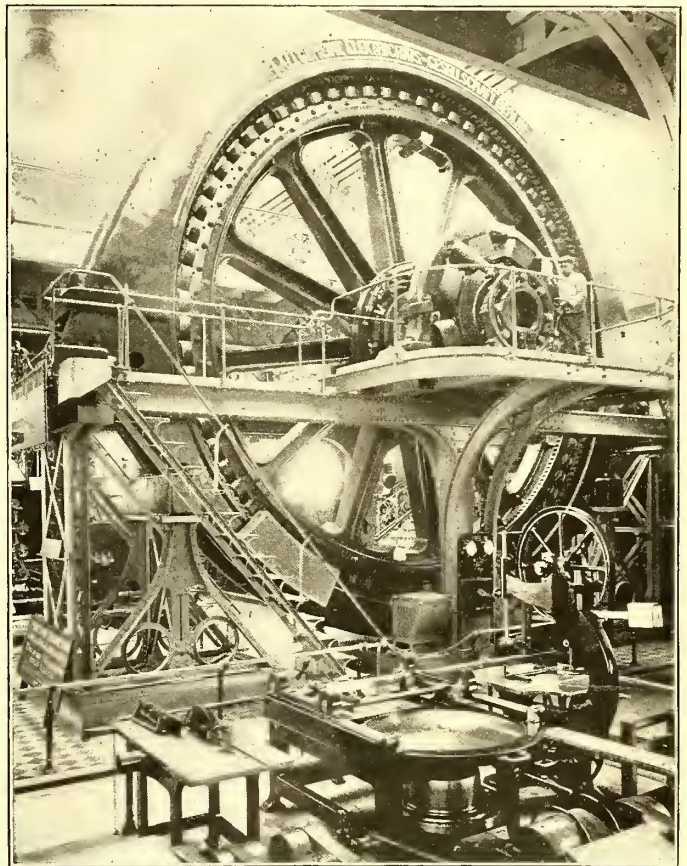
Prominent in the British section of the foreign power house at the Paris Exposition is the combined exhibit of Willans & Robinson, of Rugby, England, and Siemens Brothers & Co., of London. The engine is of the well known central valve type, and the dynamo, on the extension of the shaft, furnishes continuous current at 550 volts. The essential feature of the Willans engine, and one which contributes most to its remarkably steady operation, is the application of the constant thrust principle at all the joints, thus assuring noiseless running and freedom from the shock that is always present in an engine in which the strains are continually being reversed, an effect particularly noticeable in high-speed machinery. The first use of the Willans engine was for steam launches, where it proved eminently successful, as it was possible to secure a much higher speed with this type of engine than was previously attained, thereby reducing the weight and space occupied. The same consideration of economy of space with high rotative speed made this engine suitable for direct connection to dynamos for supply of electric current for power and lighting.

The engine on exhibition at Paris has a nominal output of 24 hp, at 200 r.p.m., but for short periods of time it is capable of developing 3000 hp. This is actually the largest engine built by the company, yet it is designed on practically the same lines as the smaller engines, having three cranks at 120 deg., and for each three superimposed cylinders for high pressure, intermediate and low pressure steam, and of 18 7/8 ins., 30 5-16 ins. and 48 ins. diameter, respectively, with a stroke of 23 5/8 ins. In order to keep all the strains in one direction, steam is admitted on only one side of the pistons, making a single-acting engine. For the exhaust, the inertia of the moving parts keeps them in compression for the beginning of the up-stroke, and an air cushion in the lower cylindrical guide prevents any change in this condition, as acceleration is reduced in the latter part of the stroke. A high speed necessitates a very accurate balance of the several lines of pistons acting on the three cranks, and this is obtained by having all exactly similar, and complete expansion is made successively through the three cylinders constituting each set. The air cushion is obtained by having a crosshead in the form of a piston working in a cylinder closed at the upper end, and the power stored away during compression of the air is given out on the return stroke. Lubrication of the cranks and other working parts, except the cylinders and valves, is effected by filling the crankshaft chamber with oil and water, and allowing the cranks to dip in the mixture and splash it on to the guides and pins.

The Siemens dynamo driven by the above engine is of the 16-pole type, giving a normal output of 1500 kw at 550 volts, at 200 r.p.m., but capable of bearing a temporary overload of 20 per cent for a short time. The field frame, of cast steel, is 14 ft. in diameter and 33 1/2 ins. wide, and carries internal radial poles with soft iron pole pieces screwed on. The commutator, being over 5 ft. in diameter, is designed to allow of repair to individual segments without the necessity of loosening the whole number.

In many industrial applications of late years it has been found that high-speed engines give the best results, when one of the prime requisites is close uniformity in speed. For cotton mills this is particularly true; but it is also found that high-speed engines are very well suited to electric traction and transmission of power, for the variation of load is in such cases often very severe, and a high-speed engine governing quickly is especially desirable for such work. The Willans engines have been very successful in filling these requirements, and the performance of the Exposition engine is entirely satisfactory.

The Allgemeine Electricitäts-Gesellschaft occupies the center of the German annex to the Electricity Building with an immense fly-wheel alternator having an outside diameter of over 28 ft. It was not practicable to put in a 4000 hp engine to drive this alternator, whose normal load is 3000 kw, and it was decided to erect it in the annex instead of in the main power house. The machine is supported, clear of the floor, by heavy steel framework, allowing of :



LARGE ALTERNATOR—PARIS

inspection of the whole, as shown in the engraving. A special shaft has been fitted, and a direct-current motor is provided to revolve the fly-wheel, which is 24 ft. 3 ins. in diameter and has 72 poles. Three-phase current at 6000 volts is given by this alternator, running at 83 r.p.m. It is destined to furnish current to Berlin and the environs, partly alternating and partly rectified, for the supply, in conjunction with other machines already running, of electric light as well as for traction and transmission of power. The weight of this alternator, complete, is 160 tons, which necessitated the use of eleven eight-wheeled cars for transportation, the armature frame and field casting being each in four parts. The annex was not intended for heavy machinery and was too light to support a traveling crane, so the parts had to be assembled by means of portable cranes and special devices. Notwithstanding these difficulties, the machine was erected in three weeks.

The New Jersey & Hudson River Railway & Ferry Company has just issued a very tasteful time table, giving a map showing the route of the company and a view of New York City from a point on the line.

Experimental Conduit Line of the London City Council

In the tramyard of the London County Council at Camberwell is installed an experimental length of an electric tramway track. The line has been erected so as to be tried under actual working conditions; it is in the open air, has a curve of 90 ft. radius and a gradient of 1 in 40. The total length of the line is 256 ft. This, the first portion of the electric tramway work of the London County Council, is now in running order, and surrounded as it is by numerous stables, sheds and buildings containing all the paraphernalia of an extensive system of horse tramways, appeals in a peculiar manner to the onlooker. In the center of a vast home of the oldest tramway fashions has sprung up a small, one might almost say, a toy, length of the newest tramway practice. The entire plant formed part of the exhibit of the British Westinghouse Company at the International Tramways and Light Railways Exhibition held in London last June. This operating tramway was the most striking of all the exhibits, and was described and commented upon in practically all the technical journals and newspapers at that time. It may, however, be as well to glance over the main points of this tramway system, now that it is likely to be a center of interest both to the

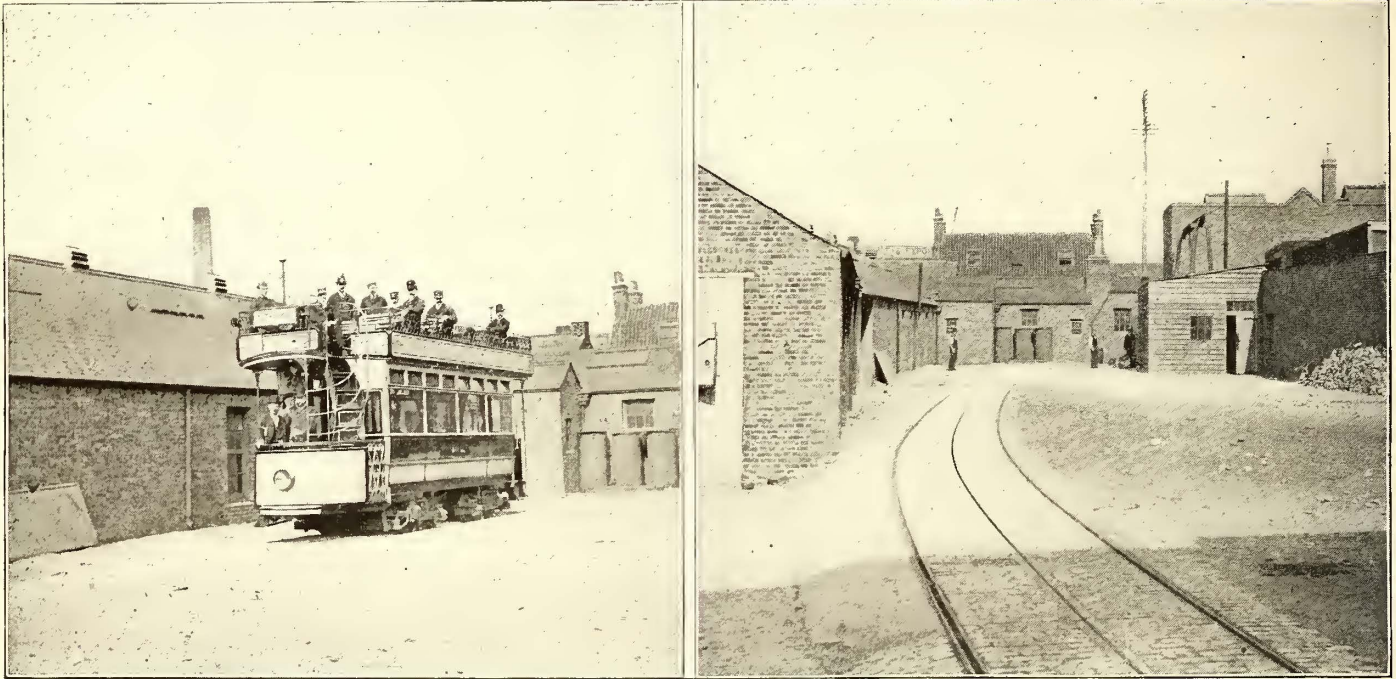
riage allows a lateral motion almost equal to the full width of the car, so that a considerable eccentricity of the conduit channel between the tracks can be allowed. The advantage of this will be seen in certain parts of the track construction, such as turnouts, etc., and in addition it will, of course, be useful in avoiding obstacles in the roadway. The car is equipped with a Westinghouse magnetic blow-out type controller at each end for facilitating running in either direction, and with an electrical brake in addition to the ordinary hand brake.

The power for operating the line is yielded by a 75-kw, 500-volt generator direct-coupled to a 124-hp Westinghouse three-cylinder gas engine. The engine is of the type which has attracted so much attention and become so popular during the last two years or so, due to its economical working and sensitive governing.

London Letter

[From Our Regular Correspondent.]

Work on the Glasgow tramways is now being pushed as fast as possible, and the laying of new tracks or putting up of overhead



EXPERIMENTAL CAR AND TRACK FOR TESTING UNDERGROUND CIRCUIT—LONDON

ratepayers of London and the authorities of other cities who are waiting for London's example before deciding upon electric tramway schemes themselves.

The tramway was purchased by the London County Council for the purpose of training motormen to drive electric cars and to enable their engineers to carry out certain experiments, while at the same time able to see for themselves the appearance and behavior of the conduit system under actual working conditions. The generating plant, consisting of gas engine and dynamo, has been hired by the Council until their own station shall be available. The line is built on a series of cast-iron yokes, placed 5 ft. from center to center, and each set on a bed of concrete 4 ins. thick. This thickness is sufficient for the heaviest traffic on the street. The yokes bear the tram rails at their extremities and the conduit section and channel rails in the center. The conduit between the yokes is of concrete about 4 ins. wall. The lead and return conductors are run side by side in the conduit. Both are insulated at their supports by stoneware insulators. The conductors are split up into sections, each section being coupled by a main branch to a continuously insulated main running the full length of the track. An automatic switch is placed in each of the branch mains, and is so arranged that its corresponding conduit conductor section is only coupled to the main when a car is actually over it. The car is equipped with two Westinghouse No. 49 motors, each 35 hp, and coupled to the car axles through a single reduction gear. Current is collected from the conduit conductors by means of a contact plow fixed beneath the car, and passing through the narrow surface slot, $\frac{3}{4}$ in. wide, of the conduit.

The contact plow is suspended by a hinge from a small carriage beneath the car. The hinge is for the purpose of allowing the plow to accommodate itself to curves in the track. In addition, the car-

construction work is being proceeded with in almost every part of the city. The power house is also making rapid progress, and recently it was inspected by the tramway committee. Mr. Parshall, the consulting engineer, showed them over the buildings and explained the machinery and its arrangements. There were two special cars of different designs submitted for the consideration of the committee, with the result that the present double-decker now on the Mitchell Street-Springburn route was formally selected as the most suitable for the new system over the whole city. At the car houses at Coplawhill they are at present turning out at the rate of five new cars every week. Mr. Young believes that the electric system, embracing the entire city, will be inaugurated about the beginning of April next year, just on the eve of the exhibition.

The overhead work in Glasgow, which is being done by Macartney & McElroy, is particularly interesting, wherever possible the span wires being attached to the buildings, doing away with the necessity of many poles. The corporation has been no respecter of buildings, and some of the finest buildings on the streets have got the little bracket attached to their walls from which the span wire is strung. In view of the large traffic which is expected in Glasgow during the exhibition, the corporation is making preparations to widen certain of the streets, which have been too narrow for many years, notably the west end of Sanchichall Street. Trouble is being experienced with many of the property holders, but the corporation, by invoking the aid of the courts, will succeed in its estimable work in good time.

The Brush Electrical Engineering Company, Ltd., has taken up the manufacture of traction trucks at its Falcon Works, Loughborough, and is thus the first and only firm that builds this class of manufacture in Great Britain. The company is at present making three standards, which cover the general needs of electric traction,

as follows: Four-wheel single type, four-wheel bogie type, and the maximum traction type. A special shop has been erected and equipped under the control and management of E. E. Cook, an engineer who has had long and successful experience in this branch of manufacture in the United States. The Brush Company is therefore in a position to quote to any specification and to handle orders of any probable magnitude.

An extensive system of new tramways, partly electrical, is projected, to join up Greater London, if Parliamentary sanction is forthcoming next session. The London United Tramways (Ltd.) propose to extend their existing lines to St. Pancras, Marylebone and Fulham, and cross the Thames to Putney, and also northward to Willesden and Southall and westward to Sunbury. The Surrey extensions will include a length of over four miles, connecting Putney with Richmond, which will proceed into Middlesex over a new bridge across the Thames. Another line will be from Hammersmith Bridge, and there will also be an extension from Kew Bridge to Richmond. In Middlesex the scheme will comprise, among others, rails connecting Hounslow with Cranford, Brentford with Ealing, Twickenham with Hanworth and Kempton Park, Isleworth with St. Margaret's—all dependent, of course, on the probably strong opposition of some of the local authorities being overcome.

The corporation of Ayr, Scotland, a town known to the whole world as the birthplace of Robbie Burns, has decided that in equipping its power house it is entirely unnecessary to go outside of Scotland, and has therefore placed a contract for two 200-kv P. P. P. lighting and traction generators, coupled to Belliss engines, with the energetic young firm of D. Bruce Peebles & Co., of Edinburgh. This firm has now on hand a very large number of machines for power and tramway work, and has achieved a most marked success in the few years it has turned its attention to electrical work.

The corporation of Liverpool is making rapid strides with the equipment of its fine system of electric tramways, and by the end of the year will have in operation about 100 miles of route. As an object lesson to other cities contemplating electric traction, the history of Liverpool should not be lost, as when the first lines were laid down the opposition to the overhead trolley was intense. Now the contractors and the corporation can hardly keep pace with the demand, and the popular cry is for electric traction. Mr. Bellamy's plan of having a reversed staircase on the cars has also proved most popular, and enables passengers, even when old and decrepit, to ascend and descend from the top part without fear of accident when the car is in motion. One interesting feature about Liverpool is the fact that their power stations provide current both for the tramways and electric lighting, which might be called the English method, in contradistinction to Glasgow, which has adopted American ideas in its tramway practice, and has separate stations for tramway power and for its lighting supply. The Liverpool corporation has about completed its two new power houses of 12,000 hp each, which are equipped with Willans engines directly coupled to Siemens dynamos of 550 volts and 1450 amps. capacity. The two cities, therefore, of Liverpool and Glasgow will form interesting subjects of comparison when the proper time comes, and are thus more than ever rivals.

Arthur Ellis, who was recently appointed electrical engineer to the city of Cardiff, has made an elaborate report on the necessities of that city for electric traction, which has been adopted by the Cardiff Council. After dealing with the probable site of the new works, Mr. Ellis recommends vertical, compound, direct-connected, slow-speed engines, with water-cooling towers, economizers and mechanical stoking and ash handling.

A. C. S.

Melbourne Report

The twenty-seventh annual report of the Melbourne Tramway & Omnibus Company, which was that for the year ending June 30, 1900, was presented to the stockholders at a meeting held Aug. 14. The tramway system of Melbourne, which is largely cable, was built by a tramway trust, representing the various municipalities interested, with money borrowed for the purpose and amounting to £1,650,000. The Melbourne Tramway & Omnibus Company rents the system, paying therefor a sum equal to the interest on this amount; also an additional sum for a sinking fund on the loan. The company supplies all its own rolling stock, car houses, etc. The population of Melbourne and the suburbs served by the system is about 450,000.

The report follows:

		INCOME	
Balance forward from last year.....	£ 30,419	10	5
Receipts from other sources.....	1,663	4	0
Interest	9,547	4	9
Traffic receipts	415,023	13	1
	£ 456,653	12	3

EXPENDITURE

Expenses of tramway trust.....	£ 905	11	8
Feed	4,319	8	1
Fuel	10,085	3	9
Licenses, rates, insurance, law costs, etc.....	14,083	4	4
Salaries of staff, and directors' and auditors' fees	16,708	17	10
Repairs and maintenance of cars, buildings, ropes and lines	73,506	14	6
Rating on tramway lines.....	7,087	11	0
Stationery and office expenses.....	4,200	3	2
Wages	110,588	11	10
Depreciation of leaseholds.....	2,175	9	6
Tramways' debenture interest.....	76,050	0	0
Tramways' debenture sinking fund.....	34,200	0	0
Tramways' renewal reserve account (of which £8,102 3s. 2d. was interest earned).....	15,157	15	9
Dividends	38,400	0	0
To apply in reduction of properties.....	10,000	0	0
Carried forward as capital reinstatement account.....	10,000	0	0
Carried forward	29,185	0	0
	£ 456,653	12	3

Communication about Car Truck Patents

PHILADELPHIA, Oct. 24, 1900.

The Peckham Motor Truck & Wheel Company has stated in the *Street Railway Review* of the issue of Oct. 18, 1900, that the result of the interference proceedings in the patent office between G. M. Brill and C. F. Uebelacker, in relation to short wheel base trucks, was that "Mr. Uebelacker was awarded a patent for his specific claims, and Mr. Brill one for his, both being awarded patents."

This statement is true to the extent that Mr. Uebelacker got his patent on specific details; but otherwise it is absolutely untrue. On the contrary, the interference was decided in favor of Mr. Brill, and the priority of invention was awarded to him.

The following is the decision of the patent office:

"Limiting Uebelacker to July 15, 1897, for his date of conception of the invention in issue, it appears that his statement fails to overcome the *prima facie* case made against him by the respective dates of filing applications.

"Judgment, therefore, on the record of priority of invention is hereby rendered in favor of George H. Brill, the senior party.

"WALTER JOHNSON,
"Examiner of Interferences."

No appeal was taken from this decision, and it has never been disturbed in any manner whatsoever.

This decision was made May 4, 1899, and the patents in suit in the North Jersey Street Railway case, which Mr. Peckham says his company is defending, were issued to Mr. Brill on June 27, 1899. The North Jersey suit was begun July 17, 1899.

That Mr. Peckham acquiesced in the decision of the commissioner of patents is clear from the following extracts from papers filed in these interference proceedings, and signed by his attorney, who was also his attorney in the North Jersey suit, viz.:

"These parties (Brill and Uebelacker) show a broad subject matter. Brill claims this subject matter and Uebelacker limits his claims to a specific embodiment. The issue as defined had for its object to determine which of the parties was entitled to priority of invention concerning the broad subject matter. * * * He (Brill) is entitled to his broad claims." * * *

Again, over Mr. Peckham's same attorney's signature in that proceeding appears the following: "So far as regards any generic feature of the invention, Brill is the first inventor. I have not contested that."

In one of the final decisions rendered in these same proceedings the commissioner of patents stated as follows: "Uebelacker can be allowed only such claims as are patentable over Brill's device. [That is, subject to Brill's prior invention.] A decision on priority makes the successful party's invention a part of the prior art in so far as his opponent is concerned, to the same extent that it would be if shown in a prior patent. It is, if anything, a better reference, since in regard to certain matters the defeated party is estopped from disputing its pertinency."

The Peckham Motor Truck & Wheel Company was the assignee of the Uebelacker application in the patent office; prosecuted these interference proceedings on it, and was the real party in interest; and the Uebelacker patent was issued to it as the assignee of Uebelacker.

This would seem to dispose of Mr. Peckham's contention that the Peckham Motor Truck & Wheel Company was the "originator" of the type of truck known as the Brill 27-G, or of any "short wheel base" pivotal truck.

J. G. BRILL COMPANY.

The Sprague Multiple-Unit Patents

After pending for more than two years there were issued on Oct. 16, 1900, two patents, which have not only been already watched with great interest by the electrical and railway world, but which bid fair to become a most important feature in the development of heavy electric railroading. The patentee, Frank J. Sprague, has long been known as a distinguished inventor, and the system for which he has secured protection has proved in practice to solve that most important question, the running of electric trains without a locomotive.

The system actually employed, as stated in the specifications, is electrical, and includes all the apparatus for controlling the speed, direction of revolution, and grouping of the motors. In all, the remarkable number of 263 claims are allowed. The explanatory part of the patent consists of an elaborate and really impressive discussion of the invention, occupying some twenty-two pages, and describes in the most complete manner the twenty sheets of drawings which precede it. A few of these latter are shown on this page. It is impossible at this early date to say which will be the most important features or upon which the greatest amount of litigation will hinge, but the drawings selected for reproduction seem to be of such a general character that they probably contain most of the salient characteristics. Fig. 1 is a plan of a car, showing the installation of a complete equipment of the multiple-unit system. Figs. 2, 3 and 4 represent diagrammatically the various connections for open circuit and forward and backward running. The same difficulty obtains in the attempt to make judicious selection of the claims as in that of the drawings. The last one is phrased in the following sweeping terms: "An electrically-equipped train having independent direction and speed-controlling circuits, substantially as described." A few of the first ones run thus:

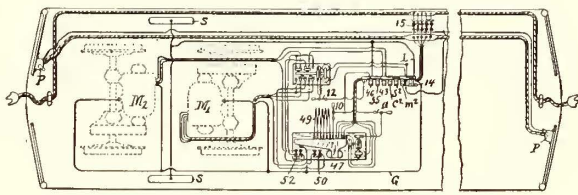


FIG. 1.—MULTIPLE-UNIT SYSTEM

1. In an electrical train system, the combination of translating devices and circuits therefor in parallel relation with each other, and a governing train line independent of the other circuits, substantially as described.

2. In an electrical train system, the combination of translating devices, circuits therefor, and a governing train line independent of the other circuits provided with sets of controlling wires, substantially as described.

3. In an electrical train system, the combination of motors, circuits therefor, an independent governing train line consisting of two sets of train wires, one set for determining direction and one set for speed regulation, substantially as described.

4. In an electrical train system, the combination of motors, circuits therefor, an independent governing train line consisting of two sets of train wires, one set for determining direction and one set for speed regulation, suitable contacts controlled by these wires, and means for holding closed the direction-controlling contacts, and means for opening and closing the contacts for regulation at will, substantially as described.

5. In an electrical train system, the combination of translating devices and circuits therefor in parallel relation with each other, a governing train line independent of the other circuits, and relays connected with the governing train line in parallel circuit with each other, substantially as described.

6. In an electrical train system, the combination of motors, circuits therefor, controllers therefor, and an independent governing train line with relays for operating the controllers, substantially as described.

Among the others are found the following:

A car equipped with a motor to drive it, a controller for the motor, a relay-circuit including a train-line for operating the controller, and one or more operator's switches connected with the train-line, substantially as described.

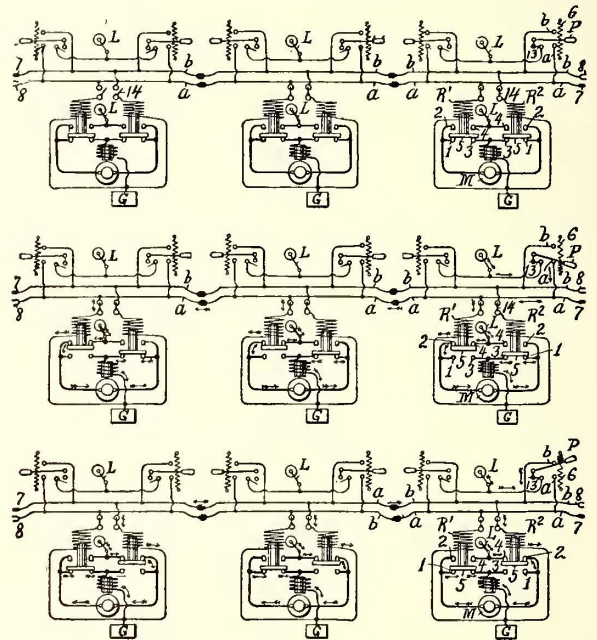
In an electrical train system, the combination of motors, circuits therefor, controllers for the motors, and a governing train-line which is independent of the motor-circuits, relays connected with the governing train-line in parallel with each other for operating the controllers, and means for energizing the governing train-line, substantially as described.

A train with a plurality of cars, a governing train-line through

the cars, one or more operator's switches connected to the train-line, and motors on one or more of the cars connected with the source of supply through contacts controlled through the train-line, but otherwise independently thereof, substantially as described.

A train with a plurality of cars, a governing train-line through the cars, one or more operator's switches connected to the train-line, and motors on one or more of the cars connected with the source of supply through reversing-contacts controlled through the train-line, but otherwise independently thereof, and independent means for connecting the motors in series and multiple and for varying the resistance in circuit therewith, substantially as described.

In summing up his description of principle and methods, Mr. Sprague says: "The practical result of the system developed in the foregoing specification and in the drawings illustrating it when applied in its entirety is that cars properly equipped can be made up interchangeably into a train of any length and can be operated from any one of a number of points, and that all an operator has to do in order to effect definite movements of the train as to acceleration, speed and direction is to make movements of his hand at any one of the operator's switches, which will be similar under the conditions that usually arise in practice. In short, a car is a unit, and a train composed of a number of similarly equipped cars is also a unit having the same general characteristics that a single unit has, preferably without any conditions being imposed as to the number, order or



FIGS. 2, 3 AND 4.—MULTIPLE-UNIT SYSTEM

end relation of the units comprising the train. The same general statement applies to the operation of a train made up of cars some or all of which are but partially equipped, but which together are provided with an operative train equipment. To effect this fundamental result practically, it has been necessary to provide for properly connecting the cars, preferably independently of sequence, number and end relation, with couplings of such character that any train hand can effect the coupling; to provide against cross connections in the circuits on the different cars; to guard against accidents due to failure of circuits or current or otherwise; to secure practical uniformity of operation in the apparatus on the different cars and equality of work in the various motors, and to secure simplicity and flexibility in the relation of the parts under all the various conditions of operation. To accomplish this, a system has been devised which is in part automatic, and includes two sets of circuits, by means of which all or part of the apparatus on the various units or for the various equipments is operated through local means whose action is initiated through a governing line and master controllers, whatever the nature of the intermediate apparatus or the specific construction of the controlling apparatus. In the numerous claims herein presented it has been attempted to cover as fully and broadly as possible those characteristics of the system which are required to render the fundamental conception possible of accomplishment or which are of advantage in point of commercial economy, efficiency, or safety. It is obvious that partial advantage may be taken of this system without adopting it in its entirety, and that the various elements can be greatly modified without losing the advantages gained by the fundamental combinations, systems and methods of operation. Many changes can be made without departing from the spirit of my invention."

CURRENT NEWS

English Deal for the Purchase of the Denver Tramways Off

W. G. Evans, secretary of the Denver Consolidated Tramway Company, returned from a trip abroad during the latter part of October. It was thought that a sale of the Denver Tramway property would be effected during Mr. Evans' stay abroad. He announces, however, that no immediate sale is contemplated. The option held by the English syndicate has expired, and the deal is off.

Experimental Freight Lines in Washington

The Washington Traction and Electric Company has established a freight service on two of its lines with a view of ascertaining the possibilities of such service if generally adopted. A freight department has been created, and T. F. Alvey has been placed in charge of the department. At this season of the year, however, the supplies of country produce coming into the city are not so large as they were during the summer, but thus far the service already established by the company on the two lines mentioned has demonstrated the fact that this city is a base of supplies for the sections of the outlying territory referred to. Quite a business has already been developed, and the outlook is promising.

No Jim Crow Cars in New Orleans

A lively debate ensued at the meeting of the New Orleans Council, held October 23, to consider the Stanley ordinance providing for the separation of whites and blacks in the street cars, and the ordinance was defeated. The general opinion was that the passage of the ordinance would do away with the hoodlum element, which was especially desired; but on the other hand, however, it would only tend to intensify the present race hatred. Would the white man, who was in a hurry, allow a "Jim Crow" car to pass and bide his time till a regular car should appear? The general opinion was that he would not. If he should board the car, then there was a possibility of an eruption. Then, again, there were men of the laboring class who worked side by side with negroes all day. He desired to reach his home as expeditiously as possible, and what harm if he rode home in the car with the man with whom he had been in contact all day? One councilman held that the street railway companies had a contract with the city, and it was hardly fair to impose on that contract; also that the ordinance was an attack upon the railway companies, and would affect the city's credit.

Inducing the Extension of Electric Lines

In Westmount, Que., a suburb of Montreal, is found a striking example of a town which fully appreciates what the construction of a suburban line means. This town has decided to pay the Montreal Street Railway Company the sum of \$2000 a year for the construction of a line connecting it with Montreal, and it has granted the company the free use of the village streets. The action of this town is in striking contrast with that of many suburban towns in the United States, who, the moment a franchise is sought by a company of another city, argue that the trade of the town will at once be transferred to the city, and that the advent of the electric railway will work to a hundred and one other harmful ends. With these thoughts uppermost in their minds, the village authorities are wont to place the heaviest restrictions on companies seeking entrance, and in many cases such companies invariably decide to abandon the contemplated extension. It is hardly to be expected that capitalists building a line, which will probably be operated at a loss for the first few years, will start out weighed down with heavy franchise obligations. The suburban extension does not, as a rule, prove remunerative for the first few years, and it is only after the advantages of the towns and the excellent means of transportation afforded have been brought to the attention of the city dwellers, that the town strikes a "boom." After this has taken place the company begins to realize on the large outlay of capital in constructing the line. Then as the town grows the company profits. Not only does the company profit, but the town itself has also been a beneficiary. In place of the little suburban town, which a few years before contained one or two stores, with a corresponding number of residences, evidence of metropolitan activity are to be found on all sides. It is fallacious for the suburban towns to retard the

construction of electric lines by imposing heavy obligations at the inception of a projected line.

Inspection of the Toledo, Fremont & Norwalk Railway

A number of the officials and invited guests of the Toledo, Fremont & Norwalk Electric Railway made a trip of inspection over that company's road on October 24. The party was carried over the entire line and then inspected the power house. An elegantly appointed banquet in the Fremont House, at Fremont, was one of the principal features of the trip. This was arranged under the direction of General Manager Stout, of the company. Speech-making, in connection with the dinner, was rather informal, and the prevailing sentiment was one of congratulations to S. F. Angus and Henry A. Haight, who promoted the road, and to the Comstock Brothers, of Detroit, who financed the line. Among those who participated were the following: President S. F. Angus, Vice-President W. B. Comstock, Treasurer A. W. Comstock, Secretary W. A. Comstock, General Counsel Henry W. Haight and General Manager F. J. Stout, of the company; F. W. Walker, of Westinghouse, Church, Kerr & Co.; A. E. Lang, president Toledo Traction Company; W. H. Churchill, of the Westinghouse Company; H. C. Hutchins, president of the Detroit Citizens Railway Company, and J. C. Riley, president of the Rapid Railway, of Detroit.

Club Houses and Merit System at Chicago

It is a notable fact that the presidents of the two largest street railway companies of the United States, the Metropolitan Street Railway Company, of New York, and the Chicago Union Traction Company, who are both self-made men, are making special efforts toward the welfare of employees and striving to come into closer personal contact with the men and cultivate pleasant relations between the employees and the company, and so between the public and the company. President Vreeland's efforts in that direction in New York are now well known. President Roach, of Chicago, is working along on the same principle as Mr. Vreeland, and last week announced his intention to build two club houses, one on the West Side, at Madison Street and Fortieth Avenue, and one on the North Side, at Lincoln and Wrightwood avenues. The entire expense will be assumed by the company. Mr. Roach hopes to make these clubs the social centers for the employees and their families, with reading-rooms, theatricals and entertainments as an attraction. In connection with this it is intended to have a system of instruction which will help to a thorough training of the men for the duties they were called to perform. Another innovation decided upon by Mr. Roach is a percentage merit system, the details of which have not been worked out, but which in general will consist in a system of credits whereby those falling below a certain standard will not be retained. The system developed by Mr. Roach will be of considerable interest. A percentage merit system has been in use for several years on the Metropolitan West Side Elevated Railroad, of Chicago.

Increase of Wages in Denver

The directors of the Denver City Tramway Company have decided to increase the wages of their employees, and have fixed upon a schedule of 18½ to 24 cents an hour, the amount varying according to the term of service. Some little time ago the employees of the company petitioned for an increase, but the matter was not settled until recently, owing to a number of the directors being out of the city.

Milwaukee Company Upheld by the Supreme Court

The Supreme Court of Wisconsin on Oct. 12, in the Milwaukee street railway case, reversed the lower court and thus upheld the 4-cent fare ordinance and the extension by the Common Council of the street railway company's franchise. With this decision comes the end of the famous street railway suits that resulted from the granting of the 4-cent franchise last January. The opinion, which is by Justice Winslow, is based upon the discretionary power of the Common Council, as granted in the city charter, to determine what shall be for the best interests of the citizens as a whole, the

Supreme Court holding that this power is absolute and cannot be questioned in any court, so long as no wilful waste or squandering of public property, rights or funds can be shown.

Regarding the \$100,000 offer by an independent company, the court ruled that this was also a matter entirely within the discretion of the Council, and that it may have acted wisely in refusing it, because a new company would find it almost impossible to give as complete and thorough a service to the citizens as the established one. The Supreme Court holds that the franchise is valid, and that the street railway company may proceed with its line extensions, which will require an expenditure of more than a quarter of a million dollars at once. The decision broadly sustains the validity of all street railway franchises in the State of Wisconsin, and its effect is the protection of millions of dollars of capital that has been invested in reliance upon these franchises in scores of cities in the State. On every point raised the Supreme Court ruled in favor of the street railway side of the case.

Attorney George P. Miller, with Charles Quarles as counsel, presented the matter to the Supreme Court for the street railway company, and Attorneys W. H. Timlin and John S. Toohey appeared for the defendant.

The history of the litigation is quite an extended one. On Jan. 2, 1900, the Common Council of the city of Milwaukee passed an ordinance which granted to the Milwaukee Railway Company the right to operate street railways upon certain streets in the city, and also extended all the existing railway franchises, already owned by the railway company upon other streets in the city, and required the railway company to file a written acceptance of the grants so made within thirty days. In consideration of this the company agreed to sell twenty-five tickets for \$1, good for transportation during certain morning and evening hours.

On Jan. 5, 1900, a citizen named J. G. Trentlae commenced an action against the railway company and the city for the purpose of restraining the railway company from filing its acceptance of these grants, and the city officers from receiving such acceptance and preventing the railway company from laying street railway tracks and operating a street railway upon First Avenue, in this city, this avenue being one of the streets covered by the grant.

Trentlae claimed that the franchise was of great value and that large amounts of money had been offered for them, but that they had been improvidently given away by the city by the ordinance and resolution without any remuneration, and that the city had no right or power to grant the franchise without consideration; that the money which the city might and could obtain for the franchise was thereby lost to the city, etc.

The court took the broad ground that the offer of the 4-cent fare was a consideration, and that the city authorities were the only ones authorized to judge whether it was adequate. That they so concluded settled the question, unless there was a manifest squandering of the city's property, and this does not seem to be the case.

Column Type Measuring Instruments

Frank W. Roller, of the firm of Machado & Roller, gave a very interesting talk upon the Whitney column type electrical measuring instruments after the reading of the paper at the meeting of the American Institute of Electrical Engineers on Wednesday, Oct. 24. These instruments, of which Machado & Roller are the New York agents, were described in the columns of the STREET RAILWAY JOURNAL a few months ago. Mr. Roller had various styles of instruments on exhibition, and the members of the Institute were allowed to examine their operation most thoroughly.

Investigation of Electrolysis from Railways in Germany

Early this year the STREET RAILWAY JOURNAL reported on the appointment of a commission by the Elektrotechnische Verein of Germany, which was to investigate the earth-return currents on electric street railways. This commission sent out the following questions, working in conjunction with the Verein Deutscher Strassenbahn und Kleinbahn Verwaltungen, to the owners of electric roads and to city gas and water works, to determine whether and to what extent these return currents have affected the gas and water pipes or other underground metallic structures:

- (1) How long has the road been in operation—i. e., with electric service?
- (2) Length of road?
- (3) Plan of route, with location of cars drawn in and a statement as to the maximum observed current consumption?
- (4) Car-kilometers per year?
- (5) Total energy consumption in kilowatt-hours per year?
- (6) Maximum current used at any time?

- (7) Maximum calculated current in the original specifications?
- (8) Maximum loss of voltage in the rails as calculated in original specifications?

(9) Maximum observed loss of pressure within the interior of the city, locating the places of observation?

(10) Special details in regard to the returns: (a) What section of rail? (b) What kind of rail joints? (c) Is the rail supported on insulators, and of what kind? (d) Are bare or insulated rail-feeding cables laid parallel to the rails? (e) Are cross connections used between the rails, and what distances apart? (f) Are earth plates used? (g) Is the track electrically connected with the water pipes?

(11) Are there several electric roads in the city, and are the systems electrically connected?

(12) (a) Is the current supplied by one or more stations? (b) Do the stations also furnish current for lighting, power or other purposes?

(13) With what pole of the generator are the rails connected?

(14) Are regular measurements made during the service of (a) the track resistance and earth resistance? (b) difference of potential between earth and different points on the track, between track and gas pipes, track and water pipes, gas and water pipes and lightning-rod plates? In answering these questions actual measurements are requested.

(15) How large are the earth differences of potentials when the cars are not in operation?

(16) Have you noticed electrolytic disturbances on rails, cables, gas and water pipes? What has your experience been?

(17) (a) Is your road blamed for such electrolytic disturbances? (b) Or has it been shown that the disturbances were due to some chemical action between pipes and soil?

(18) Does the soil show any characteristic chemical constituents such as acids and alkalies?

(19) What is the mean ground water level on the main lines?

Conclusions.

In addition to the above, four questions were submitted to the owners of gas and waterworks, and answers were received from forty gas works, twenty-five waterworks and eight gas and waterworks. Eight cities report corrosion of gas and water pipes and covering of light cables, but it is questionable whether all of this is due to stray electric railway currents. Three cases can be traced to defective electric light circuits and the other five are not of a very serious nature. This report is very encouraging, in view of the fact that seventy companies replied to the questions. In short, out of the ninety German cities which possess electric roads only two or three have to report corrosions which are to be ascribed to earth-return currents, and these took place where the current density was very large. The replies further show what means may be adopted to prevent such disturbances. The commission has begun to compile a list of rules and regulations for the prevention of such disturbances, which will be published in our columns as soon as issued.

PERSONAL MENTION

MR. RALPH D. MARCHAND, expert for the Westinghouse Company in long distance transmission, has been appointed to a similar position with the Montreal Street Railway Company and the Chambly Manufacturing Company.

MR. G. F. GREENWOOD, chief engineer and general manager of the Havana Electric Railway Company, of Havana, Cuba, and formerly of Pittsburgh, was in New York Oct. 26. Mr. Greenwood will remain in the United States about two weeks.

MR. EUGENE S. REILLY, general manager of the West End Traction Company, of Pittsburgh, has recently returned from Europe, where he visited the Paris Exposition. On his return to Pittsburgh Mr. Reilly was tendered an informal dinner by the office force of the company.

MR. JOHN FRANCIS COLLINS, superintendent of the Toledo Traction Company, celebrated his seventeenth anniversary as a street railway superintendent recently. Superintendent Collins began his railway career in Indianapolis in 1884, and later he became night superintendent of the system in that city. In 1898 he was appointed superintendent of the Toledo Traction Company.

ENGINEERING SOCIETIES

ENGINEERS' CLUB OF PHILADELPHIA.—A regular meeting of this club will be held Saturday, Nov. 3. The paper entitled, "American Isthmian Canals," will be discussed.