Street Railway Journal

VOL. XXII. NEW YORK, SATURDAY, SEPTEMBER 12, 1903 No. 11

PUBLISHED EVERY SATURDAY BY THE
McGRAW PUBLISHING COMPANY

MAIN OFFICE:
NEW YORK, ENGINEERING BUILDING, 114 LIBERTY STREET.
BRANCH OFFICES:
Chicago: Monadnock Block.
Philadelphia: 929 Chestnut Street.
Cleveland: Cuyahoga Building.
London: Hastings House, Norfolk Street, Strand.

Cable Address, "Stryjourn, New York,"—Lieber's Code used.

TERMS OF SUBSCRIPTION

In the United States, Canada and Mexico.....$4.00 per annum
Single copies, first issue of each month, 25 cents; other issues, 10 cents.

To all Countries outside of the United States, Canada and Mexico.... $6.00 £1-5s M 25 Fr. 31

Single copies, first issue of each month, 40 cents; other issues, 15 cents.
Subscriptions payable in advance, by check or money order. Remittances for foreign subscriptions may be made through our European office.

Entered as second-class matter at the New York Post Office.

EDITORIAL NOTICE

Street railway news, and all information regarding changes of officers, new equipments, extensions, financial changes and new enterprises will be greatly appreciated for use in these columns.

All matter intended for publication must be received at our office not later than Tuesday morning of each week, in order to secure insertion in the current issue.

Address all communications to

THE STREET RAILWAY JOURNAL,
114 Liberty Street, New York.

Saratoga as a Meeting Place

Saratoga differs from any place selected in previous years for a convention of the American Street Railway Association in being a small city, but opinion is divided as to whether a decision to meet in Saratoga next year would be advisable. The place has many points to recommend it, and there is ample hotel accommodation which, for the most part, is fairly good. There is also present none of the outside entertainments which exist in a large city to distract the attention of the delegates from the meetings and from the exhibits. On the other hand, Saratoga is off the line of the main trunk routes, and for this reason is somewhat inconvenient of access, especially to visitors from the West; besides the arrangements made for the exhibits during the recent convention were by no means satisfactory.

There is no association in the country at whose annual meetings the manufacturers go to such expense and trouble in exhibiting apparatus as at those of the American Street Railway Association. This fact has always constituted one of the most valuable features of the Street Railway Conventions, and all of the members of the Association are united in encouraging the supply men to make comprehensive exhibits of their apparatus at these annual gatherings.

The exhibits have grown in number and size during recent years to such an extent that it has become difficult, we acknowledge, to find in many cities a combination of convention hall, exhibit space and hotel accommodations which is entirely satisfactory. Nevertheless, we feel that we are voicing popular sentiment not only of the majority of the exhibitors but also of the delegates, to whom the exhibits constitute an important part of the convention, when we say that the facilities for the exhibits at Saratoga were inferior to those which have existed at any convention since probably that in 1891.

It was extremely fortunate that the convention this year was held during a period of fair weather, but it is easy to realize the discomfort and loss which would have been occasioned to all if the rain which prevailed during the four days just preceding the opening of the convention had continued during the days in which the associations were in session. Such an event, which was by no means unlikely, would have practically prevented all inspection of exhibits and would thus have deprived the convention, in the opinions of many delegates, of a large portion of its value. As it was, the exhibits as a whole, according to our observation, were not given the attention which has been extended to them in the past. This was undoubtedly in part due to the fact that many of the exhibitors were not favorably located, while the completion of other exhibits was delayed by the bad weather just preceding the convention. The fact that there were no facilities for the receipt and display of heavy apparatus was also a factor which affected the number and attractiveness of the exhibits.

We offer these remarks in no sense as a criticism of the selection of Saratoga as the meeting place in 1903. Many of the conditions could not have been foreseen, and others, it was thought, would be remedied. We believe, however, that the use of an adequate building to house the exhibits during the convention, or at least a more satisfactory arrangement for this portion of the convention than employed this year, should be made a condition before Saratoga is again selected as a meeting place for the American Street Railway Association.

The Proceedings of the American Street Railway Association

In many respects the convention of the American Street Railway Association was a very successful one in spite of the very poor acoustic properties of the hall, which made it difficult to understand the speakers unless one was only a few feet away. All of the papers prepared were of a high grade, and represented the most painstaking care on the parts of the authors. We expect to discuss each of these papers in detail, but it is not too much to say of them that individually and collectively they constitute an important addition to the technical literature on street railway operation.

There is a general feeling, however, that more time should have been provided for a thorough discussion of these papers. This sentiment was expressed in the meeting by several delegates, who united in the belief that the time spent in excursions and other social features of the convention should be reduced if necessary to secure sufficient time for a thorough discussion of the papers. We believe, with one speaker, that arrange-

ments should be made for holding sessions in the morning, afternoon and evening of each day, if necessary, to accomplish the results for which the convention is nominally held, and that no other course is fair either to the gentlemen who are asked to prepare the papers or to those delegates who attend the convention to discuss the papers and hear the opinions of others on the topics under consideration. As an actual matter of fact, out of the eight papers on the programme, only one was presented during the first two days of the session, and that paper was discussed by only three members. The other papers, which included all of those which were printed in advance of the meeting, as well as the important report of the Committee on Rules, were considered in a single session, that on Friday morning, at which the election of officers also took place and the final business of the Association had to be concluded.

The fault of this confessedly inadequate treatment of the literary and technical side of the Street Railway Convention cannot be laid at the door of any one individual. It is partly due to the fact that the social features of the convention have almost insensibly encroached upon the periods assigned to the business of the Association, and partly to the indifference of the delegates as a body in meeting promptly at the time of opening the sessions. The purpose outlined by Mr. Ely in his discussion of this subject to increase the value of this portion of the work of the Association will, we believe, receive the support of the great majority of the members, and in view of the benefit which all derive from a careful consideration of the topics discussed at the annual meetings, no effort should be spared to condense into every session the greatest amount of business.

We do not intend to discuss here the proper procedure for securing the most valuable results from the meetings of the Association, except to say briefly that it should be similar to that followed by all other important bodies of this kind. This includes the assignment of topics at least six months before the meeting of the Association, the publication and distribution of papers and reports to be read to the members in ample time to allow of the study of their contents, the adoption of a programme indicating the days on which the different topics are to be discussed, the appointment of gentlemen to open the discussion on each of the topics, facilities for the submission of pertinent communications and requests for information by members who cannot be present, the prompt convening of the sessions and allowance of plenty of time to complete the programme arranged. We believe that if those members who are asked to submit papers on different topics were assured of the careful consideration of their papers which such a plan as this would insure, there would be much less difficulty in securing authors than now exists. The Association is extremely fortunate at this juncture of its career in having as president a gentleman of the ability of Mr. Ely, who made such an admirable presiding officer during the sessions which have just passed, who will possess the confidence and support of the members in every step he takes to advance the interests of the Association, and who has already expressed himself as anxious to secure from the meetings of the Association the best possible results. In Secretary Penington also the members have an official who thoroughly understands the business of the Association, whose conduct of the finances has established this department of the Association on a very firm footing, and whose efficiency and ability eminently fit him for carrying out any programme which the president-elect and the executive committee may determine upon.

The Meeting Place in 1904

The question of the place of meeting in 1904 has wisely been left to the determination of the executive committee. As Mr. Ely pointed out, whatever decision is made as to the place of meeting, it should be thoroughly understood that the Association ought not to look to the representatives of the local street railway company to provide for the social entertainment of the delegates during the convention. In his discussion of this topic, Mr. Ely paid a gracious tribute to the courtesy and hospitality extended to the Association by Hon. A. B. Colvin and the officials of the Hudson Valley Railway Company, as well as by the General Electric Company and the Schenectady Railway Company, who also entertained the Association during the Saratoga Convention. The trips afforded by these companies to the delegates, as well as the special trips to the visiting ladies, for which invitations were also extended, were most enjoyable and were appreciated by the recipients of these courtesies. Every one in the Association, however, realizes that the entertainment of such a large body as attends the meetings of the American Street Railway Association is an undertaking of very considerable magnitude, and that if the Association should decide to meet next year in a large city it would be an appropriate action to take to relieve the local company of the expense now required in its entertainment.

Standard Rules for the Government of Employees

The code presented by the committee on rules for the government of employees differs radically from that proposed last year; not only has the form been materially changed but hardly any of the rules have been reproduced from the list presented a year ago. This does not mean, however, that the practice recommended by the Association is entirely different. The committee has been wise in recasting the form of the standard rules of the Association, and in doing so has adopted a different wording and arrangement than that previously used, and one which is much superior to that in the former code. This difference can, perhaps, be more clearly expressed by saying that the new rules applicable to city practice, or those through Rule 72, comprise about 4000 words, with an addition of about 2000 words on interurban signaling, while the old rules consisted of about 13,700 words, with no special rules for interurban roads except about 900 words on the subjects of semaphore and color signals.

This condensation has been accomplished principally by omitting a large part of the detail instructions for inspectors, depot masters, conductors and motormen. Instructions of this kind, while advisable in the case of individual roads, are usually not of such general application that they can properly form a part of a national code, and the members of the committee have done wisely, in our opinion, in eliminating them. The committee might even have gone a step farther and omitted for the same reason a few of the present rules, such as possibly the one providing that the car shall stop only at the farther corner, and that passengers shall not be permitted to ride on the steps. The practice recommended in each case, while it is the one generally observed, is not of such uniform adoption or so essential to safety in operation that it should be required of all companies. We assume, however, that the rules were drawn up to represent the best practice in the opinions of the members of the committee, and they are certainly worthy of the highest commendation for their conciseness, clearness and the operating methods which they prescribe.

Perhaps, the portion of the rules which will attract the most

attention are those which are classed as "interurban rules," and which relate to flag, lantern and whistle signaling. In this department of the rules the committee has very closely followed the practice of the American Railway Association, adopting the method of signaling employed on the steam railroads. The only important departure from the steam railroad rules is in spacing of trains where no block signal system is in use, which in the steam railroad rules is 5 minutes, while in the electric railroading rules the space limit of 1 mile has been adopted. There is no doubt that, as developed during the discussion on this subject at the last convention of the New York State Street Railway Association, a space limit is safer than a time limit; but whether the space limit can always be followed in electric railway work is another question. We do not presume the committee intends to have this rule applied to single-track roads with turnouts where double-headers are used, as the rear car must catch up to the forward car at the turnout, and, whether it is good practice or not, must usually follow the forward car within a much shorter distance than a mile, unless the schedule is greatly to be disorganized. Nevertheless, such a rule is undoubtedly advisable under many interurban conditions, and on a double-track road on which high speeds are attained the limit laid down by the committee is none too large. The fact that some of the longest high-speed roads in the country were represented on the committee is indicative of the satisfaction that this code of signal rules gives. It will be of interest, too, to mention that the committee had several conferences with the State Railroad Commissioners of New York, and that the rules as reported are satisfactory to these officials. This endorsement of the work of the committee should be gratifying to its members, and give confidence to operating companies which adopt them that they represent the most advanced practice.

The Association is to be congratulated upon the report of the committee on rules, and we believe that the advance made in the subject this year will be of the greatest benefit to the industry in establishing a national code, which is certainly greatly needed.

Alternating Current Distribution

We have already covered in substance much of the matter contained in Mr. McCulloch's valuable American Street Railway Association paper, but certain portions of it seem to call for additional comment. On the whole it is a very discreet and judicious study of an interesting and difficult problem, and admirably summarizes the present state of the art. The summary of present practice in power station construction is particularly instructive. The salient points in which the designs of to-day vary from those of a few years since are the almost universal use of coal-handling machinery and mechanical stokers, the greater relative importance of the boiler room in the modern station, due to large generating units, particularly turbines, and a better practice as regards steam pressures and condensation.

It takes a very short memory to run back to the time when compound condensing engines were regarded as a fad, quite unworthy of the "practical" (otherwise ignorant and untrained) engineer. Even now a relic of similar tradition is found in the common prejudice against triple-expansion engines. When one considers the design of big city power stations the comparison should not be between compound engines and turbines, but with triple-expansion engines at 200 lbs. pressure and above and the highest practicable superheating. Such an engine, as foreign tests have very plainly shown, are capable of reaching an efficiency which is considerably beyond anything yet reached with turbines. And while the turbine has a very fine efficiency over a wide range of load, this property is not a particularly valuable one in the class of stations here under discussion. If the turbine was available for direct-current generation, its high and uniform efficiency would make it invaluable and unapproachable in small stations, but on the immense scale of urban central stations, with relatively steady load, this advantage is of comparatively minor importance. There is, however, a considerable class of stations to which the steam turbine is singularly well suited, but its usefulness in any particular case must be determined on its merits and not assumed as a general and established principle.

Mr. McCulloch's tables of data upon alternating power stations is very well worth study, as showing almost every phase of current practice. Perhaps the most instructive portion is that which gives a clue to the average size of the sub-stations in use. It is observed from a glance that not a few of these are of a size that precludes any considerable gain over separate power stations so far as mere size is concerned. As we have more than once pointed out, when a huge central station is subdivided into independent units of approximately the size of its sub-stations, the ordinary operating expense would not be greatly changed by abolishing the sub-stations and replacing them by the "independent units." The gain by aggregation hinges on the cost of real estate and of fuel handling and water for condensation. It would be of great use to engineers if pretty full data were at hand on the relation of these specific charges to the total power expense in stations operated under various conditions. Cost of power, as usually given, includes no fixed charges, and the cost of handling fuel is seldom separated from the general cost of fuel.

We are inclined to think the estimate given of the efficiency of the alternating transmission system in the paper under discussion is somewhat optimistic. To begin with it omits any consideration of the raising transformers, which are, it is true, seldom used in city stations, but are likely to be as voltages increase. Then 95 per cent is a rather stiff figure for converter efficiency under practical working conditions, although it can conceivably be reached, and we very much doubt whether the losses in an actual working system from the generator switchboard to the direct-current bus-bars of the rotary can fairly be estimated at less than about 15 per cent. Often they will be more than this figure, as Professor Goldsborough's recent results show. The greatest chance for saving, in fact about the only chance for coming out square on the power bill in transmission to large sub-stations, lies in a possible reduction of the general direct-current feeder losses. The exact relation between the number of sub-stations in a given area and the total amount of copper required outside of the trolley wires is not an easy matter to figure out. It depends on the nature of the network, and particularly upon the wandering of the load, which requires a somewhat increased total capacity of sub-stations as their number is increased. It is, however, probably safe to say that the total feeder copper for a given loss may vary nearly inversely with the number of feeding stations. If sub-stations with rotaries were more nearly automatic in their operation their number could be so increased as to gain very materially in efficiency or in cost of the feeding system. This phase of the matter has not received the attention which it deserves. We do not think that the subject of supply by alternating current versus supply by direct-current stations is one that admits of being judged by definitive laws. On the contrary, the choice of the most economical system in a given

case demands a deal of skill and finesse. The present fashion is for sub-stations with rotaries, but as we have many times remarked, data on the actual performance of such systems are rather scant. We wish the Metropolitan system and the Boston Elevated system, the types of the alternating and direct-current feeding systems, would come to a friendly show-down for the benefit of the street railway fraternity at large.

Freight and Express Service

The paper presented on this feature of interurban electric operation by J. B. McClary contains not only the experience of the company with which the author is connected but that acquired by a large number of properties throughout the country, especially in the Middle West. Mr. McClary has gone very thoroughly into the investigation of this subject, and during the last year has communicated with most of the railway managers who have given it any consideration whatever. In response to about 500 inquiries for data, replies were received from 182 companies, and the information contained therein has been very carefully compiled and classified, so that the following summary may be said to represent fairly the present status of this industry.

The 182 roads from which reports were received included 71 that are now engaged in this traffic, and 111 that have thus far confined themselves exclusively to the transportation of passengers. Of the 71 roads upon which freight is carried 45 admit that it is profitable and that they contemplate further extensions along this line, and only 9 report that while they are engaged in this work they do not think well of it. Of those not now carrying freight and express 37 look upon it as a most attractive feature, and 17 are convinced that it could be done profitably. Special considerations have in some cases kept the trolley companies from invading this field when they might do so with profit.

Mr. McClary presents some interesting data regarding the character of the service which is given and the results as they appear to the railway manager. Thirty-five roads use the steam railroad classification of their States or railroad districts, others have rate sheets of their own based upon local conditions and generally much lower than the steam railroads. Thirty-eight have depots at terminals and along their lines, and nine say they have none. Eighteen handle steam railroad cars on their line, but this cannot be done in many cities and towns, excepting on the outskirts and suburbs, where factories and mills are located. Fifty roads have separate freight cars or trains, three have trailers attached to passenger cars, and eight handle packages on passenger cars. Several have tried the experiment of running wagons in the principal towns along the route to collect parcels from shippers and to deliver them to the consignees. It was thought that this would prove a great inducement, but the reports seem to indicate that thus far at least it has not proved a profitable undertaking. It seems to be the consensus of opinion that a service of this character should be organized and conducted by a local express company entirely independent of the railway organization, although, of course, there is no reason why it should not be controlled by the same interests; in fact, it has been deemed advisable to have the stockholders of the railway company and the express company identical, in order to insure retaining the business when it has been developed to considerable proportions. Five cases of this kind are reported in the paper under consideration, but there are doubtless many more examples of this practice throughout the country. Under such an arrangement it is usual for the express company to pay the railway company a certain amount for cars or space, or a percentage of the gross receipts, thus relieving the railway of all responsibility excepting merely the hauling of the goods, while the express company attends to the minor details, for which its organization should be better fitted.

Many of the roads are using a ticket or tag system, which simplifies matters and admits of much more economical operation, especially where the volume of business is comparatively small. These tags are sold in large quantities to patrons of the company, and each has a certain valuation, so that packages of different sizes may be sent merely by attaching a ticket representing the equivalent of the rate to carry it to its destination. The practice of several roads in this particular is described and illustrated very clearly, and their methods of accounting and rates for service shown.

It is evident that the interest in this subject is constantly growing, and the reports obtained by Mr. McClary warrant the assumption that the railway companies are working upon a much better basis now than at any former period, although it is apparent from the reports that many are carrying on this branch of the service at considerable loss, and others are still adhering to slip-shod methods, which must of necessity prove expensive and retard their progress. This, in some cases, is due to the fact that the facilities are inadequate, but in many it is simply poor management. In any event it must be conceded that it is the part of wisdom for the manager to look carefully into the problem before committing his company to such an important and radical innovation. In the first place, the investment required for properly developing such business, and then for handling it after it has once been established, is much larger than is usually anticipated. This has brought many of the pioneers in this department to grief, and it explains to a considerable extent the failure of some of the companies mentioned herein. Again, the possibilities of certain fields had been overestimated, and some were already occupied by steam lines having much better facilities than the electric companies could possibly hope to command at the outset. This handicapped the newcomer, and oftentimes the failure of the service in the earliest stages condemned it for all time with the shippers who were disappointed. These are only a few of the reasons which have made the freight and express business a ticklish proposition for electric railways to undertake. Experience in this branch, although dearly bought, has proved extremely valuable to those who are now engaged in developing important properties. We are not prepared to go as far as Mr. McClary in asserting "That electric railways can serve the public in transporting passengers to their satisfaction is proof that they can surely serve the same people in hauling freight and express matter, and do it safely and profitably." On the contrary, they are entirely different propositions and depend upon different conditions. But we do believe, and we think that it must be admitted even by those who are not favorable to this innovation, that there are splendid opportunities in this line, as are exemplified by the experience of several of the companies operating in the vicinity of Saratoga.

The Status of the Steam Turbine

Mr. Emmet's Association paper is a most interesting account of the evolution and capabilities of the Curtis turbine, which has already forced its way into commercial prominence. The turbine generator, as developed by the General Electric Company, is certainly a very striking and successful machine, and the probable effect of this development on future central station practice is a highly interesting subject of discussion. As between the Curtis and other forms of steam turbine it is not

our purpose to institute comparisons. In due season, when turbines have been long enough in use to furnish adequate data, such a comparison would have force, but at present the whole class of turbines rather than any one form is on trial. The Curtis machine presents many striking features of design, particularly the vertical shaft and electrical valve gear. The desirability of the former feature is a question of fact rather than of theory, involving the use of daring mechanical expedients, which must be judged by their results after considerable experience. We see no reason why the vertical shaft design should not be successful, considering the nature of the lubrication, but whether it presents any material advantage practically over the horizontal shaft turbine, save in the matter of floor space, remains to be seen. And considering the fact that turbines are not yet adapted to use with direct-current dynamos, which must needs be located near the center of load, we are inclined to think that economy of floor space is a matter to which overmuch weight is at present attached. The electrical valve gear, too, must be judged by its results—it certainly is not vital to the success of the turbine, and if it should be advisable to turn to a purely mechanical gear the ultimate usefulness of the turbine will be in no way impaired.

The main question is the final economy of the turbine as a prime mover for general purposes. It has many strong points in its favor—the very high mechanical efficiency, the ease of using superheated steam, and the high rotative speed so well adapted to the direct connection of alternators. The low frictional losses insure high efficiency over a wide range of load, and the whole combination is most compact and easy to operate, which tends to keep down the cost of power. On the other hand, the turbine runs at enormous peripheral speed, which reduces the factor of safety. Still more tremendous, the condensation must be exceptionally perfect to insure high efficiency, and the actual working efficiency is not yet definitely known. We greatly regret that Mr. Emmet was unable to give the final results from the tests of the splendid 5000-kw unit installed in Chicago, which would have thrown a great deal of light on the economics of the situation. It has already been shown by numerous tests that turbine generators of some hundreds of kilowatts capacity are capable of remarkable results, quite comparable with those attained by first-class compound condensing engines. But how about the larger units? Are they able to cope in point of steam consumption with high-pressure triple expansion engines, working with high superheating and giving results like those obtained from the Sulzer engine noted in Mr. Dawson's recent paper? Unless they are so able the bitter necessity for keeping down the fuel bill will tell somewhat against them. Good as the turbine is we are by no means convinced that the reciprocating engine is a dead dog yet, and the competition now in evidence will have the result of improving the economy of both classes of machines, for which the purchaser should be duly grateful.

We think, also, with one of the speakers at the session on Thursday, that they err who underestimate the capabilities of the gas engine. It is a grievous mistake to judge these engines by the wheezy little abominations with which Americans have until recently been contented. It is highly probable that both the first cost and efficiency of the gas engine will be greatly bettered in the near future, and we do not believe the depreciation on the large units will be so serious as many believe. As the price of fuel rises it looks now as though we should be treated to a magnificent triangular competition between gas engines, steam turbines and improved steam engines, and the higher the cost and the lower the rate for money the less first cost will count in the game.

Meanwhile, the turbine has unquestionably a great field before it. In certain lines of electrical and other work its known economy is ample to insure it precedence and to give it a very material advantage over all competitors. If it shall prove feasible to arrange the turbine for direct coupling to continuous-current generators, the scope of turbine work will be enormously widened, and this step in advance, though difficult, is one which should be taken if possible, and taken at once. Meanwhile, there will be accumulated in the very near future a vast store of practical experience which will show definitely the uses and limitations of the turbine. In any event we can clearly see that there are to be notable improvements in the economy of prime movers within the next few years, to the great advantage of their users. We applaud the skill and daring of the engineers who have already brought the turbine to so promising a position in the art, and wish them the best of luck in the struggle for supremacy upon which they have now fairly entered. They cannot be definitely repulsed, for part of the field is already assured them, and every hard-won gain will be a gain for the world as well. Improvement in prime movers is of so great importance in the world's industry that he who makes it is a benefactor.

The Supply Dealers' Association

For some time past there has been a feeling on the part of many of the manufacturers who make annual exhibits at the Street Railway Association, as well as that of many of the members and leading officials of the Association itself, that the interests of both could be promoted by an intelligent plan of co-operation between the executive committee of the Association and the supply men. Heretofore all of the work of preparing for the convention and all the details relating to the exhibits has devolved upon the officers of the Association or upon the local committee appointed by them. The supply men attend the conventions upon exactly the same basis as they did ten or fifteen years ago, when their number was one-half or one-quarter what it is at present. They are practically the guests of the Association and are permitted to attend the meetings and participate in all of the excursions and other entertainments which may have been provided. The only difference in treatment between a supply man at the convention and a delegate is that the former, not being a member of the Association, does not have the right of the floor during debate and that he has to pay no annual dues.

The representatives of many of the supply houses have felt for a long time that they would be glad to relieve the Street Railway Association of much of the detail work connected with an annual convention, or in some other way to assist in the success of the meetings to which they are invited. While this sentiment has been respected, it has been accompanied, in the minds of many of the members of the Association, with a feeling that the Association could preserve a more independent course if all arrangements for the annual conventions were carried out directly by its own officials. This idea has to a considerable extent passed away, and it is now the opinion of many members of the Association that an association of the supply men, if conducted along the proper lines, would be advantageous in affording a means for friendly co-operation between those who make the exhibits at the annual conventions and those who inspect them. We give the details, elsewhere in this issue, of the appointment of a committee at a meeting of the supply men at Saratoga to organize such an association and confer with the executive committee of the American Street Railway Association on the subject.

PROCEEDINGS OF THE SARATOGA CONVENTIONS

THE AMERICAN STREET RAILWAY ASSOCIATION

THURSDAY'S SESSION

Vice-President Ely called the meeting to order on Thursday, Sept. 3, at 10:15 a. m.

The Vice-President—The first business which we shall consider this morning is the matter which was under consideration at the time of adjournment yesterday—that relating to the carrying of the United States mail. The chair understands that Mr. Grant has a resolution to offer on that subject.

Mr. Grant—Mr. President, I offer the following resolution:

Resolved, That the president of this organization be empowered to appoint a committee of three to confer with the Postmaster-General in relation to compensation for the carrying of mail by interurban cars, for mail in pouches and mail cars in cities; said committee to enter upon its duties forthwith and report to the secretary of the Association immediately upon the completion of its work.

The resolution was seconded and adopted.

The Vice-President—We will now take up the paper by W. L. R. Emmet on "Steam Turbines."

Mr. Emmet's paper is published in this issue on another page.

The Vice-President—Gentlemen, the paper is open for discussion, and we are all very much indebted to Mr. Emmet for the valuable paper which he has presented to the meeting. I will ask John I. Beggs, of Milwaukee, if he will kindly open the discussion.

Mr. Beggs—I did not expect to be called upon to discuss this question of steam turbines—the request to do so is a surprise, yet it is a subject I am deeply interested in, as I believe is also every other member of this Association who is required to spend such a large amount of money as we are called upon to do in producing steam. I have listened with a great deal of interest to Mr. Emmet's paper, having discussed the subject personally with him to some extent, and having a great deal of confidence in Mr. Emmet's engineering skill and in his predictions. It was my pleasure and privilege some years ago to be associated with Mr. Emmet.

I believe that engineering circles generally are waiting with a great deal of interest the results of the tests now being made in the power plant of the Commonwealth Electric Company, of Chicago, upon the first 5000-kw turbine unit that has been installed. I went to see the turbine during the time of its construction, and I am very hopeful that the prediction of the General Electric Company that steam turbines would come into quite general use, and which they have given us reason to expect might be realized, is about to be fulfilled. I have had considerable doubt about this at times, for the reason that some of the most eminent, I may say those among the very first engineers of this country, those whose reputations have been tested by almost a half century of work, whose experience is large, have given expression to a doubt as to the successful operation and economy which would be shown by the steam turbine. Being pretty closely brought in contact with some of those engineers, and having discussed the question with them from time to time in the past two or three years, I naturally have had greater doubts upon the question of the steam turbine than I might otherwise have had. But I am hopeful that the predictions now made for the steam turbine are about to be realized. I do not see, however, that there is anything we can do except to wait until the curves and tests which Mr. Emmet indicates are going to be made have been made and we have the results before us.

In this connection I desire to throw out a suggestion as to whether or not, about the time that the steam turbine has reached the stage of perfection suggested by Mr. Emmet and the manufacturers of it, there is not a new power now looming up which may as far surpass the steam turbine as the steam turbine surpasses the reciprocating engine, at least so far as the matter of economy goes. I refer to the gas engine. We have given considerable thought to it for the last two years. If the predictions made for the gas engine, in using gas now produced as by-products, or in using the ordinary illuminating gas or producer gas from plants installed in connection with our own steam plants, are carried out, we can cut the cost of a kilowatt-hour of current, no matter how high the economy of the plant may be, in half, and possibly reduce it two-thirds in cost. I think this is an important question. There is one large engine building concern in this country which has recently acquired the right to build in this country the Nuremberg gas engine. They propose to have one of these engines installed in St. Louis twelve months hence. There is also a 3000-hp gas engine to be direct-connected to a 2000-kw generator, which it is likewise proposed to install in the St. Louis Exposition. In the Northwest, where coal is such a factor that we are paying $3.50 for 2000 lbs. for screenings, which four years ago cost us only $1.70, you can appreciate that any device which will bring down the cost of producing steam is of great moment. The element of power in the cost of operating a car mile to-day becomes a very serious question, and if the cost of generating the power can be cut in half, and that without the use of a steam power plant, anything which will tend to that end becomes a very important factor.

As I said at the outset, I appreciate very greatly the labor Mr. Emmet has personally put on this question, because he has devoted two or three years of his time almost continuously to the matter of steam turbines. I also appreciate the efforts of the General Electric Company to reduce the cost of steam turbines—that is one of the important elements in the proposition. Some of you gentlemen will recollect our discussion at Detroit, and when the paper was read at that time the author of it, I have no doubt inspired by the manufacturers, was generous enough to propose to give us the steam turbine and the generator with it at a cost not exceeding that of the reciprocating engine and the generator. I remember at that time that I raised the point that the cost of the production of that unit must be very greatly under that of a reciprocating engine and a generator. I am pleased to state that we can now buy a steam turbine unit, such as has been described this morning, the entire unit, for about the cost of a reciprocating engine. That much progress has been made in eleven months. The paper presented at Detroit was by a representative of the Westinghouse Company, building the Parsons turbine, and I took direct issue with him at that time that the users of this apparatus were entitled to some of the saving that was effected in the greatly reduced cost of producing the apparatus. I do not think I am divulging any secret when I state that the cost of this unit is greatly reduced; in fact, inquiries which I have made, of recent date, indicate that I can buy a steam turbine unit, with generator complete, at about the cost of a reciprocating engine of equal capacity; of course, with the slower speed of the reciprocating engine the cost of the generator becomes one-half of the engine itself—in other words, the cost of the generator on a reciprocating engine, running 75 r. p. m., is about one-half the cost of the engine. That amount is saved in the turbine, and that is important. I may say further, that one element which will come up in the question of the use of gas engines will be the greatly increased cost of the engine itself. It is a question of commercial calculation, as to whether the greatly increased investment will be saved in the greatly reduced cost of producing power.

The Vice-President—This is an interesting subject, and Mr. Beggs' remarks are of much value, and I hope that others will take part in this discussion. Referring to the very interesting subject of gas engines, of which Mr. Beggs spoke, I might merely allude to the fact that in the new plant of the Lackawanna Steel Company, at Buffalo, by apparatus quite simple in its nature, the escaping gases from stacks of the blast furnace and the ovens are recovered, washed and conducted to the engine room, where they are used as fuel, costing nothing to the plant, yet supplying fuel for an installation of 40,000-hp of gas engines. I have seen the plant several times. The engineer in charge is a Russian—of course, you all know that in the matter of gas engines, their manufacture and use, we are far behind Europe. I think the units are of 2000 hp each, perhaps there are some of 5000 hp, but my impression is that most of them are 2000-hp units.

Mr. Beggs—I wish to say a word further. It is a very important point, particularly to investors in these properties. We have sometimes on that account to look at matters differently than from the purely operating standpoint of these plants. The tendency of the time is for consolidation of electric railway and electric lighting properties in the various cities. It is a natural combination in the interests of the public; the public gets the benefit of it. There has been formed in the West a large manufacturing establishment to produce coke for domestic use, furnace and foundry use. This company is building eighty ovens at the present time, and has some 28 acres of land, and in the manufacture of the coke their gas becomes a by-product.

E. G. Connette, Syracuse—It occurs to me, Mr. Chairman, that while the discussion of the gas engine is interesting, the real subject of discussion is steam turbines, and that is what I think the members of the Association would like to have considered.

The Vice-President—I was about to suggest that perhaps it is not quite correct to enter upon a discussion of gas engines at length, when the subject of steam turbines is up and such a fine paper upon that subject has been read to us.

Mr. Connette—That is what I refer to. I suggest, however, as the gas engine question is a very interesting one, that the executive committee might take cognizance of the fact and have the matter brought up at the next annual convention for discussion; but I think it would be proper, in deference to Mr. Emmet, who has presented this able paper, that we should discuss the question of steam turbines.

C. O. Mailloux, New York—I would claim your indulgence for a few minutes of your time for the purpose of discussing the relation between the gas engine and steam turbine, although it has just been pointed out that a discussion of the gas engine is not exactly relevant to the subject before the house; but it seems to me, since the matter has been brought before the house, that I would be negligent in my duty to my fellow delegates in this meeting if I did not also contribute the information which I have in regard to the relationship or comparison between the two. I have had occasion to investigate the question of gas engines, as well as the question of turbines, in my professional capacity to my clients, and I think I can sum up my view of the applicability of the gas engine by the old, trite saying, "Circumstances alter cases." I find it makes all the difference in the world whether you get gas for nothing or have to produce it. In a case where the gas costs nothing, as at Buffalo, or in places similarly situated, or the gas is obtained at a cost which is below 20 cents per 1000 cu. ft., I think gas engines will undoubtedly be more economical, or at any rate as economical, as steam turbines, especially when coal is relatively high. But when the power producer is compelled to produce his own gas the situation is quite different. I had occasion to institute an interesting comparison recently in the case of a plant of 15,000 kw, where I received estimates from a concern that offered to do the entire work by gas engines—the same gas engine as is used in Buffalo—and where I also had estimates based upon the use of steam turbines. It is for that reason I thought I would speak of this comparison, since it is a case in point. I found as the first point in the comparison that in the gas engine system the largest unit was about 2000 hp. It would be necessary to have something like ten units, and, therefore, a larger building would be required for the plant, and a larger maintenance account, because the number of units is greater The gas engine is not a simple device and has a certain maintenance account. I found, also, in order to get the economy promised to me by the representative of the system, that I would have to go into the chemical business—in other words, I was told that out of the combustion of the gas or manufacture of the gas, I would get certain chemical by-products, and would have to go into the chemical business to sell them. I understood that in an installation of 3000 kw there would be something like $50,000 a year or more recovered in the form of chemical by-products. The principal objection was that it required an initial outlay of over $1,000,000—that was the crucial thing. If you consider the interest upon the extra initial investment—the depreciation, insurance, taxes and all things which constitute fixed charges, you will find you must have greater efficiency and economy in your coal to come out even. In that particular case I found that instead of coming out $100,000 ahead as against the steam turbines, we would be more nearly that much behind each year. It is needless to say I did not advise my clients to adopt the gas engine plant in that case. On the other hand, I had a case of a pumping plant in Mexico, where coal is $15 a ton, delivered on the mountain 700 miles from the nearest coal mine. I found in that case a gas engine, operated with producer gas, though it might cost more than the steam turbine, would pay for itself in something like three or four years. The pumping duty is constant and it lasts 24 hours a day. There is an ideal load curve, which is an exactly suitable condition for the best economy to be obtained by the use of the gas engine.

I also had occasion to investigate a case in Arizona, where the power was to be used for lighting and traction, and found in that case that the cost was very nearly even. The company was one which produced gas as well as electricity. They make the gas and could procure it at the lowest cost, but after a careful investigation they decided to adopt steam turbines. Further investigation in the case shows that in the present state of manufacture the cost per kilowatt of the gas engine outfit is at least twice that of the steam turbine outfit. I have had a station operating under my direction which has been installed for a year, running one unit per year, and for the last five or six months running two units of 400 kw each. The results have been extremely satisfactory and we have recently ordered two units of 3000 kw each. I do not think I am telling any trade secrets if I state that the cost per kilowatt for the last two units ordered is under $28 for the unit installed, not including the piping or condensers.

The great point in the steam turbine which appeals to me, as the result of my experience, is that it enables the station equipment to be greatly simplified, not only in detail, but also in those things which eventually tell on the maintenance. You have fewer parts; there are no adjusting parts and various other things of that kind are much simpler in the steam turbine. But there is one other feature which is, I think, of the greatest utility, and that is the ability to apply superheat in the use of the steam turbine. I pointed out in the discussion last year that there is no limit to the superheat that you can apply in the case of the turbine; there are no conditions of lubrication to impose limitations; no packing, nothing to prevent you from applying all of the superheat possible to get. The steam turbine is related to the question of the design of the plant in another way—heretofore we have been accustomed, when we

wanted a higher efficiency in our steam-producing outfit, to consider the introduction of fuel economizers. We have also been obliged to resort to extremely high steam pressures. We find with the steam turbine, allowing for ample superheating, with a moderate steam pressure, 150 lbs., which is high as compared to ten years ago, but low as compared with the practice of to-day—with a steam pressure of 150 lbs. and superheating up to 600 degs.—it is possible to get as good economy as with, perhaps, 175 lbs. or 180 lbs. of steam pressure, using fuel economizers. The cost of the station is less, the expense of running is much less, and, all things considered, the cost of producing power is much reduced.

The only possible drawback which I have thus far had brought to my attention connected with the steam turbine, is the fact that it is not economical without condensation, and in fact without very good condensation. One needs with the steam turbine a very good vacuum, and I have experienced some difficulty hitherto in getting a satisfactory vacuum; but others have attained it, and I have no doubt that I shall be able, by slight changes which I contemplate, and which I shall introduce in new apparatus, to overcome the difficulty. I feel convinced that the design of the condensing outfit requires much more care and involves some more cost, perhaps $3 or $4 per horse-power, for the condensing outfit of the turbine than for the condensing outfit of the ordinary engine. I know from the results obtained that there are no difficulties which lie in the way of carrying out perfectly a system of condensation giving results which would lead to the best economy; and I do not know of any other respect in which, even in the present state of the art, the steam turbine is inferior to the other method. When you consider the saving of space in the building, the reduction in materials, oils, supplies, etc., there is no doubt that if the pounds of steam were the same there would be a saving in the use of the turbine. In conclusion, I will say that while I was a strong partisan of the steam turbine last year, as the result of my experience during the past twelve months I am to-day a stronger advocate of the steam turbine than ever.

J. G. White, of New York—I assume many of the gentlemen are in practically the same position as myself in reference to this important subject. Probably most of those who have given the subject any consideration appreciate the necessity of high vacuum, and also the advantages of reduced space, saving in initial investment, oil and other supplies; but what most of us want to know is what can be depended upon as to reliability? Can we install steam turbines to-day and be certain that they will start off without serious interruption, or at least that after a few weeks of operation they can be depended upon to take up the regular load and carry it day after day? On this particular point I wish to ask a question of Mr. Emmet and Mr. Mailloux. Mr. Emmet, fortunately for all of us, does not claim that either he or his company is infallible. He is frank in acknowledging the developmental defects which must come into any large new experimental work, and for that reason all of us have a great deal of confidence in any statement made by him. Mr. Emmet talks very frankly to us, when he is speaking to us informally, and it may be that on such occasions he makes statements which he would not care to have published; but I wish to ask him what can be depended upon in the steam turbine as to reliability? I understand that at Newport there are two turbines in operation, the original one of which gave considerable trouble in its experimental stages, but is now said to be on a regular working basis and running with considerable regularity, and also that there is a second unit, which I understand is in operation and running satisfactorily. I also ask Mr. Mailloux as to how many stoppages there have been during the last sixty days, or some definite period, in the plant to which he referred. My object is to get a statement of what we could naturally expect from an installation of two, three or four turbines, as to perfect reliability of service.

The Vice-President—I will ask Mr. Emmet, in answering Mr. White's question, also to close the discussion as far as he wishes and say anything further he desires upon the subject.

Mr. Emmet—We have had experience with two turbines, one of 600 kw in Schenectady, which is of the older type, and a vertical shaft turbine at Newport, which is of the newest type. The machine at Schenectady involved no radically new or peculiar mechanical devices, and was put in service two years ago, and has run almost continuously without having any interruption of service or trouble of any kind. The machine located at Newport has carried its load continuously, and it is only through an excess of conscientiousness that in the paper I refer to any of the troubles we have had, because there have been practically none which interrupted the service. We have made a record of all stoppages, and I think there were three stoppages which interrupted the service in Newport between June and September, and the longest stoppage was less than 20 minutes. This, however, was inspired by a certain amount of trouble going on in the valves, which had to be corrected from time to time. However, the Newport machine, as it stands, if it had to be kept in its present condition, without improvement, and simply maintained by the renewal of those valve parts as they give out, would be maintained and run at a small fraction of what it would cost to maintain any reciprocating engine of equal capacity.

In comparing turbines and gas engines I think Mr. Mailloux's statement of the comparison is a very just one—it is purely a question of the cost of fuel; that is, with the turbine in its present state of development. The actual fuel economy of the gas engine in its greatest state of perfection is greater than that of any steam engine heretofore produced. However, the very highest results obtained so far with steam turbines, in the matter of fuel economy, that is, actual consumption of combustibles, are not so far below the thermic results obtained from gas engines. The very best gas engine that has ever been operated on a theoretical basis produced a fuel economy something like 32 per cent total work units or mechanical equivalent from the heat in the coal. The best results produced with highly superheated steam under favorable conditions I cannot exactly quote, but the thermal economy of the steam turbines would be something like 23 per cent or 24 per cent. The gas engines which actually operate on commercial basis do not run anywhere near the engine which had an efficiency of 32 per cent. They run nearly 26 per cent or 27 per cent, and while they compare favorably with ordinary engine performances, they are not very much in advance of the best steam turbine performances. Furthermore, the cost of the gas engine is, as Mr. Mailloux says, possibly twice the cost of the steam turbine unit. If, however, the steam turbine unit is credited with the possible simplifications which surround it, the difference will be much greater. The steam turbine needs no heavy foundation. A power station for boilers and turbines could be floated on 3 ft. of concrete on any salt meadow, and a like inexpensive structure made to shelter it, and its efficiency be as good as if it were installed in the most expensive station. There will be simplifications in this direction—the ideal turbine station which will be far removed, maybe, from the city, will be laid out more on the lines of a coal yard, or any similar place, than on lines where a large and expensive building will be required. On this basis the difference of cost will be greater than Mr. Mailloux stated, and even now, if we capitalize the difference in fuel consumption between the two engines, it will not cover the first cost.

Furthermore, the turbine is ideally simple and the gas engine is very complicated. Everyone knows how simple the steam turbine is in a proper state of development. The only experience we have had in this country with steam turbines is with very new steam turbines. The troubles now experienced, we think, are of a purely temporary character. The

steam turbine, as it will be in six months from to-day, can be operated by a child indefinitely, virtually without maintenance. The wear and deterioration is nothing and the whole plant can be reduced to an ideal condition of simplification. Against this we must consider a gas plant, in which gas must be produced, and in which an immense maintenance cost goes on in connection with deterioration and renewal of converters and mechanism which must be attended to—the maintenance of engines twice the size of steam engines, twice as complicated and less perfectly lubricated. The gas engine is a gasolene automobile on a large scale, and perhaps some of you have had experience with those machines; whereas the steam turbine is as simple as an ordinary grindstone. Naturally every one is interested in the development of the gas engine, and we all realize that some day, if coal continues to increase in cost, and gas engines are improved at the same rate that the turbine has been improved, the time will come when fuel economy will be the only consideration and gas engines will come into more extensive use. I think, however, the introduction of a steam turbine is certain to give the gas engine a long set-back.

Mr. Beggs—I rise to a question of personal privilege. I presume I should feel rebuked by our good friend Mr. Connette's remarks. I do not, however, and I have no apology to make, either to the Association or to the writer of this very able paper upon steam turbines. I think it is perfectly germane to this question and vital to it that in considering the methods by which we shall produce electric current, that if there is any other question directly connected with it, it is important this Association should know it and give consideration to it at this time. The closing remark of Mr. Emmet is the very point I wanted to bring out before this convention. It is only eleven months ago that we were told the cost of a steam turbine unit was double what it really is to-day. What brought that about, gentlemen? It is obvious, from discussion, it is because of competition between the builders who have acquired the right to construct steam turbines in this country. With regard to the gas engine in this country, we are in the same position that we were in three years ago with respect to the steam turbine—we scarcely know anything about it. Even the builders of the steam turbines to-day question whether it is not more economical and more advisable to install units of 2000-kw capacity than units of 5000-kw capacity. There is a 3000-hp gas engine being built at the present time for installation in St. Louis. I feel that it is becoming a question with many of us whether we get all the benefit we should from our meetings. If we are not to be at liberty to discuss the papers which are read at the meeting in any and all directions that will throw light upon the subject, we shall fail to get the full results that should follow the discussion of subjects before this Association.

The Vice-President—Mr. Beggs misunderstood the chair, and lest that misunderstanding may be general, let me say that it seems to the chair quite proper that there should be the widest discussion on all these subjects and the comparative merits of these engines should be gone into at this time. My thought was that while the discussion of the paper was up, and until the author of the paper made his final remarks, it might be well to confine the discussion to the subject of turbines at the present time. I think, however, that the discussion should be as wide as the field of the various classes of engines will permit; but it seemed to the chair that we should at first discuss the subject directly before the meeting.

Mr. Beggs—It was my idea to arouse the manufacturers of gas engines to the necessity of putting forth their best efforts to improve those engines. I also desire to put on the record that I had no intention of any discourtesy toward Mr. Emmet in discussing the question of the gas engine, because I opened my remarks by saying there is not a man in the engineering field in the United States to-day for whom I have greater respect and admiration, having been associated with him ten or twelve years ago as the engineer of the department of which I was the head.

Mr. Mailloux—A question was asked me by Mr. White, and if it be the pleasure of the meeting to have me answer the question, although the discussion has apparently been closed, I shall be happy to do so.

The Vice-President—We shall be glad to have you answer the question, Mr. Mailloux.

Mr. Mailloux—I shall confine myself merely to a statement of fact. The first 400-kw unit was ready some time early in the winter. We were expecting to run the turbine light on Saturday, and to put it in regular service on Monday. We started it up a little on the morning of Friday. That afternoon we had a burn-out in one of the units that was carrying the load. It left us entirely unprepared to carry on the work of the station unless we pressed a turbine into service. Even though the packing was not finished, we started the turbine and have not been able to spare it since. It has not stopped except during periods of light loads, when it became possible for us to dispense with it, that we might complete the piping and adjustment of the unit. If any trouble has occurred with it, it must have occurred since I left New York. So far as I know there has not been any interruption whatever. We experienced a little difficulty in paralleling the two units, there was a slight hunting or some disturbance due to imperfect belting, but it was remedied. At first the attendants were careful to exercise a strict supervision of the turbine, and remained around the unit while it was running, feeling they should be there in case of emergency, but they have become accustomed to the machine and do not feel it is necessary to be there so much and the unit is left to take care of itself. In closing, I want to state again, to save Mr. Beggs' feeling, I am not at all averse to the use of gas engines myself. I was careful to state that "circumstances alter cases," which is the keynote of the whole question. I also stated that there was one case, that of a mountain plant, in which I recommended a gas engine.

After the conclusion of Mr. Mailloux's remarks there was a general discussion on the question as to what extent the proceedings of the convention should be given to the technical press for publication before the remarks were revised by the various speakers. The enterprise of the technical press in publishing the discussions was commended. Some of the members thought there might be a freer expression of opinion if the report of the proceedings was not printed before revision by the speakers, and some members expressed the opinion that a member should have the privilege of having expunged from the record any remarks he did not wish to have printed. The discussion was participated in by W. Worth Bean, St. Joseph, Mich.; L. E. Myers, Peoria, Ill.; H. H. Vreeland, New York; C. C. Mailloux, New York; G. Tracy Rogers, Binghamton, N. Y.; John I. Beggs, Milwaukee, and J. G. White, New York.

The vice-president appointed the following committee to consider the matter and report to the convention: Messrs. Mailloux, White and Beggs.

The following named gentlemen were appointed as a committee on resolutions to report at this convention: W. Worth Bean, St. Joseph, Mich.; C. Loomis Allen, Utica, N. Y.; Thomas Hawken, Rockland, Maine.

The following named gentlemen were appointed a committee on rules to report at the next convention: E. G. Connette, Syracuse, N. Y.; T. E. Mitten, Buffalo, N. Y.; W. E. Harrington, Camden, N. J.; Richard McCulloch, Chicago, and John J. Stanley, Cleveland.

Mr. Beggs offered the following resolution:

Resolved, That the executive committee to be elected at this annual meeting be requested and directed to make an earnest effort to have prepared and presented at the next annual meeting papers from prominent and experienced manufacturers of reciprocating engines, manufacturers of steam turbines, and manufacturers of gas engines, as to their respective merits.

The resolution was seconded by Mr. Connette and carried.

The secretary read the following communication:

Binghamton, N. Y., Sept. 1, 1903.

T. C. Penington, Secretary American Street Railway Association, Saratoga, N. Y.

Dear Sir: The twenty-first annual meeting of the Street Railway Association of the State of New York will occur at the Yates Hotel, Syracuse, Tuesday and Wednesday, October 6th and 7th.

An unusually interesting State meeting is anticipated. Papers upon practical street railway subjects will be presented and topics of general interest discussed. In addition to the interesting and profitable features of the meeting, a splendid programme of entertainment (including the annual dinner on Tuesday evening, October 6th) has been arranged by the local committee.

All in attendance (including street railway and supply men) at the twenty-second annual meeting of the American Street Railway Association are respectfully invited and urged to attend the State meeting at Syracuse and participate in the benefits and pleasures thereof.

It is the aim of the officials of the Street Railway Association of the State of New York to make the twenty-first annual the most largely attended, interesting and profitable meeting in the history of the Association. Yours respectfully,

G. T. Rogers, President.

On motion the meeting adjourned until 9 o'clock Friday morning.

FRIDAY'S SESSION

Vice-President Ely called the meeting to order at 9 o'clock and requested H. H. Vreeland to preside.

The Chairman—The first business to be considered this morning is the paper on "Electric Welded Joints," by William Pestell, superintendent of motive power and machinery of the Worcester Consolidated Street Railway Company. Inasmuch as this paper is printed and has been distributed to the members of the Association, it will not be necessary to have it read. I learn that Mr. Pestell, the writer of the paper, is not present. I intended to ask him to make a brief statement of the points contained in his paper. (This paper is printed elsewhere in this issue.)

Mr. Gotshall—I move that we pass to the next paper. Perhaps Mr. Pestell will come in later and we can take up the discussion of his paper then.

The motion was seconded and carried.

The Chairman—As Richard McCulloch, the author of the paper on "The Production and Distribution of Alternating Currents for Large City Systems," is present, we will consider that paper now. It has been distributed to the members, and I will ask Mr. McCulloch to open the discussion of the paper, calling attention of the members to such points as he particularly desires to emphasize. Mr. McCulloch is the assistant general manager of the Chicago City Railway Company.

Mr. McCulloch—The paper consists of a description of the general practice in large city power plants of producing alternating current, with limited discussion of the advantages of some of the newer forms. In general terms, the conclusion of the paper is that in cities of less than 250,000 inhabitants, unless special conditions are found to exist, the best practice would be to generate direct current, and the alternating current will be serviceable more particularly to the very large cities and for cities where the greater part of the load comes from the interurban or suburban places.

Mr. Mailloux—The paper is primarily a statement of facts—an analysis of the present state of the art of producing and distributing alternating current—and it will be very useful to the members as a work of reference, because it so concisely, and yet comprehensively, gives a resume of the entire situation. In my opinion, all that is necessary to state is that the work of Mr. McCulloch has been admirably done and deserves the thanks of the Association.

W. C. Gotshall, Portchester, N. Y.—Some data are given as to the relative areas and cubical contents of stations designed to use the existing reciprocating engines and also to use turbines. I have no doubt Mr. McCulloch got considerable information while he was gathering the data for his paper as to the cost of some stations which have been in operation for a short time producing power by turbines and the details of the cost. It occurred to me that he must have obtained some data of the cost of producing a unit quantity of energy and the distribution of cost for those places. If he has done so, it would be well for him to give the information to the Association if he can do so consistently.

Mr. McCulloch—In answer to Mr. Gotshall's question, I will state that I made no effort to incorporate in the paper any data in regard to the cost of power, because that depends largely on load conditions. The cost in most of the large stations is not a secret at all and is pretty generally known, so that I made no effort to put anything of that sort in the paper.

The Vice-President—We will now pass to the paper entitled "The Evils of Maintenance and Champerty in Personal Injury Cases," by Michael Brennan, counsel of the Detroit United Railway. (The paper will be found on another page of this issue.)

Mr. Gotshall—Is the writer of the paper here?

The Vice-President—He is not. The chair will say, no one else offering anything, that the committee in selecting this topic was actuated by the feeling that while it would be impossible to harmonize the statutes and rules and practices of courts that affect this matter, by reason of the Association extending to all the States, still it was along the line of standardization, and the thought upon the matter and the consideration of it might be useful in bringing about, or in assisting to bring about some line of thought that would be common to all. Of course, the laws that affect the subjects treated in the paper differ widely in the several parts of the country. If there is no discussion desired we will pass the paper. It has been printed and distributed in due season and I hope it has been read by all.

The next paper is entitled "Train Orders and Train Signals on Interurban Roads," by C. A. Coons, superintendent of transportation International Railway Company, Buffalo, N. Y. I would ask Mr. Coons if he has anything in particular to point out in connection with his paper other than as set forth in the paper itself. (It will be found on another page.)

Mr. Coons—I have nothing to add to the paper.

The Vice-President—This paper has also been printed and distributed. If that is a sufficient consideration of it and no member wishes to discuss it, we will pass to the next paper, "Freight and Express on Electric Railways," by J. B. McClary, manager of the railway department of the Birmingham Railway, Light & Power Company, Birmingham, Alabama. (This paper appears elsewhere.)

Mr. Gotshall—It appears to me that this is one of the most important subjects in connection with what are undoubtedly the coming electric railways; that is, the lines connecting the centers of population adjoining and about large cities. For about a year I have been trying to get some information on this matter, and the trend of what I have been doing has been to ascertain the income from this service and the amount of money it is costing to do a given amount of business. I do not find that there is any statement in this paper showing anything from which you could derive much information concerning the income or the cost of doing business. I have found in going over the matter and corresponding with railroads in different parts of the country, as to the express and freight business, that they are receiving all the way from $500 to $900 per mile of single track, that is, the gross receipts for the freight and express business they are doing. I have not been able to get satisfactory information which would indicate the cost of doing that business. It is certainly unfortunate that our time is limited and that there is no disposition to discuss the paper in detail, and it appears to me the matter might well be brought up in some other form at the next session, when we trust we

shall have sufficient time to discuss all these papers. It would require three or four hours to discuss this paper properly.

Mr. Mailloux—I have often noticed that it is only upon reading papers, after they have become cold in the transactions of an association, one gets ideas and suggestions which might lead to important questions and discussion. It seems to me, therefore, that in the case of this Association many of the subjects which form the basis of papers or reports at one annual meeting might well serve as the basis of topical discussions at a subsequent meeting. In this way the members would have time during the year to read the papers and collate their ideas, and come prepared at the next meeting to discuss and finish any consideration of a subject which might not have been accomplished at the meeting at which the papers were read. There are many of these subjects which are still live questions, even after the lapse of a year. The paper on "Express and Freight on Electric Railways" will not only be a live topic next year, but of greater interest than it is to-day, and will continue to be so for many years; hence there will be no harm in bringing that subject up again at a subsequent meeting. The same thing may be said concerning the paper on "The Right of Way," which will be as lively a question next year as it is this year. In looking over the list it seems to me that all of the subjects will be just as interesting next year as they are to-day, and I think it would be well for the committee on programme to bear in mind that fact and recommend as subjects for topical discussion many of the points which do not receive a comprehensive and satisfactory discussion to-day.

John I. Beggs, Milwaukee—This question of freight and express is likely to become much more important with electric railways as time passes on. It is being tried by quite a number of the roads, but in many States of the Union we are not permitted to carry freight, and therefore some who attend the convention have not given attention to it, except in a general way. In the State of Wisconsin, where our company has large interests, it is impracticable to carry even small parcels, unless it is in charge of the passenger, and we have no right to make an extra charge for it anywhere in the State of Wisconsin. Under the statutes of that State we are prohibited from doing it. In the State of Wisconsin if we attempted to carry package freight, we would have to condemn every foot of every street in any city or highway on which the company operated cars, which would make it absolutely impracticable; and that is a condition which meets many of those operating street railways. I believe it is generally admitted throughout the East that electric railways do not possess the right to carry freight. I am not prepared, for this reason, to discuss the question. I am watching the matter with much interest and am awaiting the time when a demand shall be made in all the cities of the Union that the electric railways shall be permitted to perform the great service to the community, particularly in the rural districts, of carrying express and freight matter, so that this service can be performed with dispatch and economy for the people.

G. Tracy Rogers, Binghamton—Some years ago we started an express business in a small way on our interurban road, about 10 miles in length, in a small town of 1500 persons at the other end. We used a trailer first, and then we used a larger one, and then we bought a freight car. We had no terminal, and left the freight car standing in the middle of one of our city streets. Some of the city officials objected to the car being left on the street, and resolutions were introduced in the Common Council to have the car taken off the street, but the merchants in the city came forward and protested, and wished the car to remain anywhere we wanted to leave it, as the service was a great accommodation to them and the people on the line. The result has been that in our small way we have made a little money on the enterprise, and to-day we are buying real estate as near as we can to the heart of the city in each of the towns we reach with the freight and express service.

Our plan is to farm the business out to an express man. He pays so much of the expense, and then we have a percentage, and I will state that the business has been fairly profitable.

Mr. Gotshall—If Mr. Rogers has no objection, I would ask him what the duty of the car is—the car mileage; how many trips a day it makes, and what is the basis on which the business is computed.

Mr. Rogers—The car makes two trips, the distance being about 9 miles. One of the principal reasons why we inaugurated the service and continue to put money into it is that it helps to develop outlying sections of our district; opens up new fields for passenger service. New towns are starting up in our vicinity, and we wish to encourage them. We have the competition of two steam roads to meet.

Mr. Gotshall.—In investigating this subject I find that electric railways carry parcels at about one-half the price charged by steam railroads. Reports which some roads make are very interesting, and it will be a very important subject, for the reason that the introduction of these frequent units, carrying parcels at relatively low cost compared with existing conditions, will work radical changes in and about the districts located near the large cities. I think the subject should be continued and given more attention than it has received in the paper and the short discussions.

C. Loomis Allen, Utica, N. Y.—In December last we organized an express department on the Utica & Mohawk Valley Railroad. We did not undertake to handle anything in the way of heavy material or freight matter. We operate three express cars for about twelve hours a day. We do not take any material for shipment unless it is to be delivered at the terminal point of shipment. By that I mean we have at each village or municipality where we give service, teams for the delivery of the express matter. In each of the cities we maintain teams for the purpose of collecting express matter, on the same system as that adopted by the old-line express companies. The expense, which, of course, must be very large, due to the maintenance of the drivers and agents in each of the municipalities, has been in the neighborhood of about 70 per cent of the gross receipts.

W. K. Morley, Grand Rapids—We have about 45 miles of track, and we have three freight cars. We make a round trip with these freight cars every day. The management thinks that the freight business is susceptible of development, and proposes to invest considerable more money for freight equipment next year. We handle almost any kind of freight, except the lower classes of freight, which we do not want. We have an agent at all terminals and sub-stations, which costs us nothing additional, as we should need some one at the substation to help out. We figure that the freight business pays us, and we are going to develop it. We get the same rates as the steam roads. We do not devote ourselves entirely to the high class of express business, but handle anything except low-class freight. We cannot handle, and do not want to handle, carload business.

The Vice-President—As to the suggestion made by Mr. Gotshall, unless there is some direction from the convention, the matter will be brought to the attention of the executive committee when selecting the subjects for next year's papers. It would seem in the light of the experience which we are having on the International Railway Company of Buffalo, where we operate several interurban lines, one of them being 35 miles long, and a high-speed road under steam railroad rules, with freight trains drawn by electric locomotives, handling mail, express, fruit, small crops and all kinds of baggage freight—it would seem to be a subject that might occupy the attention of the convention again with great profit. Some of the statements contained in the paper which has been presented are

very true, and especially one where the manager has shown his profits and added "that it is 'velvet,' there is no doubt, if you would engage in the business, and not let expenses eat it up." Where I have seen this business best done, the expenses are eating it up. It is all right enough to say you will go into the freight and express business, but when you establish a freight station and go there to get freight, then you must have a station master, someone to unlock the car and let the stuff out to the farmer who calls for a bale of wire or something of that sort, and when he comes with stuff to ship you must have someone there to receive it and take care of it. That means you are going into the equipment of a full-fledged freight-operating department, and that is a branch of steam-railroad operation that is technical in the highest degree. Many railway managers have gone up against this railway proposition like a lot of boys. That is not a reflection on anyone at all. The street railway man says: "Everybody concedes that in the steam railroad business the freight is the cream of the business; the big roads make their money out of the freight and carry passengers in many cases at a loss; therefore, we can make money out of freight." The big roads have long hauls; we have short hauls. If you are going to handle freight to any extent you must make an arrangement with steam railroads for cars. We cannot equip our roads with standard freight cars to haul freight 15 miles, 20 miles, or 40 miles. We must make an arrangement with the steam railroad companies not only to furnish freight-car equipment, but to take freight from us and haul it to the center for which it is destined. That means you go to a steam railroad manager, prejudiced against you very often, and ask them to take the stuff from you. The answer is invariably that they will be glad to do it, because the electric railroad will be able to originate freight for the steam roads. It is within the knowledge of some present that there exists as beautiful a gentlemen's agreement between steam railroad people to discourage this kind of business as there ever was to regulate the distribution of the proceeds of the mail-coach robberies. When you visit the steam railroad manager you are received with courtesy and politeness, entertained by the hour, and taken out to lunch, but you do not get anything, except what you eat. They do not propose we shall get into that business if they can stop it, and I know of my own knowledge where a steam railroad—a trunk line extending from New York to Chicago—operating large freight steamers on the Great Lakes, one of the greatest trunk lines in this country, had an arrangement with an electric railroad whereunder the trunk line furnished the freight cars to the electric road and received freight originating on the line of the electric railway in the cars of the trunk line, and in turn delivered cars to the electric railway. The steam railroad transported these freight cars to another trunk line, which had then to carry it to points not reached by the first trunk line, but the second steam road refused to receive the car. One of the roads refusing these cars is a trunk line in the New England States, and the parties who have the matter in hand got around the question by making an arrangement with another line, which was a competitor of the first named.

I agree with Mr. Gotshall that this is a subject of the greatest importance, and its fair consideration, with the idea of arriving at some practical determination, might save those about to institute electric express and freight routes a great deal of money.

If there is no further discussion on this paper we will proceed to the next one, entitled "The Right of Way," by H. H. Vreeland, president of the Interurban Street Railway Company of New York. (This paper will be found on another page.)

Mr. Vreeland read the paper, and said: In the preparation of a paper of this character, not having to do with statistics, or illustrations, it has always been my purpose to make it concise, to endeavor to have it bristle with points which could be taken up for discussion.

The necessity of approaching questions of this character from the right point of view is very important. Last winter there was a great agitation in New York City, as you all know, on the question of transportation. The existing facilities in the city were clogged and hampered in every way by abnormal conditions—elevated lines by reason of reconstruction, and the surface lines by subway construction, and all that went with that. It was declared that proper facilities were not offered to the public. There were two ways to approach that state of affairs: One way was to say that the company was giving all the service it could give, and doing the best it could do, and that is all that could be done, which would at once raise a controversy as to whether the company was really doing it or not. There was another way to approach the matter, and that was that the conditions that existed at that time, and surrounded the operation of the cars in the city were apparent to the eye of everybody, but in the rush of business had been lost sight of. It was no new point, nothing novel; everyone saw it every day, and yet when I made the statement in a public meeting the matter was viewed in an entirely different way. We elaborated that point after making a careful study of the general traffic conditions of the city, and went on to show that until there was a recognition on the part of public authorities that the movement of thousands of citizens should be considered of greater importance than the delivery of a ton of coal or a barrel of flour, the railways were helpless to improve the condition of affairs, the matter was taken up as an almost entirely new proposition. Any number of letters were written to me at that time by persons who rode in the cars of our company on Broadway, and who would say that a man with a truck of coal had held the car up for five or ten minutes, and they would all close with saying that the position which the company had taken in the matter was right. The man with the truckload of coal had been running on the tracks for the last twenty years, but the public had become so used to this condition of affairs that it did not exercise enough thought to understand that the true cause of the delay in local transportation was not any fault of the operating company, but of the conditions of traffic which existed on the streets of the city, and had existed all the while. The agitation resulted in strong public sentiment. The regulation of city vehicular traffic was taken up by the police authorities and by other civil bodies, in the interest of the movement of car traffic, and treated from the standpoint, not of the company, but of the public; that the public were in the cars, and that no one lost his right to free movement, etc., by reason of being in a car, and while the car itself might not have the same rights as an individual who was obstructing it in the street, the passengers in the cars lost none of their right to free and easy passage through the city streets; that it was a question of the convenience of the few standing aside for the convenience of the many. This agitation resulted in quite a revolution, which has had a lasting and improving effect all the time on the question of our transportation.

On the same line as I indicated in my paper last year, and on the same general lines as taken in his opening address by the presiding officer a few days ago, it seems to me on this question of right of way and other important questions connected with our work, that they are not taken hold of in a strong enough manner; that our side of the question is not put in proper shape before the public in many instances. We are prone to consider that we know it all, and the other fellow does not know anything; that the newspaper man does not know anything when he criticises us; that the citizen who writes a letter of complaint or criticism to the company does not know anything, but we know it all. We make ourselves believe that we are carrying on our particular business better than anyone

else could do it, and we resent suggestions and criticisms, when we really should study every criticism which is made to see whether we are right or not, and get some good out of the criticism and produce a better result. It is the one thing, in my opinion, which has created much of the antagonism that exists in the public mind and in the public press regarding matters connected with the operation of all our systems of transportation, some of the new systems as well as some of the old, the point that we think we know it all. I find when you approach any question from that standpoint that you can create not only a good deal of disturbance in the minds of others, but a good deal of disturbance in connection with the management of the property you have to do with.

I will take up another point which occurred to me as a strong point, and that is the moving of the United States mail. When you consider the rights of the many as against the rights of the few, the United States mail wagon affords one of the strongest examples. A mail wagon leaves the General Postoffice in New York to go to the Grand Central Depot. It has mails destined for the Pacific Coast, Honolulu, Japan, etc.—nothing local in its character whatever—yet I as a citizen of New York and you as a citizen of New York, or of any other city, if you happen to be in New York, must stand aside and let that mail wagon go by. The mail wagon and its contents are of no interest to us; add nothing to the comfort or convenience of our lives; there is no mail destined for our office or our houses; we have no interest in it whatever. Yet the consideration of the interests of the world as a whole in the movement of its mail matter is such that the consideration of the rights of the millions against the few makes it necessary that you all must go a little to one side and give the mail wagon the freedom of the streets.

We do not ask in our business for the freedom of the street in the operation of our cars, except for the operation of the cars in the interests of the general public and the quick handling of the people who are entrusted in our care. Of course, it is absolutely unnecessary, in view of the many addresses we have had on the subject of what a boon street railways have been to the United States, to go over that old ground again and say why all this should be done, except to leave the statement in this shape—that we should consider this question in a broad way and see if we cannot get the general authorities, not only of one State, but of all the States, educated up to that point where they will consider this question from the standpoint of the public itself. Our regulations are just as crude with reference to municipal propositions connected with railway properties, lighting properties, etc., as are many of our rules and regulations with reference to the operation of a property. The conditions have changed so quickly in street railway operation that they have not been met at all by any change in municipal regulations. When this question was receiving so much consideration in New York City last winter and the matter discussed very thoroughly in the newspapers, the newspaper men were surprised to find that the movement of electric cars was governed by regulations and laws established in the '60s and '70s. It was necessary to collate these laws to show the absurdity of attempting to regulate this vast traffic by rules which had been framed for conditions which existed thirty or forty years ago. It was like an experience I had not long ago where, in looking over some questions connected with an accident, I took up the rules and regulations of a certain company, and found that they were dated in July, 1872, when the property was a horse-car line with less than one hundred employees, and operated about twenty cars. That same property by consolidation had grown into a system employing more than 1200 men, with a corresponding increase in service, and all the operations of the company increased in proportion, yet the road was operated under rules and regulations dated in 1872, telling how the man should care for the horses, etc., and nothing was said with reference to electric motors.

I am free to say that although there are certain limitations, restrictions and conditions imposed on the operation of street railways abroad, I would be willing to accept these restrictions and limitations and bear whatever loss might ensue, to gain the advantage of having a proper regulation of all kinds of street traffic, and have such regulations thoroughly and intelligently enforced, such as exists abroad in the operation of the various transportation systems. The systematic manner in which regulations governing street traffic of all kinds are enforced was one of the things which appealed to me very much in looking over the conditions that existed on the other side of the water.

On the question as applied to this association, I think that the importance of a proposition of this kind may be minimized in the minds of men who have to do with the operation of lines in the smaller cities and towns, but the importance of matters of this character is emphasized when you consider that a compilation was made last winter of the laws and regulations governing the movement of all street traffic of the United States by the authorities of the city of New York to determine what was reasonable regulation. Some gentleman in this room may consider that this matter is of no interest to him, because of the condition which prevails in the city where his lines are located, but you must consider these two points: First, that whatever your regulations are, when this question comes up in other sections of the country, your regulations become a part of the consideration of what is being done in other places, large or small, and the next fact is that some of you bright young men may be operating the lines in the city of New York within the next few years and will have to face this condition yourself. The same thing is true of the franchise proposition, and franchise regulations and limitations, which could just as well be included in this general proposition, in my mind. On this point of franchise limitations and conditions you gentlemen of the association who have to do with the operation of properties cannot in fairness to the country as a whole consider these things as entirely of your locality. To-day inquiry is being made abroad as to what we are doing in this country, and the limitations and restrictions that you may have in a weak moment accepted in securing something for your property may be a keynote and turning point on which hundreds of enterprises abroad may be stranded, and ultimately some in our own country. Without going into a discussion of the details of this matter, from the standpoint of franchise limitations, restrictions and conditions, from the standpoint of vehicular traffic and regulations, and from the standpoint of rules and regulations which govern the employees of the properties throughout the country, we cannot consider any one of these points as individual, but they must be considered collectively and as a part of the whole number of the railroad properties of the United States, if not of the world.

The chairman, in his address, referred to the matter of rules and regulations of the steam railroads, which I was very glad to have brought out in connection with the work of this association. I had occasion back in the early '80s to examine a number of engineers and conductors for appointment on a property that required a large summer service, and among the number were some men from the West. In examining them on our train orders and regulations, the most important and essential in the operation of a railroad, there was not one man who understood our orders. They were men who had run trains for fifteen or twenty years in the West. As the chairman pointed out, to-day an engineer, under the rules and regulations for the movement of trains, by telegraphic orders, who may have been running a train in California last week can to-morrow step on an engine in Maine, and his rules are just the same, and the engine is run under the same orders. The thing is important to us, for the reason that in New York City we are every day hiring men as motormen, and they come from all parts of the United States. We have a school of exami-

nation and instruction in which these matters are gone over thoroughly, and it is the most surprising thing to find what a diversity there is in regulations in cities and States that border on each other, where there should be no difference whatever.

J. G. White, New York—There is, perhaps, no need to elaborate on the point of view offered by Mr. Vreeland, who has brought this subject to our attention. It seems to me that it is a self-evident proposition that to secure attention at the hands of municipal authorities the subject must be presented as conducive to the comfort and welfare of the citizens, and not as increasing the earnings of the street railway companies. If a car is delayed for fifteen minutes by a coal truck unloading it is of comparatively little use to say that the wages of the motorman and conductor for that fifteen minutes amounted to 11½ cents, or whatever it may be, and that that much of the street railway company's earnings are wasted. But if we point out that seventy-five or more passengers have been delayed for that fifteen minutes, then it begins to be of interest to the traveling public, and they will assist in bringing about some reasonable regulations.

The general impression in this country is that electric railroading has advanced far beyond anything known on the other side of the Atlantic. Mr. Vreeland implied that this is not entirely correct, without going into details. In this matter of regulating vehicular traffic and imposing municipal regulations which tend to minimize the delays to the traveling public, European cities are far ahead of those in this country. Frequently one sees on Broadway, in New York, perhaps a 5-ton truck loaded with coal or fireproofing material for a new building, which is backed around with its rear wheels toward the pavement, and which prevents the passage of street cars, and there is a string of cars extending down three or four blocks before the wagon will move or its load is discharged. In most of the municipalities abroad wagons are not allowed to back to the curb in that way, and if any particularly heavy material is to be unloaded it has to be done within certain hours, say between 8 and 10 o'clock in the evening, and at no other time during the twenty-four hours is it permitted, but if the material to be unloaded is not of a nature to cause much noise and keep people awake, it may be done during the entire night. Coal, for example, is not permitted to be unloaded unless the wagon is drawn along the curb and the coal taken away in sacks or baskets. The crying need for some regulations in this country applies more particularly to cities like New York, where the traffic is dense and the best facilities possible to provide will scarcely take care of it, and to cities like Boston and Chicago, where the traffic is condensed into restricted business areas, and consequently where special regulations should be formulated in justice to the city and to the people in the city, and should be rigidly enforced.

It seems to me this association might perhaps partly collate the rules and regulations on this subject in foreign cities and gather the information in convenient form so that it could be used by the members of the Association to bring about police and municipal regulations in their respective cities, and such an action by this Association would be very advantageous in this respect.

The Vice-President—It seems to me that the questions brought up by Mr. Vreeland in his paper and in his remarks concerning it are very important, and that in the investigation of these questions along the lines of an honest and earnest attempt to get something better lies as much money saved for our corporations as in any other branch of the business. We who use alternating current in the operation of cars know what "out of step" means. Has it ever occurred to us that we are a little out of step with the public and the authorities? It seems to me that we are. The field is wide open for useful tillage. In what public school in the United States is a word ever said to a boy or a girl about the rule and law of the road? The city schools are filled with hundreds of thousands of children who are not instructed in the simplest rules as to how to cross a street, how to go along the street, or how to drive a horse or a dog attached to a vehicle, or anything of the kind. What little instructions children receive in this particular they get from thoughtful parents, but many of the parents in large cities are in utter ignorance of the common rules and laws governing the conduct of individuals passing along the public way. There are few, if any, ordinances in force giving anything like proper regulation to the passage over the public ways or streets. It is as simple as the nose on a man's face—the portion of the street or highway from curb to curb should be reserved for the passage of vehicles; pedestrians should be limited to the sidewalks, and should be compelled to cross the streets at the crossing, and not to make a parlor floor of a city street, using the street as if they were in their own homes, as is done in Buffalo and other large cities. Women, without looking up, step into the street in every part of Buffalo, where we have asphalt pavements, meandering along the street with the cars passing by them in quick succession, the women acting as if they were threading the mazes of the dance. How the motormen can escape hitting them is a wonder to me. Yesterday those who took the ride by the courtesy of the Schenectady Road, and looked out of the window, saw several cases where women, and in one case a large fleshy woman, with an infant in her arms, risked their lives by crossing the track, with perfect recklessness, in front of the swiftly moving car. In Nuremburg, Germany, it is a criminal offense to attempt to board or alight from a moving car. Why should there not be a law like that in every State in this country? There is a law in the State of New York that makes an attempt to commit suicide a criminal offense, and it is just as much an attempt to commit suicide to jump off a moving car, in many instances, as to draw a razor across one's throat, and is followed with as bad results in many cases. It is a perfectly simple and easy matter to get at, for the reason that our interests and the interests of the public are identical, as pointed out by Mr. Vreeland. No sane person wants to get hurt or to be killed, and therefore the method of controlling transportation problems should be carefully examined by the public authorities and public men, and the people should be convinced that we are not trying to establish rules arbitrarily, so that the street car shall not have any obstacle, and shall be free to run through the streets at 30 miles an hour without let or hindrance, but that we are endeavoring to work for the people, for the benefit of everyone in town, and that is all we want to do.

It suggested itself to me a short time ago that possibly I might accomplish some good by sending a letter to School Superintendent Emerson, of the city of Buffalo, asking him if he would not think it a wise thing to set aside several periods each week, two or three, consisting of a few minutes each, in which the teachers might in a very simple way instruct the children as to the rule of the road and what they ought to do. If that plan were adopted, it seems to me that after a while we would have a lot of people walking on the streets that know something about the rules of the road and their individual rights and the rights of others.

There have been some unusual decisions of the courts recently. In New York State the law has been laid down by courts that at street intersections the rights of any vehicle, and the vehicle known as a street car, are equal; that is to say, a milk peddler, driving a wagon of milk or a man bringing in garden truck from the country, has as much right to our tracks at the intersection of streets as our car with 150 busy men going to business. I do not believe that such a decision would be maintained in a court of last resort.

Mr. Beggs—I reduced the obstructions to our lines in the city of Milwaukee very largely by a personal appeal to the users of large numbers of teams. For instance, the brewing

interests, with hundreds of large 3 and 4-horse teams, occupied and obstructed our lines until I made a personal request to them to reduce this annoyance as much as possible. The same course was followed in the case of large manufacturers who many times with their wagons loaded with castings and things of that kind would delay a car for several blocks rather than turn out of the tracks. By co-operation much can be done, especially when it is educational. What the teamsters of one class of business will do the others drop into after a while and adopt. It seems to me if we could enlist the co-operation, for instance, of the express companies which have a large number of teams, with drivers who are usually very indifferent as to the accommodation of any one else, and the ice distributors, large coal dealers, and people of that kind, we would accomplish more in our respective cities than in any other way. In some of the cities where the railways provide a steel tramway for vehicular traffic, which is done by municipal requirement in those cities that have a flat girder rail, it is difficult to keep them out of the track, as it is the easiest place in which they can run. This is one of the advantages that come in with the grooved rail; one of the greatest advantages which we have is where we have finally converted our city officials to realize the benefit of a high T-rail with granite headers on each side. Such a form of track construction does not make a convenient place for driving, and our obstructions from vehicles in the city of Milwaukee have been reduced 50 per cent in five years.

In our State we are fortunate enough to have from the Supreme Court, two or three years ago, a very sensible decision, which has accorded to street cars, at street intersections at least and in most parts of the city, rights superior to a vehicle, upon the reasoning that a street car is restricted to the rails upon which it runs and cannot turn out or in, and that therefore other vehicles must give way to it; and at street intersections the law of steam railroads applies—"stop, look and listen." It is also held that where a team continues for several blocks, or any considerable distance, in a track, and is struck by a street car, the driver is guilty of contributory negligence and cannot recover damages from the street car company —that it is his duty to keep watch, knowing he is in the line of street car track and to keep out of the way. In a case where a man had not looked back for 300 feet the case was turned out of court.

John Grant, St. Louis—I may state an experience we had in St. Louis. We found in 1901 that the authorities of the city did not know the law. We went to the police department and tried to have the delays caused to cars eliminated to some extent, and were informed that there was a law which allowed a wagon to hold a car for five minutes. We thought that was peculiar and had our attorneys look the matter up and found the law provided that when a car came up the wagon must move out of the track immediately. Some of our friends started a crusade against wagons on the track, with the result that drivers delaying cars are arrested and fined. We had some trouble from wagons and pursued the method Mr. Beggs mentioned, going to a large number of the livery and express companies and breweries and making appeals to them. One very large concern which employs in the neighborhood of fifty wagons made it a rule that any of their drivers whose wagon was hit by a street car paid the damages to the wagon and lost his position. In that way much can be accomplished, but it may be that in the great number of changes being made around the country in the different roads, some of the men do not know the laws of their city in relation to cars. Some of our city authorities did not know the law, and as soon as we pointed it out they helped us to do away with a great many of the delays. In the last two years 50 per cent of the delays on our line have been eliminated. It means hard work all the time—you have to keep after the drivers, and the authorities also have to keep them up to the mark. If the laws to keep wagons off the tracks could be passed in different cities generally, the law being a reasonable one, it would be a good thing.

The Vice-President—Is there anything further to be said? If not, we will take up the next subject, "Comparative Merits of Single and Double Truck Cars for City Service," by John I. Beggs, Milwaukee Electric Railway & Light Company, Milwaukee, Wis. Mr. Beggs has not prepared a paper, but as he is present he will probably give us his views on the subject.

Mr. Beggs—The principal point of advantage to result from the use of double-truck cars is, in the first place, a much higher speed, of which the public receives the benefit. As soon as the public realizes that it does not seriously affect the street railway company to have its cars obstructed, but that it is the people on the car who are discommoded, the public will awaken to the fact that it up to them to get a better condition of affairs, so that in running double-truck cars the first point is the smooth and comfortable riding of the passengers as compared with the single-truck car, with the great oscillation sometimes experienced running over a track which is indifferently maintained. The track may be really twice as bad, but to the riding public it would not be evident in a double-truck car. The next thing is that the large double-truck car, equipped with four motors, one on each axle, which has been our practice for six or seven years, enables the car to be accelerated much quicker; in other words, in many of our cities, the blocks are only 300 ft. or 400 ft. long, some shorter than that. If we follow out the rules as laid out in the usual book of rules, we would not get a street car up to speed between crossings. The car is limited as to the number of trips it can make over a line during the day, and consequently the cost of operation is unnecessarily increased. The quicker acceleration means higher average speed; in other words, I believe that it is applicable in most cities, even where there is pretty dense traffic. I am not referring to Broadway, New York, as the conditions there are unusual, but on our city lines, where traffic is sometimes quite dense, we maintain an average schedule speed of 9 miles an hour. With the large cars you are enabled, because of the greater seating capacity, to maintain long headway on the lines and still take care of the traveling public. Longer headway means less car miles and less car hours and less trainmen, and that your trainmen are performing more service for the company, and thereby reducing the cost per car hour or car mile for trainmen alone. The consumption of power is possibly increased yet not more than would be necessary, in all probability, to put the same number of single-truck cars, with two motor equipment, in operation. Then the cost of track repair and maintenance is less, as we discovered after an experience of seven years with double-truck cars, which run smoother, than single-truck cars.

These are the principal points which seven years of use and the adoption of heavy truck cars as standard has brought out, and which in our experience have been more than satisfactory. We established several years ago as a standard a large double-truck car, fitted with cross-seats for forty-four passengers. They have a capacity, when passengers stand, of over 100. These are the reasons for maintaining that it is much more advantageous, both to the general public and the operating company, to maintain and operate large double-truck cars equipped with a motor on each axle, and with a motor of sufficient capacity to warrant you in quickly accelerating the car and getting it up to speed within about 200 ft., so that you are able to make the average speed of the car with the usual number of stops, of about 9 miles an hour.

Mr. Gotshall—I believe that a great deal of good could be accomplished by this Association as a national body if there were appointed a number of standing committees, such as I believe now exists in the New York State Association. My idea is that there should be a committee on legislation, another

committee on standards and operation, and other similar committees. It appears to me that if the important matters of the Association were taken up by special committees in this manner much good could be accomplished along the lines that have been indicated by Mr. Vreeland and other speakers. A representative committee of this Association, embodying the views of our members, could present these matters to legislators throughout the country and seek to have laws enacted which will remedy some of the troubles complained of. I would suggest that the executive committee of the Association take up the matter of the appointment of the committee on legislation, and it seems to me the matter could be extended by having subcommittees subsidiary to the main committee in each one of the cities of the Union.

The Vice-President—It is quite evident from very extended investigation among the members of the Association and the supply men that the time is ripe for the making of new arrangements in the affairs of the Association, and it is no reflection upon any of us at all. There seems to be a general acquiescence in the thought and its expression that we have outgrown the clothes that were cut for a much smaller association and an association under different conditions.

It is my opinion that a motion to refer to the executive committee the consideration of the subjects which have been suggested would be the proper way to have these matters formulated and presented to the members.

(Mr. Gotshall then presented a resolution that the suggestions made be referred to the executive committee for consideration. The motion was carried.)

Vice-President Arkwright in the chair.

The Chairman—The next business in order is the report of the committee on rules for the government of employees, of which E. G. Connette, of Syracuse, is chairman.

Mr. Connette—Mr. Chairman, the report of the rules committee has been printed and distributed among the members of this Association, and the members have had the report in their possession long enough to know what it contains without my undertaking to read any portion of it. The committee, of course, in undertaking to compile a standard code of rules met with more difficulties than any of you would imagine. For instance, when we undertook to make a rule that was applicable to the small roads as well as to the very large roads, in a good many cases we encountered serious difficulty. We have, therefore, only presented to you a code of rules general in their nature, applicable only to conductors and motormen, because they are the employees principally to whom the rules apply. A rule that will apply to a motorman and conductor running upon a small road can also be applied to one similarly employed upon a large road. The rules pertaining to interurban service, I am free to say, were practically appropriated from the rules of the American Railway Association, which is composed of the steam railroads, and the rules which are in effect upon steam railroads are the result of years of experience and study—we believe of over twenty-five, perhaps forty, years' experience. The committee did not think it could compile a set of rules which would be an improvement on the rules which were adopted and are now in effect upon the various steam railroads of the country, especially so far as the movement of trains is concerned and the use of signals.

I am now going to diverge just a little from the report. I brought this question up before the committee, but it was deemed to be perhaps not within its scope to embrace a suggestion of the plan which I am about to make. Upon long single-track interurban lines, it is better practice, or it would be better practice when it was adopted, instead of running a greater number of separate cars, or changing the headway as the business fluctuates, to maintain a uniform schedule of headway and use the multiple control system and increase the length of the train as the business may require it, instead of changing the headway or instead of running trains in sections. In my opinion, this method of operation would be more satisfactory, because of: First, less liability of accident, which is a great factor in the operation of cars; secondly, it would reduce the expense of operation, so far as the platform expense goes; third, it would take care of the traveling public, I believe, in a more satisfactory manner, because if the schedule is thirty minutes' headway on an interurban line, and that schedule is uniformly maintained, no matter what the business may be, the public will know that a car will be at a given point at a given time, and that ample cars will be provided, that the same time will be made as with one, on the multiple control system. I put this out as an opinion of my own. I believe the interurban roads will come to it, and run trains as steam roads run trains. I believe the running of separate cars to meet increased demands will be done away with ultimately, and that we will adhere to the time-table instead of changing the headway and mixing up the motormen and conductors and multiplying the duties of the train despatcher and causing accidents, at least increasing the hazard of them, the danger would be reduced to a minimum, and I believe the service, in every respect, would be the more appreciated by the public.

You will note the report of the committee in regard to the signals for interurban lines. I have said that we practically appropriated the rules and regulations of the American Railway Association. I may say that we changed the signals, not in respect to color, but instead of using flags, as on steam roads, we use the colored plate hanging over the dash of the car. That was done for several reasons. In the first place, when a flag is stuck on the end of a car, while the car is running it is difficult for a motorman on an approaching car to distinguish what the signal is until he has passed by it, whereas with the signal on the front of the car he sees it and notices whether it is the regular car, a section of the regular train, or an extra car.

Mr. Mailloux—I desire to make a suggestion that every individual member present, who has the authority to do so, should make a careful study of these rules and endeavor to apply them if possible and report the results to the committee. In that way, every member of the Association becomes a cooperative factor in the development and perfecting of a system of rules and regulations, signals, etc., by sending opinions, criticisms, suggestions of changes, etc., to the committee during the next ten months, the committee would be able, at the next annual meeting, to give us valuable information tending to the further development and perfection of the system of signals, etc.

I want to take issue with Mr. Connette in regard to what he said about the single-headway system. I think that depends entirely on the form of load curve with which he has to deal. It would be influenced by the line and the service the line is expected to give. In an ordinary interurban line, where the stations are relatively far apart and the load curve, so to speak, fairly even, that method might well apply, but I submit, in cases where your interurban line approximates rapid transit conditions such a method will be absolutely impossible.

Take a case like the New York & Portchester Railroad; if you plot the number of passengers carried per hour during the twenty-four hours, you will find enormous peaks which represent the hours when people go to New York and come back. Evidently, the service must be adequate for the maximum demands made upon it. That service, with a four-track road, requires five minutes headway with as long trains as we can possibly operate on the local track and ten minutes headway on express trains. We cannot maintain such a headway as that during the entire day. There are times when it is necessary to reduce the number of trains, as well as the number of cars.

Mr. Connette—I refer to a single-track road.

Mr. Mailloux—It may be on a single-track road it would be valuable, but it depends on the load curve. When the curve is

flat and does not have enormous peaks, the method suggested is most satisfactory and preferable, but where the curve shows peaks it would not be.

Mr. Myers—I understand that the committee is to continue for another year, and is to go on with its work. I assume that these rules are to be adopted by the association. I have been waiting for seven months to get these standard rules, in order to apply them to a property we took over some time ago. I want to start off with a firm foundation, and I told our superintendent we would wait until the Association met, when these rules were to be presented, and that, as they were to be adopted generally, we would also adopt them. I would like an expression as to how many members will adopt these rules.

Mr. Connette—There is no use in this Association continuing a committee on rules unless when the committee has given a report that is satisfactory to the Association it is adopted and becomes the standard of the members of the Association. Of course, there is nothing binding or compulsory on the members of the Association to adopt the code of rules that might be presented by this committee and approved by the Association, but there is no use in the Association considering the question of a standard code of rules unless the members are willing to adopt the rules, if the Association finds that the committee has presented a code of rules that is satisfactory. I will say, in this connection, that the New York State Association has had a committee on standard rules for nearly three years, of which I have the honor to be chairman, and this report is to a large extent the result of the work of that committee, supplemented by the committee of this Association. The New York State Board of Railroad Commissioners, I think, met with the committee two or three times, and finally approved the report of the committee, but requested that the committee pursue the matter of rules applying to interurban roads a little further. In fact, the committee has presented very few rules applicable to interurban service, and the Board of Railroad Commissioners asked that we might continue the committee to further consider the rules applicable to interurban roads which is now being done by the New York State Association. This report is before the convention. It is for you to do as you please with it. I do not think we have the time to consider even a half dozen of these rules, if we take them rule by rule, even two or three of the principal topics in connection with these rules, concerning which there may be a difference of opinion. I would suggest that if you do not want to take action on this report, at this meeting, each member of this Association carefully consider the rules, and write all suggestions or recommend actions to the committee, either direct or through the secretary of the Association.

Mr. Beggs—I desire to say a word in commendation of the work of this committee, and I say it as freely and as cheerfully as I severely criticised the report presented to us twelve months ago, which did not seem to have been compiled for street railway management at all, but was apparently compiled for limited trains on trunk lines. I may say that for two years we have had no books of rules to give our 1000 trainmen or 1200 trainmen, waiting, as a matter of courtesy to this Association, until it should have had presented to and approved by it a code of rules that we could feel might be fairly adopted by all the roads connected with the Association, if not all the roads of the country. That code I now have in my hand, and I would like to have it receive the sanction of this Association, but whether it does or not, with a few trifling modifications in these rules, they will be printed for our company within the next thirty days. I have read every section in the report very carefully. As you know, we operate nearly 200 miles if interurban lines in connection with our metropolitan system, and I think there is very little to be desired, from my point of view at least, in these rules. I have been responsible for putting many of them into effect in the operation of interurban lines for several years. I, therefore, propose, after I have suggested slight modifications, to move the adoption of this report by the Association. I want to suggest changes in three paragraphs. There may be some slight modification necessary in the rules due to the local conditions. I do not think the fact that this committee is to be continued should be taken as an inference that the report is not to be adopted.

In paragraph 5, section i, I should advocate prohibiting the smoking of tobacco while on duty in any part of the company's buildings, except in the conductors' and motormen's room, and would likewise prohibit the trainmen from smoking when riding on the company's equipment in uniform and not on duty. I have seen, on many roads (we do not permit it on ours), the employees of the company smoking while in uniform on the equipment of the company. I propose to prohibit that when the men are in uniform. If the man has paid his fare and is riding like any other passenger, he may exercise the rights of other passengers.

I would like to enlarge rule 14, just to broaden it slightly. From my observation, the violation of this rule on many roads is the cause of great inconvenience to the public. The rule says "Do not remove trolley from wire at end of run, or elsewhere, at night, until passengers have alighted from the car." I would add to that rule "nor until those waiting to enter the car have entered it and are seated." I think that is just as important. I have seen dozens of people scrambling in the dark, and they stumble up the steps, while the motorman carries his trolley around.

Rule 24 raises an important question. I seriously consider the advisability of assuming that street railways generally are going to continue to stop on the far side of the streets, as it is called. There are some municipalities which are now enacting ordinances requiring the street cars to stop on the near side of the street, and I am in favor of that. The city of Cincinnati is at present considering the enactment of an ordinance requiring street cars to stop on the near side of the street; and in answer to an inquiry received a few days before leaving my office, from Mr. Foraker, second vice-president of the Cincinnati Traction Company, as to my opinion on that point, I told him I favored the cars stopping at the near side of the crossing. It gives the car an opportunity to slow up before crossing the street, and avoids its coming in contact with vehicles or other cars. The statement as to which side of the street the car should stop may be left out. There are some cities that require you to stop on the near side of the street, and I much prefer this plan. I shall take steps to have it enacted into law in my own city. I suggest that rule 24, as to where the car shall stop, might, with advantage, be stricken out.

The committee, in the first paragraph in the report, directs special attention to rules 61 and 62. I believe it would be advantageous to leave the matters referred to in those rules to the decision of the local companies, because we must give our conductors and motormen authority to put off the cars passengers who refuse to pay fare; otherwise, they will discuss the matter while they ride out the distance they want to go. It is not unusual on street railways to have a man present a large bill which the conductor is unable to change. Under this rule the man would not be put off. We put him off on our road. We require passengers to pay their fare, but here you say they must not be ejected from the car, but the facts of the case must be brought to the attention of the first inspector, starter or official of the company, who is met, and the conductor must act according to the instructions received from such inspector, starter or other official. In the heart of the city, the conductor would not go very far before coming to a superior officer, but in sparsely-settled sections the chances would be, in many parts of the day, that he would have to go to the heart of the city before he found an officer whom he could consult. I think most of the provisions you have made for protecting the

passenger and keeping the company from being involved in litigation by unauthorized ejectment of the passenger are carefully taken up.

In order to bring the matter regularly before the Association, Mr. President, I move that the rules, as presented by this committee, be adopted as the standard code of rules of the street railway companies in the jurisdiction of this Association.

Mr. White—I will second the motion of Mr. Beggs, and if he will allow it, suggest an amendment—that is, that the set of rules, as presented, be adopted by the Association, and that the members of the Association be requested to adopt these rules as their standard rules, with such modifications as may be necessary to meet local conditions; and that the members of the Association be requested to communicate with this committee, which is to be continued during the current year, any amendments which their experience with the rules leads them to think advisable, and the committee report to the next meeting such amendments as they think will be advantageous, to be embodied into the later standard rules.

Mr. Beggs—I cheerfully accept the amendment.

Mr. Myers—I want to bring to the attention of the Association a scheme we have recently adopted. I do not know that it is original with us, but on the backs of our accident reports we have placed all possible forms of construction for special work, cross-overs, single and double track, turn-outs, etc., and we require the employees to illustrate on the back of the accident report just where an accident happened, whether to a person or vehicle. I think such a provision, in connection with these rules, in regard to reports, would be very valuable. The average motorman or conductor is not usually intellectual, and his report is often confused. I make this suggestion to work in with the form of reports of accidents recommended in the book of rules. I wish specially to refer to the last paragraph of rule 8, which refers to railroad crossings. It says that where a crossing is protected by a derailing switch, interlocking plant or flagman, employed by the company, this rule does not apply, but special instructions are to be issued to cover it. I would ask why this provision is restricted to crossings protected by flagmen, or operated by interlocking plants employed by the company. I venture to say that we are operating the largest interlocking plant of any street railway in the United States. We have thirteen crossings in some 1400 feet, with seven semaphores in our tower. As is the rule among the Western railway lines, the jurisdiction of the plant rests with the company seeking the crossing. In that case, it controls and operates it with its own men. Suppose some company seeks to cross the tracks? The burden of the operation is divided equally in Illinois and other Western States, and we appoint the operator. We have the right to ask for his dismissal, without giving cause, but I want to know from Mr. Connette why he applies this rule only to the employees of the company working under this rule? Why do not these rules apply, regardless of who is paying the operator of the signals his salary?

John Grant, St. Louis—I understand the idea is that where a company requires a modification in the rules to meet the conditions in its city, they make it under the rule; for example, in rule 8, relating to railroad crossings, we are required, by ordinance, to stop at our own crossing. So if we adopt these rules we would have to embody an amendment to the rule, and that would be in the nature of an amendment to rule 8, the present rule 8 to remain as the standard. The rule, however, will still be rule 8, and any amendments to it would be rule 8, section a, b, c, etc.

Mr. Connette—Referring to rule 8, I will say that that rule gave the committee perhaps more trouble than any other in the book. In fact, the committee gave this subject much time and attention, because the State Railroad Commissioners of New York have a pretty close supervision over the railroads in the State, and they were particularly insistent on this rule. Explaining this last paragraph of rule 8, I will say that a crossing protected by a derailing switch, or by an interlocking plant, leaves no necessity for the conductor to flag the car over the crossing.

Mr. Myers—I understand that.

Mr. Connette—As to the part which says "the flagman employed by the company," etc., of course if there is a flagman at the crossing employed by the company to flag the car across the crossing it becomes unnecessary for the conductor to perform that duty. If there is a flagman at the crossing, not employed by the company operating the cars, the company operating the cars has no jurisdiction over that flagman, and cannot require him to flag the cars over the crossing, and, therefore, it becomes necessary for the conductor to perform this duty. For instance, at Washington Street and Salina Street, in the city of Syracuse, we have two flagmen to flag our cars over the crossing of the New York Central tracks. The New York Central people also have flagmen there to signal their trains across Salina Street, but our men pay no attention to the signals of the flagmen of the New York Central, but are required to obey the signals of our own men.

Mr. Myers—How about the joint employee? I mean where A petitions for the right of crossing the tracks of B, it is the custom in many of the Western cities for the company seeking the crossing to install the safety appliances. The maintenance and cost of operation is divided equally between them. The manual labor is furnished by the company petitioning the right to cross and installing the protection, but half, or whatever the proportion agreed upon may be, of operating the tower or other form of protection, is paid by the company whose tracks are crossed. He is not the employee of both companies, but each pays half his salary.

Mr. Connette—Then, as a matter of protection, you ought to require your men to comply with this rule.

Mr. Myers—That is what I want to bring out.

Mr. Connette—It is not a question of who employs the man or who he is working for. This rule is intended as a matter of safety, because there are two railroads, one crossing the other, and this rule is framed for the purpose of avoiding the possibility of an accident at this crossing.

J. N. Shannahan, Fonda, N. Y.—We have a peculiar proposition on our road in the fact that we operate both steam and electric lines, and on all grade crossings we do not permit the flagmen to signal the electric cars, but have incorporated rule 8 in our book of electric rules and rigidly enforce it.

H. M. Sloan, Chicago—It seems to me if these rules are to be adopted as standard there are many which will not cover the operation of cars in all cities. Some companies are not operating interurban lines, and it seems to me that if the rules are to be standard they should not be changed as to their numbers. If a rule is not to be used by any given road it can be omitted, but the rule number should stand. A road might use rule 3, for example, and have no use for rules 4, 5 and 6, but these numbers should be given, and rule 7 retain its original number as embodied in the report of the committee.

W. Worth Bean, St. Joseph, Mich.—In Michigan the statute requires that conductor shall proceed ahead of the car, according to rule 8, and if he fails to do so the company is not censured, but there is a fine of $20 imposed upon the conductor. It is not a fine upon the company but upon the employee.

Mr. Connette—Referring to the remarks of Messrs. Grant and Sloan, suggesting that perhaps the local conditions of some of the railways represented in the association are such as to require some additional rule, or perhaps the adoption of a substitute which would not conflict with these rules—for instance, in the case Mr. Grant cites, of the city of St. Louis requiring that they shall flag their own cars across their own crossing, all that is necessary for Mr. Grant to do is to supplement rule 8 by adding rule 8-a, and put in the condition

he refers to. As to Mr. Sloan's suggestion that if these rules are adopted the numbers ought to remain, that is the plan, so that rule 5, for instance, is always rule 5. If there is a rule in this book that is absolutely impracticable of adoption by any member of this Association let the rule be omitted, but the number of the rule should be printed and the space left blank, so that whatever rules are used will have the same number on all the roads using them.

The motion of Mr. Beggs, as amended by Mr. White, covering the adoption of the rules, was then carried.

The Chairman—The special committee appointed at the session yesterday to consider the matter of furnishing reports to the press is ready to report. The secretary will present the report.

The secretary read the following:

TO THE AMERICAN STREET RAILWAY ASSOCIATION.

Gentlemen.—Your special committee, after duly considering the question of the revision of papers and discussions prior to publication, reports as follows:

We recognize the importance and desirability of encouraging and securing a comprehensive and even confidential discussion of topics presented before the Association.

We also recognize the importance and utility of the press and the desirability of not unduly restricting its privileges.

We are of the opinion that the realization of these two objects necessitates intelligent censorship of the proceedings. We recommend for adoption the following rules:

1. Upon the request of any delegate any remarks or data submitted by him shall be considered privileged communications, and withheld from publication in both the press and the annual report.

2. At the first session of each meeting of the Association the chairman shall appoint from the delegates in attendance a censorship committee of three members. All reports of proceedings shall be submitted to this committee, and approved by at least one member thereof before being made accessible to the press.

So far as possible all persons participating in the discussion shall be given an opportunity by the committee to revise and correct their remarks before publication.

The committee also recommends that, to promote the best interests of the Association, the technical press be respectfully requested to refrain from the daily publication of the proceedings.

Respectfully submitted,

C. O. MAILLOUX,
JOHN I. BEGGS,
J. G. WHITE.

The report of the committee was adopted and approved.

Mr. Beggs offered the following resolution:

Resolved, That the president of this Association be requested to appoint a committee of three members to confer with the so-called "steel rail pool," to obtain, if possible, a discontinuance of or material reduction in the differential charged for high tee girder and grooved rails used in street railway construction.

W. K. Morley offered the following resolution:

Whereas, Owing to the change of conditions, and especially to the growth of the suburban and interurban railway interests, and the fact that the mule has been relegated to the plow, and that electricity is the motive power more generally used in street, suburban and interurban railway service; therefore, be it

Resolved, That the name of this Association be and is hereby changed from "The American Street Railway Association" to "The American Electric Railway Association."

On motion the resolution was referred to the executive committee.

The Vice-President—The chair announces the appointment of the following committee on compensation for carrying the mails: Messrs. Grant, of St. Louis, chairman; Beggs, of Milwaukee; Rogers, of Binghamton.

The report of the committee on nominations was presented as follows:

Your committee on nominations respectfully report recommending the following list of officers for the ensuing year:

For president, W. Caryl Ely, president International Railway Company, Buffalo, N. Y.

First vice-president, Elwin C. Foster, president New Orleans Railways Company, New Orleans, La.

Second vice-president, John Grant, general superintendent St. Louis Transit Company, St. Louis, Mo.

Third vice-president, James F. Shaw, president Boston & Worcester Street Railway Company, Boston, Mass.

Secretary and treasurer, T. C. Penington, treasurer Chicago City Railway, Chicago, Ill.

For executive committee, president, vice-president, and Jere C. Hutchins, president Detroit United Railway, Detroit, Mich.; A. B. Colvin, president Hudson Valley Railway Company, Glens Falls, N. Y.; G. Tracy Rogers, president Binghamton Railway Company, Binghamton, N. Y.; W. A. Smith, general manager Omaha & Council Bluffs Railway Company, Omaha, Neb.; S. L. Nelson, vice-president and general manager Fort Wayne & Southwestern Traction Company, Fort Wayne, Ind.

The committee have received but one invitation for a place for holding the next annual meeting. The Mayor, secretary of the Chamber of Commerce and one business man of Chattanooga, Tenn., have extended an invitation to the Association to meet in their city next year. Owing to the limited information in the possession of your committee we do not feel warranted in recommending Chattanooga as the next meeting place, but do recommend that the matter be referred, with full power, to the incoming executive committee.

Respectfully submitted,

R. T. LAFFIN, Chairman.
H. M. SLOAN,
FRANK R. HENRY,
ALBERT H. STANLEY,
E. S. GOODRICH,
Committee on Nominations.

On motion the secretary was authorized to cast a ballot for the gentlemen named as the officers of the Association.

On motion the question of a place for the next meeting was referred to the executive committee.

The committee on resolutions reported the following:

Resolved, That a vote of thanks of this Association be given to the officers and executive committee for the able manner in which the affairs of the Association have been conducted the past year.

Resolved, That a vote of thanks be extended to the General Electric Company for the excursion and luncheon, and general cordial reception given to the delegates and their friends at Schenectady.

Resolved, That a vote of thanks be given to the Hudson Valley Railway Company for courtesies extended to this Association. Also to the Schenectady Railway, the United Railway Company, of Albany; the telephone and telegraph companies, the local committee of arrangements and the railroad passenger associations for courtesies extended to us.

Resolved, That a vote of thanks be given to the supply men for the splendid exhibit given the delegates of this Association.

The above resolutions were unanimously carried.

Mr. Worth Bean—Mr. Chairman, if you will pardon me, I want to say a word. We are twenty-one years old as an Association, and we have met for twenty-two consecutive conventions. I have been to all the conventions, and I have seen the time when the nominating committee has had considerable trouble in selecting the place of meeting, owing to the fact that numerous invitations were extended to the Association. We have grown to such magnitude and such proportions that the American Street Railway Association to-day has no invitation to visit a city for its next meeting where ample hotel accommodations can be afforded us. I hope the time will come when we shall not expect such invitations. I hope the incoming executive committee will take decided action to the effect that we do not desire to have it understood that we expect these generous invitations from our friends in the business, and to be entertained by them at enormous expense, in the future. I went to the meeting in Boston in 1882; there were twenty-five delegates. To-day we have at this convention 300 delegates, and our membership is 206 companies. I trust the executive committee will consider the selection of a place where this Association can meet, and where we individually can pay our bills and pay our car fares, and not expect courtesies to be extended so that burdens are put on local companies; but let us go to any proper place, any city in the United States that the executive committee sees fit to select, transact our business as business people, and not junket and waste so much time. Let

us also give the attention to the supply men that is proper, and in a measure repay them for going to the enormous expense to show us the interesting exhibits which are a part and parcel of our exhibits; and if we do not want to examine and look into the supply men's exhibits we should inform the gentlemen we do not want them around us. I want them. They have helped to increase our business and helped us in many other ways, and it is a matter of courtesy to them that we should give them attention.

I am informed they feel that at this convention we have had so many other things to do that we have failed to visit them and give them the attention they deserve, after offering the exhibit they have for our special benefit. I do not know that it is germane to the matters before the house, but I felt it was my duty to speak on these points. I hope the executive committee will take this matter up seriously and let us do our business in the manner it should be done. We have just elected a very able board of officers and executive committee, and the next meeting of the Association should see the most radical changes in our methods of doing business.

W. E. Harrington, Camden, N. J.—I wish to supplement Mr. Bean's statement by some observations I have made since I have been here that struck me forcibly. I think we can draw lessons from the new association composed of the master mechanics, which has just started in. They have decided to hold their meeting two days in advance of the meeting of this Association, and to hold three sessions each day to accomplish their work. I have been here since Tuesday morning and have not been able to accomplish anything like what I wished to do in the matter of seeing certain exhibits and talking with certain people as to details in connection with our business. I think the pleasure trips have been of such a character that we have lost too much valuable time. I know from talks I have had with general managers of different companies that they will not come again to our meetings unless we make some very great changes in the way of handling our business. I think the practice of spending so much time in sightseeing and things of that kind should be done away with, and we should devote ourselves strictly to the business for which the delegates attend the convention.

President Ely—Gentlemen of the convention, I desire to return to you my sincere thanks for the very great honor which you have conferred upon me in selecting me president of the Association. I accept the place with a full realization of the responsibility. I deem it a position of great responsibility. I will endeavor, with the help of the other officers and the executive committee, and all concerned in the welfare of the Association and the business represented by it, to devote such an amount of whatever ability and energy I may be possessed of together with a sufficient amount of time, in an earnest endeavor to bring about good results during the next year.

The convention then adjourned to meet at the banquet in the evening.

THE THREE NEW PRESIDENTS

The three gentlemen who have been elected to fill the offices of presidents of the three associations which met in Saratoga last week have all been prominent in railway affairs as well as in the work of the associations over whose interests they will preside during the coming year.

W. Caryl Ely, who is president of the International Railway Company, of Buffalo, is of New England descent, but was born in Middlefield, Otsego County, in 1856. He is a member of the New York bar, to which he was admitted in 1882 at Ithaca. In 1885 he moved to Niagara Falls to practice law, and in 1899 was elected to the presidency of the Buffalo Railway and its allied companies. He was one of the original promoters and incorporators of the Niagara Falls Power Company, and was the chief promoter and first president of the Buffalo & Niagara Falls Electric Railway Company. In 1898, largely owing to his initiative, all of the electric railways in Buffalo, Niagara Falls, Tonawanda, Lockport and vicinity were consolidated into the International Railway Company, whose capital stock is owned and held by the International Traction Company, and Mr. Ely was elected president of both corporations. Mr. Ely has twice served as first vice-president of the American Street Railway Association, and has also been a member for a number of terms of the executive committee of the New York State Street Railway Association.

W. CARYL ELY
American Street Railway Association

F. E. SMITH
Street Railway Accountants' Association of America

E. W. OLDS
American Railway Mechanical and Electrical Association

THE PRESIDENTS-ELECT OF THE THREE ASSOCIATIONS

F. E. Smith, who has been elected president of the Street Railway Accountants' Association of America, has been an active member of that organization since its incorporation, and was elected one of the vice-presidents in 1898. He is auditor for the receivers of the Chicago Union Traction Company, and is also auditor of the Chicago Consolidated Traction Company. Previous to going to Chicago in 1898 Mr. Smith was auditor of the Massachusetts Electric Companies, of Boston, and for five years before that of the Lynn & Boston system.

Edwin W. Olds, who has been elected second president of the American Railway Mechanical and Electrical Association, at the Saratoga Convention, is a native of Vermont, and has had a long mechanical experience. He first became connected with street railway work in 1890, when he entered the service of the Denver Tramway Company, of Denver, Col. In 1896 Mr. Olds was offered the position of superintendent of rolling stock of the Milwaukee Electric Railway & Light Company, which position he has since held. Mr. Olds was a member of the executive committee of the American Railway Mechanical and Electrical Association last year, and his elevation to the presidency is a well-merited tribute to his ability and standing in mechanical and electrical affairs.

THE AMERICAN RAILWAY MECHANICAL AND ELECTRICAL ASSOCIATION

THURSDAY'S SESSION

The final session of the American Railway Mechanical and Electrical Association was called to order at 10:10 by President Farmer.

D. F. Carver's paper, "Use and Abuse of Controlling Mechanism," was read by the president in Mr. Carver's absence. This paper was published on page 475 of the STREET RAILWAY JOURNAL last week.

Mr. Mundy—Regarding Mr. Carver's statement that the controller has only two points, and about the rheostat being merely a matter of form, I can state that some few months ago we were blowing up and completely destroying the interiors of controllers at the rate of about sixty per week, and we have now reduced that trouble to a very small percentage of what it was at first. But we have accomplished this result, not by going to work on the controllers, but by getting the rheostat on the cars in proper condition. The condition of the rheostat affects the controller more than anything else. The older type of resistances made were made of layers of iron with asbestos between them. They would burn out, short-circuit, and have all kinds of trouble. We have been substituting the grid rheostat, which will break sometimes, but does not change materially in its resistance, and you can take a controller, throw it around to the same points, and it will not blow out, provided the stops are graded on the rheostat properly. It has reduced the cost of our controller repairs—it is hard to give the repair cost percentages, but it is hardly comparable with what it was before.

Mr. Morgan—One question in that regard. We have had that same trouble and particularly so on our interurban line. We run there with the K-14 type of control, and run as high as 45 miles per hour, and down a long grade we have between New Castle and Sharon we run probably from 50 miles to 53 miles an hour. We have had the greatest trouble with the resistance on account of the asbestos and iron jamming from one coil to the other. There should be absolutely no reason why a grid rheostat should not be substituted for a single one of the coil rheostats. Have you tried the substitution of one individual set of coils without taking out your full equipment and throwing it away?

Mr. Mundy—Such a plan is perfectly practicable. I would say in regard to that plan that on the rheostats, as we are placing them on our cars to-day, some are not complete equipments of grid rheostat. In other cases, we are using the grid rheostat for the highest points, viz., the R-3 to R-5, and the first points, R-1 to R-2, seldom burn up. The latter we keep in service, using both the General Electric ribbon type between vitrified granite blocks and the Westinghouse round type, and we find that they hold up very satisfactorily. One thing, regarding the proportioning of the resistances. I am somewhat radical and go further than the manufacturers, in that I do not make the first point in my controller a running point. I make that more an arcing point, raising the resistance probably 50 per cent to 75 per cent higher than would be proper to get the right acceleration of the car. That reduces the arc in turning off and makes considerable difference in the tendency to blow up.

Mr. Morgan—We have adopted the same plan. In fact, if we put the controller on the first point, the car will not start. The second point is really the running point on our controller.

Mr. Pestell—I quite agree with Mr. Mundy and Mr. Morgan. In regard to extra resistance on the first point, the great trouble with the blowing out of controllers, arcing and blowing through the cover, has been due principally, I think, to the fact that the controllers were put on one notch and thrown off again before the motors had time to get any speed at all; that is, if the motorman got two bells to start and then, before the car had actually gotten under way, he got a bell to stop, and threw off the controller, in nine cases out of ten it would blow through the cover of the controller. Putting on the extra resistance on the first point tends to stop that. We had a little experience here a short time ago using a S. R. G. motor on a transfer table and we found that the ordinary magnet in the controller would not take care of the arc at all. That is, there was so much self-induction in the motor, and the resistance was so high that the small amount of current would not make a strong enough magnet to blow out the arc, and the latter would be maintained for some time—in fact, until it burned out the controller, and we had to rig it up with a smaller wire. I think the same principle holds good in starting and stopping the controller, not that there are not enough turns of wire, but the fact that the motor has a high self-induction before it is started, both in the armature and the fields, and that tends to kick back and blow holes in the cover when the motor does not start before the current is shut off.

Mr. Mundy—Another cause for blowing up controllers is very serious, and is practically impossible to overcome from the motorman's standpoint, and that is where the motorman sees he is getting into a tight place and has either a car or a wagon ahead of him. His first inclination is to throw the reverse handle. With a four-motor equipment this means that the motors would buck at once. After the track is clear the motorman goes ahead and throws the reverse handle back into the forward position. There is nothing to break the arc except the reverse cylinder, because the motors generate and the arc chars the reverse cylinder, short circuiting it. The next thing we have is the outside shell of the controller. The rest of it has gone up in smoke. To overcome this the manufacturers are making for me to-day what might be called a special controller, but which is one which I think they expect to make a standard. In this controller the reverse cylinder is made with much longer breaks and the arc effect is between each finger. This, of course, does not overcome the bucking tendency, but it does keep the arc from going from finger to finger. I think that it is practically impossible to educate the motormen not to do it, because I find that when I am running a car myself my first inclination is to commit the same fault.

Mr. Morgan—I would like to say in that connection I had very much the same trouble, but I have posted rules on the subject, as I have charge of the mechanical department as well as the operating department. These rules require the motorman to wait before he reverses. I have also experienced the inclination to do things that you don't want the motorman to do. But I argue he is running the car every day and he should do it a great deal better than I. A motorman has no right to assume because a man running a car once a week does something which is, perhaps, a little wrong, that he is also justified in doing it. I always point out to the men that I am not a motorman.

Mr. Pestell—I would like to ask whether anybody here has had any experience with flashing over the controllers on the connecting board below the blow-out magnet for no apparent cause, that is, when the board is apparently clean and all right previous to the time of flashing over?

Mr. Mundy—As I think I said yesterday, I was recently testing some fuses on a car and purposely applied the brake as tight as possible in throwing the controller around to the full multiple position to try the fuse. The controller drew some arcs at the top end, and there was an arc from the controller finger to the cover of the controller, but when I opened it up I also found that the head of every screw in the connection board had simply been burned off. You could not use a screwdriver in getting any screw out. The cause of the trouble was that the gases formed by the arc completely filled the controller and short-circuited the different connections.

Mr. Olds—We have that same trouble. Sometimes in a short circuit, as you throw off, you will find the connecting board contacts burned as well as possibly with the trolley, or wherever the short circuit may occur. Regarding the reversing of the car we think it is policy and best that the motorman should understand the reversing of the car, although some have thought best to take off one of the contacts on the backing-up part of the cylinder at each end, so that should they wish to back up they are obliged to do it on two motors. I think that is poor policy, because there are times when we want a man to use anything that he can to make a quick stop. I think if they get in a tight place they should strip the gears or strip the armatures—I don't care what they do—to stop the car. But we have the same trouble that Mr. Mundy speaks of, the men will use the reverse when they ought not to, and the burning of the reverse is quite a serious matter, especially during the winter. The motorman will come in with his controller burned up. You will say to him, "You have been using your reverse." "Oh, no, I never use the reverse." But open it up and you will find blisters on the back of the contact. They are all burned, whereas the go-ahead is perfectly clean. Regarding Mr. Mundy's improvement—because I consider it is his improvement—he is the man who suggested it and took it up with the General Electric Company—I think it will help us out of the trouble considerably. We are experimenting a little to-day on putting the controller in the center of the car mechanically. Just what will be the outcome of it I am not prepared to say, but we wish to get the controller off from the front platform. All our electrical appliances, if possible, should be taken from the platform. Whether we can accomplish it or not is problematical. The type-M does do that to a very great extent, although they place the circuit breaker on the platform or in the motorman's cab, which is sometimes a source of trouble.

Mr. Pestell—I would like to ask the representatives of any roads here if, on their roads, motormen are instructed relative to the generator effect of the motors in stopping a car so that they would have proper instructions for stopping a car, provided the trolley was off and they had no power and the brakes refused to work? The thought occurred to me in connection with the statement that some roads did away with some of the contacts on the reverse cylinder in the reverse position.

Mr. Morgan—I have always believed that was pretty general practice. I know I have always done so with roads with which I have been connected. I take the stand in regard to reversing a car that no matter what mechanical damage is done anything is better than personal damage, and, of course, you must stop your car in some other way, if you are in trouble with the brakes and with your trolley off. Our men understand the effect of the four-motor equipment and also understand how to reverse their cars with a two-motor equipment. We are now anticipating having a monthly examination of all men on such points, but on that particularly. An unfortunate accident a short time ago brought this point very vividly to my mind. We run a single-track system with time limit, and had an excursion train coming behind a regular. The head car had broken its trolley rope, and the trolley had gone up, and with the usual luck in such cases had struck a pole and was bent so that the front car could not be moved until a man was sent on top of the car. The motorman flagged the rear car immediately, and the conductor went on top to fix the trolley. The result was that when this rear car tried to stop the brakes refused to act. The motorman put on his reverse, but as the rails were greasy from a recent rain, the wheels skidded. If the motorman had not been instructed regarding the reverse the accident would have been more serious. I attribute the result that it was no worse to the fact that that man understood thoroughly his reversing. I believe the time is coming when we shall have to adopt very much the same practice in regard to the instruction of our motormen as is adopted by the steam roads. I think Mr. Ely mentioned in his address yesterday the well-known fact that an engineer or even a brakeman on a steam railroad is efficient on any road in the United States, and it strikes me that we are taking a stride in exactly the right direction, particularly for interurban roads, if we endorse and help in every way the movement that is on foot to instruct motormen and conductors on a general rule plan so that, understanding the rules of one road, they will understand the rules of all other roads. Of course, we cannot expect to have the rules identical, because there are going to be exceptions on different roads on account of the general lay-out of the road. But we can expect them to know just such things as this reversing item which saves accidents, and that, with our friends the ambulance chaser, is getting to be the worst thing we have to contend with.

Mr. Olds—Regarding the adoption of standard methods, I find it is a very important matter, and when we go back to the records of the master mechanics and car builders we find that practically the first thing that they adopted was a standard journal and journal box. It seemed but a small matter at that time, but we can see to-day where they are. They stand at the front in all steam railway equipment, and the managers of the steam roads will not adopt anything that is not recommended by the master mechanics or master car builders. We do not expect to be able to get everything down to a standard, but we can go a long ways toward it. In our own road, seven years ago, we put in a standard axle and journal box. Everything, up to the present day, that we have purchased or ordered has used that same journal box and axle. In three or four different styles of truck, the same car wheels can go in in any of them. On our new interurban cars we have put in the standard 4¼-in. x 8-in. journal box, M. C. B. standard. The new city cars are to have the 3¾-in. x 7-in. journal, and we propose to stay by those tactics. These remarks, of course, are out of order in the discussion of this paper, but I feel that we should, as soon as possible, decide upon standards and the instruction of our motorman can be along these same lines. A number of years ago we had an accident caused by the power going off on a very steep grade. The motorman set his brake, the conductor became rattled and went to the rear end and also set the brake. We found all eight wheels were locked. The locking of the wheels, of course, had caused the car to slide more than it would if they had simply set the brakes as they should. The motorman, in that case, did not understand that if he had left the controller at the running speed—it was a two-motor equipment—his motors would have generated and stopped. For that reason, I think it is very important that all our motormen should be instructed that the motors will generate—a two-motor when in parallel and the four-motor by simply pulling the reverse handle.

Mr. Morgan—I do not want to take up too much time of the convention, but this matter of the instruction of motormen has been something of a hobby with me for some time. If we had a large road and could afford the system of training employed on most of the large roads now, a regular school, we would be in a different position, but we cannot afford to take our men through and give them a mechanical and electrical instruction before we make motormen of them. The question of standards has been, as most of us know, a matter of discussion with the American Street Railway Association for some time, but I think the forming of this Association provides a splendid opportunity in the same direction, the standardizing of equipment, and particularly of trucks. We all recognize the fact that electrical equipment is still being improved, and we cannot expect to standardize or change the mechanical construction which has been in use for a number of years. We can standardize as well as the master car builders, and in so doing we help our supply men and ourselves, and I would strongly urge that that matter be considered seriously by this convention at this time, so as to push it forward.

The secretary announced that both the STREET RAILWAY JOURNAL and the "Street Railway Review" had offered the use of their type in printing the proceedings of the Association. A vote of thanks was extended to both papers, and the offers were referred to the executive committee.

The secretary then read the report of the nominating committee, as follows:

President, E. W. Olds, of Milwaukee.

First vice-president, Alfred Green, of Rochester.

Second vice-president, C. F. Baker, of Boston.

Third vice-president, W. O. Mundy, of St. Louis.

For members of the executive committee, the officers mentioned above and T. J. Mullen, H. H. Adams, D. F. Carver and H. J. Lake.

Secretary and treasurer, Walter Mower.

The officers, as nominated, were unanimously elected.

President Farmer then referred to the excellent work accomplished during the last year in the interests of the Association by the secretary, Mr. Mower, and, upon motion of Mr. Pestell, the Association extended a vote of thanks to Mr. Mower.

Mr. Olds—We, at this time, have a gentleman with us, occupying our chair, who was the first one to call us together one year ago. Through his efforts and the efforts of our worthy secretary we have the meeting to-day in Saratoga which, I feel, has been a grand success, and I hope that our year to come may be as successful as the year that has just flown. And I wish to thank each one of you and the companies that you represent for the honor that you have conferred upon me to-day, and at the same time I wish to make a motion that we extend to our worthy president, Mr. Farmer, a vote of thanks for his efforts in making a success of our organization, as we see it to-day.

The motion was seconded and unanimously carried.

President Farmer—I think the newly-elected officers will take hold immediately after the adjournment of this meeting, and I suggest that as Mr. Olds may have some things to say or have done, which he can do much better here than by correspondence, it would be well to adjourn the meeting, so that Mr. Olds can re-convene the Association, and I would say I am very much obliged for the courtesy that you have done me in overlooking the mistakes I have made presiding at this table. I am a better hand in the shop than I am here, and I shall never forget the kindness that you have all extended to me.

President Olds here took the chair, being escorted to it by a committee composed of Mr. Mundy and Mr. Baker.

Mr. Mundy—I think, next to keeping apparatus in proper shape, the keeping of records is of as much importance as anything else, because it soon tells us whether we are following along a line consistent with good practice and with what other roads are doing. If somebody else is doing things better than you are, you will find it out. I think the standardization of all records adopted by all roads to give this direct information is so important that we ought to have a committee to start to work on it at the present time—for something to give us, at least, grounds to work on at our next regular meeting.

Mr. Lake—The report-sheet matter is a subject that I have not heard mentioned during any of the meetings, and most of our talk has pertained to the city use of cars. I, for one, have no city cars whatever to look after, and my work is entirely interurban and I think, very likely, that there are other members of the Association that are in the same position as I.

Mr. Mundy—Our president's remark that the various members of the Association make suggestions as to the proper subjects for papers next year is certainly a very good one. If we have to rely on either one or a committee of two or three to pick out the papers and the men who are to write on them, we will not, of course, get the best papers. If each member will consider the topic that he thinks is the most important for a paper or papers at the next meeting and will give that suggestion to the secretary, the committee selecting the papers will have some ground to work upon.

Mr. Bigelow—On this subject of reports and classification, I believe that the Accountants' Association made a collection of different forms, and should think it would be very interesting for the committee, after it is formed, to make a collection of the forms used by the different companies, and have it here for the different members to look over in connection with whatever report they make.

Mr. Olds—The question of standardization, not only of our equipment, but of our system of records, needs to be gone into. That should be one of the matters that should come up at our next meeting. Regarding the appointing of committees, I wish to leave that until our executive meeting.

Mr. Miller, of Buffalo, and Mr. Matte, of Indiana, each made a few remarks in response to an invitation from the president.

The meeting then adjourned.

STREET RAILWAY ACCOUNTANTS' ASSOCIATION OF AMERICA

THURSDAY MORNING

President Davies called the meeting to order at 10:20 a. m.

In the temporary absence of Secretary Brockway the president appointed as secretary pro tem Mr. Ross, of Montreal, who read the first paper on the programme, on "Car Maintenance Records," by S. C. Stivers, lately auditor of Jersey City, Hoboken & Paterson Street Railway, Hoboken, N. J. This paper was published on page 463 of last week's issue.

The chair called for discussion of the paper, and Mr. Magilton stated that the system had been resorted to but had not been adopted to a very great extent as yet, and he asked if any instance could be cited where car wheels or other important parts of the car had been rejected as not up to standard. This work in their case was done outside of the general office, and he (the speaker) had not a very deep interest in it directly as yet, though he expected to have later on. They had from time to time rejected certain purchases, but the records were not yet complete enough to show that they had not been up to standard.

Mr. Pease said their wheels were all guaranteed to make a given number of miles. If they did not make the required mileage the company did not pay for them. His company was not keeping the car maintenance record except so far as car wheels were concerned. For that purpose the facts were ascertained by the use of the usual car mileage record, with the date when the wheel was put on and taken off, and if it were reground that date also was entered. When a wheel was removed on account of chipped flange and had not made the required mileage the company did not accept the wheel. They kept a record of each wheel and not of a few selected ones only. He did not know whether it was necessary to number each wheel, but thought it was advantageous; their wheels were all numbered by the car wheel company, and no two bore the same number.

Mr. White reported that his company kept car mileage records, but they did not buy their wheels with any special guarantee, at least did not keep the record for that. If they did not get the mileage out of the wheels that they expected they looked about for something better. They never got any rebate on any wheels that did not wear. He inquired if under the guarantee there was ever any question made of the purchaser's complaints.

Mr. Pease replied that there never had been in their experience. The cause of removal of the wheel was a determining factor. If a wheel was worn flat from sliding or skidding, was then reground and afterward made the required mileage,

the purchasing company paid for the wheel. Forty thousand miles with them covered the life of the wheel.

Mr. White pointed out that there was quite a number of things entering into the question of the life of a wheel, some of which, in the way of repairs, he thought were rather unnecessary. For instance, an armature winder should, in many cases, be held responsible for an armature that burned out, and often the motorman should be discharged rather than the armature. He thought the foreman of the shop should be able to tell what work his armature windings were doing.

Mr. Smith wished to know whether Mr. Pease's company could get the same guarantee from the manufacturers on wheels to be used with the air brake as with the hand brake, and was answered in the affimative.

At this point the president announced the arrival in the room of T. Commerford Martin, the special expert of the United States Government on street railway statistics, who had kindly consented to read, in the absence of the author, a paper prepared for the convention by W. M. Steuart, chief statistician for manufactures of the United States Census Department.

Mr. Martin was received with applause, and read the paper referred to. It is published elsewhere in this issue.

Mr. Duffy paid a high compliment to the instructiveness and interest of Mr. Steuart's paper, and moved that the thanks of the Association be extended therefor, which motion was carried.

President Davies also acknowledged on behalf of the Association the obligation felt for the statistics furnished by the Bureau, which contained valuable information for the standing committee of the Association and for the members themselves, and they would await, he felt sure, with great interest the final report, in which he understood Mr. Martin was to have a directing hand. He predicted that as a result of the work of this Association and the census statisticians the next eight or ten years would witness improvements in accounting which would perfect the art still further than it was carried at present.

Mr. Martin said that while he could not say just what the final report would be as yet, but it would have some forty or fifty tables in addition to those presented in the present bulletin, and he thought they would bring out some further points of interest.

The president then announced the presence of Ex-President Calderwood, of Brooklyn, and invited him to address the meeting.

Mr. Calderwood expressed his great pleasure at being able to meet with the Association after an unavoidable absence from the last three conventions, and that the pleasure of the meeting was mutual was amply evidenced by the welcome extended to the speaker.

The president then called for any further discussion of the paper on "Car Maintenance Records," and in response Mr. McDole said he thought the subject was one which would come more directly under the jurisdiction of the operating department, and Mr. Mitchell stated that that was the course adopted by their company, the auditing department dealing simply with the totals.

William F. Ham, on behalf of the committee on standard form of report for electric railways, then presented the report of that committee, which is published elsewhere in this issue. This report, on motion, duly seconded, was received and the thanks of the Association voted the committee for its efficient labors.

Mr. Judson, the accountant of the New York Board of Railroad Commissioners, was introduced by the president, and received with applause. He addressed a few remarks only to the Association, stating that he would be satisfied if they would just allow him to sit down and listen to what was going on.

Mr. Ross, chairman of the nominating committee, announced a meeting of that committee for 9 o'clock, p. m., to prepare its report for presentation at Friday's session.

On motion, adjourned until Friday morning at 10 o'clock.

FRIDAY MORNING

President Davies called the meeting to order at 10:20, and called for the report of the executive committee as the first order of business, which report was presented by Secretary Brockway. On motion it was duly accepted and its recommendations adopted.

Frank R. Henry, of St. Louis, then read a paper on "The Advantages and Disadvantages of the 'Bag System,' as Compared with the 'Receiver System' of Handling Conductors' Remittances." This paper was published on page 471 of last week's issue.

Mr. Ham said that the paper expressed his views and that he agreed absolutely with everything stated therein. In Washington, however, probably 90 per cent of the business was ticket business, and he (the speaker) felt satisfied that under those conditions the receiver system was impracticable. They made it a practice to deal personally with conductors in the adjustment of discrepancies, and he (the speaker) was becoming more and more impressed with the defects in the methods of making returns in bags. The better that you can treat the men, the more courtesy you can show them, the better it is for the company, and from that standpoint alone he should prefer the receiver system to the bag system, where the former could be employed.

Mr. Smith reported some valuable details, as well as the general results obtained by his company in the use of the receiver system, and stated that the expense of that system amounted, with them, to $1.93 per $1,000 collected.

Mr. Mitchell stated that in Pittsburg they had both systems, and he might say also a third system which was somewhat like the bag system. They had gone through a consolidation some eighteen months ago, and had not yet been able to make up their minds as to which system they wanted to adopt exclusively, largely owing to the fact that there were conflicting opinions among the several officers.

Mr. Fullerton said his company, at Detroit, had the tickets and transfers turned in each trip, and the cash once a day. They had the same trouble with contentions over shortages and overages that others complained of, and for that reason, among others, he was very much interested in this question and its consideration at this meeting, to see if something could not be invented to do away with that feature. One other difficulty they experienced was the delay caused conductors in turning in their receipts at times when a great many of them pulled off at about the same time.

Mr. Henry said that at their largest car house, where they ran some 240 cars, they never experienced serious trouble from that source, the men not being delayed, as a rule, more than a minute or a minute and a half. During exceptional rushes, and such conditions as they expected to arise at the World's Fair time, doubtless there would be more congestion, and then it would be a question of putting on more receivers and throwing more work on them.

Mr. Lester, of the Worcester Consolidated, said they had adopted the receiver system. They had had the bag system in vogue on some of the suburban roads before the consolidation, but it was very unsatisfactory, as, sometimes, bags were turned in as they should be and sometimes not, and there was always a dispute between the receiver and the conductor.

Mr. Henry explained that instead of having the receiver indicate the amount of money and adult tickets on the trip sheet, as described in his paper, they had since changed the procedure by cutting out that detail, and all the receiver did now was to take the amount reported to him, which he could check, if he saw fit, put his initials on the trip sheet, treating that as a teller would a deposit sheet.

Mr. Duffy stated that from his experience, both with the bag system and the receiver system, there was nothing whatever to be said in favor of the former, where the latter was practicable.

Mr. Bartlett said that in Boston they were using the bag system, more from force of circumstances, he supposed, than anything else, but he agreed with those who had already spoken in the view that the receiver system, where it could be used with reasonable economy, was the system to use.

Mr. Mitchell reported that, in their experience, the bag system was costing them about $2 for $1,000 collected, and the receiver system about $3.17 for $1,000.

Mr. Boyle stated his company used the fare-box system on four lines and the receiver system on the others—he hardly knew whether theirs would be called a receiver or a bag system, as it was a combination of both.

Mr. Mackay stated that they were using the bag system, principally, he thought, on the ground of greater economy, but they had overcome some of the difficulties that had been mentioned by preceding speakers, as, for instance, in the check provided against the purloining of receipts.

Vice-President Ely, of the American Street Railway Association, visited the Accountants' meeting at this point, and was invited by the chair to address the members.

Mr. Ely was greeted with applause and spoke briefly. He said that he came before the Accountants with fear and trembling, as he always did, because he never knew what the result was going to be until after he had gotten through. Though he had left the meeting of the American Street Railway Association in the midst of a very important discussion, and had but a moment to spare, he felt that he could not refrain from accepting their kind invitation to appear before them. He looked upon the Accountants' Association as one of the most valuable results of the existence of the American Street Railway Association, and the work which the former had accomplished spoke for itself, and was an achievement of which they might well feel proud. However, Rome was not built in a day, and perfection could not be attained without continuous labor. The only thing to do was to put their shoulders to the propositions still before them and just keep on pushing. He complimented the Accountants upon being a thoughtful, very intelligent, clean, bright and business-like body of men. He hoped to meet twice as many of them next year, and that success would crown their efforts in every branch of their work.

Messrs. Hogarth, Henry, Smith, Christ, Pease, Simpson and others contributed further to the discussion of the bag versus the receiver system of handling remittances, whereupon this subject was closed and the chair called upon C. N. Duffy to present the subject next announced on the programme, a "Comparison of the Municipal Tramways Association of Great Britain; Proposed Standard Classification and Form of Report with the American Standard."

Mr. Duffy presented this subject very interestingly in what he termed an "informal talk," beginning with the correspondence with Mr. Dalrymple, of the Glasgow Corporation Tramways Company, preliminary to the investigation that had been made, showing among other things that full credit had been given to the work accomplished by the Street Railway Accountants' Association of America. He (the speaker) had advocated very warmly the adoption by the British Association of the American classification, with a view to securing its use the world over, and was met with the argument that the difference in conditions presented obstacles to that consummation, especially in respect to those companies abroad which were municipally owned and operated. Mr. Duffy then proceeded to a comparison of the details of the respective classifications and forms, which, owing to the limited time at his disposal, was necessarily somewhat hurried and incomplete; and on motion it was voted that anything additional which Mr. Duffy would have time to write upon the subject should be included in the printed proceedings.

On motion of Mr. Ross the president was directed to appoint a committee of one to rearrange the selection of blanks, as recommended by the executive committee, and Mr. White, of Hartford, was appointed as such committee.

The committee on nominations presented the following report, which was adopted unanimously:

For president, F. E. Smith, of Chicago.

First vice-president, F. R. Henry, of St. Louis.

Second vice-president, C. O. Simpson, of Birmingham, Ala.

Third vice-president, J. J. Magilton, of Schenectady.

Secretary-treasurer, W. B. Brockway, of Yonkers.

Executive committee—H. J. Davies, of Cleveland; S. C. Rogers, of Youngstown, Ohio; S. G. Boyle, of Louisville, Ky.; H. M. Pease, of Buffalo.

President Davies said that in retiring from the chair he wished to express his thanks to the members for their attendance, for their patience with their presiding officer, to the members of the executive committee for their assistance and especially to Secretary Brockway for courtesies innumerable, which had made the work of the president almost a pastime. He congratulated the Association upon the selection made for its officers for the coming year.

President-elect Smith was then called to the chair, and pleaded the lateness of the hour as an excuse for limiting his remarks to an expression of appreciation of the honor conferred.

Secretary Brockway announced that the place of the next meeting of the American Street Railway Association had been left, as it was last year, to the executive committee, in consequence of which it would not be known until that committee had taken action where the place of meeting would be.

Mr. White moved that the executive committee be given authority to arrange for the printing of the standard report of the commissioners of the several States in the regular form for distribution to members of the Association, which motion, as amended in some of its details in the course of a brief discussion, was carried.

It was moved by Mr. Mackay that the portrait of the outgoing president be inserted in the proceedings, and that the thanks of the Association be extended to him for the very able manner in which he had discharged his duties. (Carried.)

The secretary was directed to draft a set of resolutions expressing the appreciation of the Association for the courtesies and privileges extended at this meeting.

Mr. Henry, of St. Louis, reminded the Association of the approaching World's Fair in his city and invited the members to call upon him during their visit there, when he would do all in his power to see that they were properly taken care of.

On motion of Mr. Mitchell the convention then adjourned sine die.

THE BANQUET

The twenty-second annual banquet of the American Street Railway Association was held in the large dining room of the Grand Union Hotel on the evening of Friday, Sept. 4. The tables were very tastefully decorated with gladiolus and roses, and the orchestra of the hotel provided the music. Hon. Addison B. Colvin was the toastmaster, and his introductions of the speakers were particularly felicitous. The speeches were all well received, and, as given in the official list, were as follows: "How the Wheels Go Round," Hon. Adelbert P. Knapp; "The Legal Side," Hon. Job E. Hedges; "The Empire State," Hon. George E. Green; "The Relation of Labor to Capital," Rev. John R. Mackay, D. D.; "The Perfection of Success," Herbert H. Vreeland; "The Happiness (?) of Public Service," Hon. Edgar T. Brackett; "The Best Fare—The Feminine Fair," Hon. W. Caryl Ely.

PAPERS READ AT THE SARATOGA CONVENTIONS

PRODUCTION AND DISTRIBUTION OF ALTERNATING CURRENT FOR LARGE CITY SYSTEMS

BY RICHARD McCULLOCH

The large city street railway system of to-day is due to a process of evolution. In most cities twenty years ago the business of transporting passengers through the streets on rails was divided up among several companies operated with more or less skill, each independent of the other, and each striving after the other's business and paralleling its tracks. When the electric era came on motive power was changed and a new equipment selected according to the judgment of the manager, with no particular regard for standardization of apparatus, and without any thought toward a unity of purpose in the operation of the several properties. And so it comes about that when the several roads are consolidated into one system, as has happened in all except a few of our large cities, the manager of the consolidated property finds himself in possession of all sorts and styles of equipment, chosen with a greater or less amount of wisdom, and an aggregation of power plants and feeder systems which, however suitable they might have been for the individual roads, do not lend themselves readily to an economical operation of the property as a whole. The weeding out and the standardization of apparatus, and the adjustment of generation and transmission systems is the task of to-day. The question of power plants and distribution is the most difficult of solution, and in taking it up several plans suggest themselves.

(1) To keep the best of the present plants, add to them as necessary, and adjust the distribution systems from them.

(2) To abandon the present plants, constructing an entirely new plant with a new distribution system leading from it, using the old plants as sub-stations if they are suitably located.

(3) A combination of these two systems, which consists in the beginning of a new plant, the plans of which contemplate the operation of the entire system from it at some future date; at the present time, however, only putting enough apparatus in the station to take care of the growth of the system and adding to it from year to year as other stations are abandoned.

Either of the latter schemes would lead us to consider the generation of alternating current and its transmission to sub-stations, and any change in the power plant system involves a discussion of the relative advantages of power generation in one or several power plants. This question has lately received a great deal of attention in the engineering world, and has been thoroughly discussed from an engineering standpoint.

The great and all-important question which confronts the manager and which the engineer should assist him in solving, is how to transport passengers with the greatest degree of safety, reliability and economy. The power plant and transmission system constitute only two links in the chain of many devices necessary to accomplish this task, and should not be given undue importance in the laying out of the general scheme. Economy of generation or transmission of power should never be sought after at the expense of safety or reliability of operation. True engineering should take into account the financial questions involved in the operation of the property, but, unfortunately, there are fads and fashions in engineering, just as in matters of dress. Large questions of policy which should be solved by sound engineering have sometimes been settled from a desire to be in the prevailing fashion or to have a power plant which will eclipse in daring the last one built. This cannot always be laid at the door of the engineer, who is sometimes called into consultation only after the great questions have been disposed of, leaving him only the details. All this, perhaps, has little to do with the subject of this paper, but it is given as a preface, because, after all, more important than the question of how to generate and transmit alternating current is whether or not to generate it at all.

In this paper the alternating current will be considered to be made by steam power at a central power station, transmitted at a high voltage to sub-stations located in different parts of the territory to be served, there converted into 575-volt direct current and distributed by means of feeders to the trolley sections in the usual way.

The use of alternating current motors for street cars, although the subject of a great deal of experimenting, has not yet been successful. In Switzerland on an interurban road, and in Northern Italy on a steam road which has been converted to electric traction, alternating current motors are used, and their use was seriously considered in the electric equipment of one of the London underground roads formerly operated by steam locomotives. Where the stops are frequent, however, as is the case in city service, in the present state of the art the use of alternating current motors is impracticable.

For railway and power transmission work the advantage of transmission by alternating current is that small high-tension feeders from the central station and short direct-current feeders from the sub-stations are substituted for the long, heavy lines of feeders leading from the central direct-current station. The problem is more one of current transmission than of current production.

The discussion will be taken up under the following headings:

The Production of Alternating Current.

The Transmission of Alternating Current.

The Relative Advantages of Alternating and Direct Current Transmission.

As a complete description of an alternating current station, transmission line and sub-station would be very long, and of no great novelty, the following discussion will call attention only to those general points which are most remarkable in present practice and those which should be especially looked after in the design:

THE PRODUCTION OF ALTERNATING CURRENT

Site of Station.—The central station should be located where coal may be obtained by rail or water, or both, and where large quantities of water may be obtained for condensing purposes. If a location fulfilling these requirements may be obtained in any large city near the center of gravity of the load, well and good; if not, it is not so serious as it would be if the plant were designed to furnish direct current. The location should not be in a residence district, where the plant is apt to become a nuisance, and physical obstacles to the laying of feeder mains, such as rivers, bridges, etc., should be avoided if possible in the selection of the site.

In the general principles of its construction the alternating current plant does not differ from the direct-current plant, except that the amount of power installed and the size of units usually warrants a magnitude of construction rarely attempted in direct-current plants. We have the same boiler plant, the same engines, similar generators, and a switchboard which transmits alternating current to feeders instead of direct current.

Coal Supply.—There is no point more important to the continuous operation of a power plant than regularity and infallibility in the delivery of coal. The amount of coal coming to one of our large power plants is such that extraordinary means must be taken for quickly unloading and handling it. If coal is delivered by rail a large switch-yard must be provided for handling the cars, and if bottom-dumping cars cannot be depended upon, some form of a car tipple for quick unloading should be installed. The tipple used on the ore docks suggests itself for this purpose. If coal is delivered by water, clam-shell drop-buckets are used for unloading the barges. Those of us in the West learned by last winter's experience that we must expect at times to be obliged to burn all sorts of coal in all sorts of conditions. It is, of course, preferable that the coal should be delivered crushed ready for the automatic stokers, but provision should be made in the lay-out of the station for a coal-crushing plant to handle lump and mine run coal. The quantity of coal burned in the large stations is such that if an attempt is made to furnish storage capacity within the plant for even a modest period of time, the size and cost of the building is enormously increased by the large coal tank perched high in the air above the boilers. It is perhaps a better plan, if the location of the power plant permits it, to carry only a few days' supply in the tank in the boiler room, and provide a separate building for the coal reserve, connected by conveyors to the boiler room, where the coal may be kept nearer the ground, and the cost of the iron work for its storage diminished.

The large power plants in the Eastern cities burn buckwheat anthracite, while those in the West burn bituminous screenings, which term includes all that will pass through the 1¼-in. screen at the mine, including the dust and fine coal made by the cutters. The plant should be laid out for the kind of coal it is intended to burn, and in cases where the cities are located so far from the mines that the cost of transportation becomes a large factor in the cost of the coal, it would pay to devote a great deal of attention to a determination of what is really the most economical coal

to burn, and not assume, as is often done, that that coal is the best which can be had for the lowest price per ton.

Building.—The power plant should be substantial and fireproof and just as ornate as the directors of the company wish to authorize, it being remembered that although it is creditable to a railroad company to have a handsome power plant, the gross receipts are not increased nor the operating expenses decreased thereby. The plant should be entirely closed and should be constructed with the idea that all employees and visitors should enter by one door and be checked in and out, just as in a well managed factory. When this door is closed the plant should be impregnable, and conveniences should be arranged so that if necessary the entire operating force can be lodged and fed in the building.

Coal and Ash Handling Machinery.—The apparatus to handle the coal and ashes of a large power station constitutes a formidable plant in itself. It is, perhaps, better in a large installation to keep the coal and ash handling apparatus independent, as ashes are much more abrasive than coal, and it is better to leave either set of apparatus free so that it can be used at any time. Some form of the self-dumping bucket conveyor is in general use for coal, while various apparatus has been installed for handling ashes.

Mechanical Stokers.—The use of mechanical stokers in the large plants of to-day is universal. They are more efficient on low-grade fuel, and by their use and that of coal and ash handling machinery, the employment of a large number of laborers in the boiler room is dispensed with, and the likelihood of labor troubles diminished. In fact, if it were necessary to handle the coal and ashes, and fire and boilers by hand, it would be difficult to get men enough into some of our large plants to keep them going, and these men would be a constant source of annoyance.

Boilers.—Some form of water-tube boiler is usually chosen for large plants because it may be made in large sizes without danger of explosion and occupies less ground space per horsepower than the fire-tube boiler. There is nothing remarkable about the boiler installation for an alternating current plant except that the size of the plant and the size of the units is such that a two-story boiler room is usually required. This feature, however, has already been introduced in some of our large direct-current plants. The question of pressure and superheated steam, while naturally belonging to boilers, will be taken up in the discussion of steam engines.

Engines.—Until quite recently the only prime mover for driving generators of large size in railway steam plants was the compound, condensing steam engine. The triple expansion engine has been used in no large installation. In one recent installation a duplex compound engine, with the two low-pressure cylinders horizontal and the two high-pressure cylinders vertical, drives the generator. This is a mammoth unit of 5000 kw, and is the largest which has been built.

Steam Turbines.—Of late years, however, improvements in manufacturing facilities and our increased knowledge of the properties of steam have made possible the utilization of the steam turbine, which, remarkable to state, makes use of the principle upon which the first steps toward the application of steam as a prime mover were based. It seems as if we are on the verge of a radical change in the application of steam, as the introduction of the turbine makes an entire change in the usual layout of the power station. And, as in the case of all great inventions, necessity was the mother of this one. The steam engine has reached such a size that for large units it is heavy, clumsy, delicate of adjustment and requires constant skilled attention. On account of the inertia of the valves and reciprocating parts, the speed of the steam engine must be kept so low that the cost of the electric generator is greatly increased. In fact, it would seem that the limit in the size of steam engines for driving electric generators is about reached. If the claims of its advocates are only partly realized, the steam turbine is the ideal machine for driving alternating current generators. The efficiency of the steam turbine is claimed to be fully equal to that of the best steam engine; the turbine being a rotary machine, the thrusts caused by the reciprocating motion of the steam engine are avoided, thus relieving the foundation and frame of that strain, and facilitating the operation in parallel of alternating current generators; foundations and buildings for turbines are cheaper than for engines; as the electric generator is driven by the turbine at a much higher speed than by the engine, its cost is less; there being no valve gear and reciprocating parts in connection with the turbine, its maintenance is less, and there is no need of the skilled attendance during operation so necessary with the engine; as no oil is needed for the lubrication of the turbines, the steam may be condensed in surface condensers and used over again in the boilers, thus affording practically distilled water for boiler use. All of these claims are being made for the turbine, and although all of them may not be fully realized, it is likely that there will be such advantages in the use of steam turbines that no large alternating current plant will be built in the future containing any other prime mover. One of the most important advantages of the steam turbine for electric work is that between half load and 50 per cent overload its efficiency is nearly constant, and that even at less than half load its efficiency is good.

Superheated Steam.—The amount which steam may be superheated when used for driving steam engines is limited on account of the carbonizing action of the steam on the cylinder and valve lubricants. With a special valve gear constructed for use with superheated steam, steam superheated 150 dgs. F above the temperature corresponding to its pressure may be used. With steam turbines any superheat which it is practicable to obtain may be used, and great economy is effected by its use. Some of the makers of water-tube boilers now make an attachment to be placed in the path of the heated gases within the brickwork of the boiler for superheating the steam. The amount of superheat which can be obtained by this device depends upon its heating surface, but enough heating surface may be placed within the brickwork of a boiler to obtain about 200 degrees of superheat. If it is desired to obtain a greater degree of superheat than this it is advisable to use an external superheater.

Condensers.—In order to obtain the maximum economy by the use of steam turbines, as rare a vacuum as possible should be maintained by the condenser, the usual specification calling for 28 ins. This necessitates a larger and more expensive condenser than is usually installed with the same capacity in steam engines. The economy of the steam turbine increases very rapidly, both with the quantity of superheat and the rareness of the vacuum, and the limit of 28 ins. has only been set because it is the limiting vacuum which it is practicable to maintain.

Steam Pressure.—Economy in the use of steam also increases with the steam pressure. With compound condensing engines the common pressure in use in 175 lbs., while with steam turbines the economical point seems to be about 200 lbs.

Piping.—The design and installation of the piping in a large, high-pressure plant necessitates the greatest degree of skill. The old fads of double-headers, auxiliary headers and loop systems have expired, and now the best practice is to make the piping as short and simple as possible, and make up in excellence of construction the security which it was once sought to obtain by doubling the installation. In some of the large plants recently installed, the condensers have been set directly over tunnels connected with the water supply and the heavy piping necessary for the condensing water has been entirely done away with.

Auxiliaries.—The auxiliary apparatus, such as coal crushers, coal and ash handling machinery, stoker machinery, boiler feed pumps, condenser pumps, air pumps, cranes, exciters, elevators, etc., require a large amount of power for their operation, and the piping for the engines furnishing this power is expensive of installation and maintenance. It is recommended that these auxiliaries, so far as possible, be driven by motors, preferably induction motors. There will be a gain in economy over steam operation, and a large amount of high-pressure steam-piping will be done away with. Any machine which should run at a reasonably constant speed can be operated by means of an induction motor, and one which requires a variable speed can be run with a direct-current motor.

For one large alternating current plant, the construction of which is now pending, it is proposed to furnish current for the auxiliaries and for the excitation of the generators as follows: Small alternating current generators, driven by turbines, are to be installed to furnish current of a voltage suitable for driving all the induction motors in the plant. Rotary converters, driven by this current, furnish the direct current, probably at 250 volts, for exciting the main generators, and for lighting the plant. A storage battery installed on this 250-volt circuit steadies any fluctuations and furnishes a reserve in case of a breakdown. In this way the running of the auxiliaries, the excitation of the generators and the lighting of the plant are made entirely independent of the main current supply.

Division Into Units.—Large alternating current city plants as at present installed represent a vast quantity of power under one roof. Any accident which might cripple the plant would have very serious results, and affect a large number of people and industries. The greatest care should be taken to avoid such a possibility. In order to prevent, as far as possible, the crippling of the entire plant by an accident to any part of it, some of the more recent installations have been divided into units, each unit consisting of a generator, engine and condenser, together with the necessary number of boilers to furnish steam for the engines and the auxiliaries in connection with the boilers. It is intended that

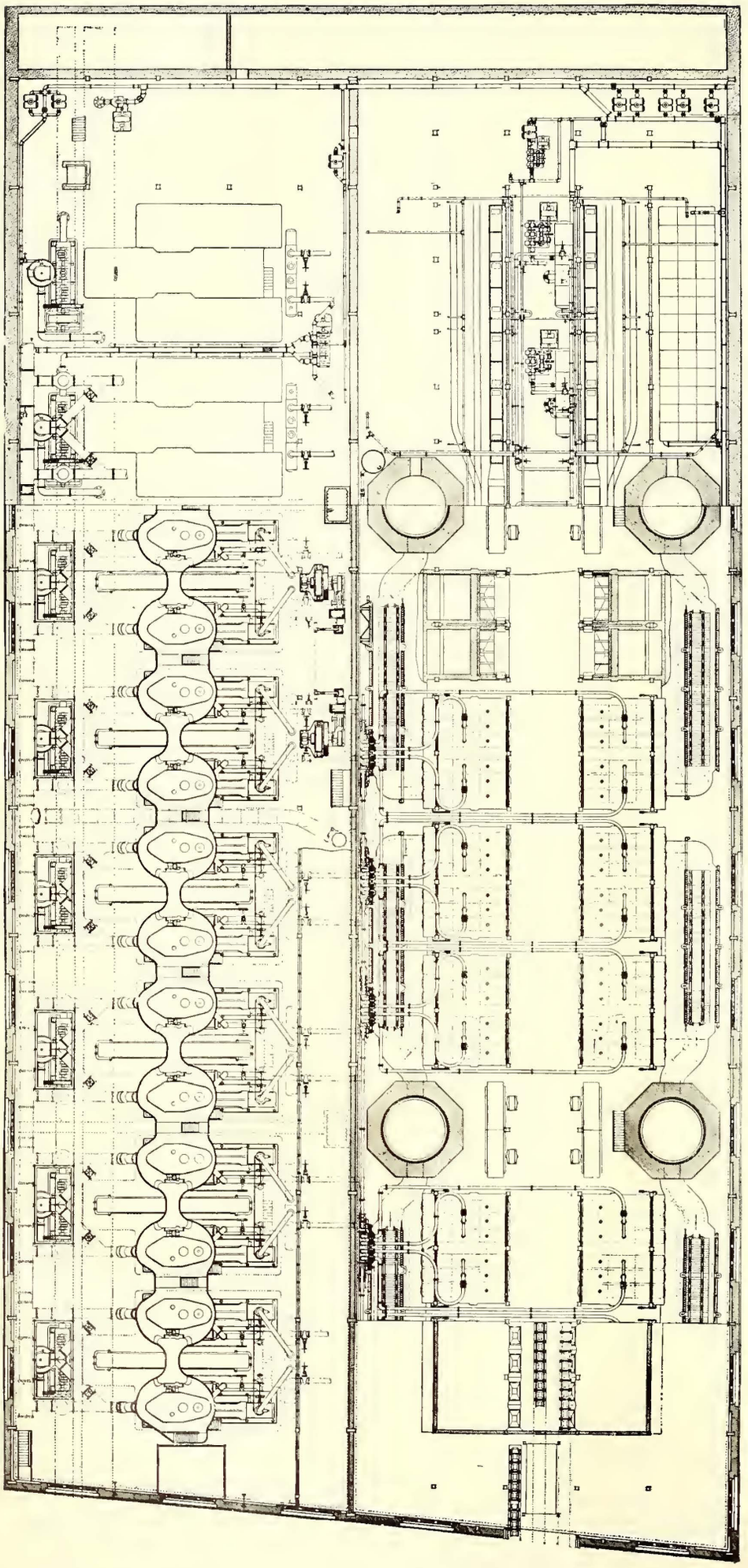


FIG. 1.—PLAN OF MANHATTAN POWER STATION

each unit shall be independent of any other; in fact, there will be as many separate power plants as there are units. An emergency steam connection is made between the steam headers, but for emergency use alone. The unit method minimizes the danger of a complete shut-down of the plant, but the price paid for it is the greater amount of reserve apparatus necessary, and also a somewhat poorer economy if the unit idea is carried out in detail as to feeders and substations.

Frequency.—By common consent a periodicity of 25 cycles per second has been adopted in the United States for alternating current power work. In Europe there seems to be no fixed standard, each installation following the ideas of its designer. Rotary converters work better at low frequency, and in a combined railway and lighting plant where alternating current lighting is to be done it is best to generate at 25 cycles, use rotary converters at this periodicity for the railway and direct-current lighting, and install motor generators to give a frequency of 60 cycles for any alternating current lighting.

Phase.—Where the generator voltage is used in transmission it is the accepted practice to generate three-phase current. Where the generator current is stepped up for transmission it is the custom with some manufacturers to generate two-phase current and in stepping up the current for transmission to change it to three-phase. In most city installations the desired transmission voltage is less than 15,000, and as this voltage can be obtained with modern insulation in well-designed generators, unquestionably the best practice is to generate at the transmission voltage, because this obviates the use of step-up transformers. Where the desired transmission voltage is above that which can be obtained in the generator, it is common to generate at a low voltage and raise to the transmission voltage by means of step-up transformers.

Operation of Generators.—For railway and power purposes there is no great difference between the running of alternating and direct-current generators. If there is any difference it should be in favor of the alternating-current machine, owing to the substitution of rings for the commutator, and the slightly greater efficiency owing to the absence of brush friction and losses. The large modern machines are made of the revolving field type, the revolving parts carrying low-voltage current and the high voltage confined to the stationary parts with little risk of accidental contact with persons. With engines of good regulation and similar types of valve gear there is no difficulty in running engine-driven alternating-current generators in parellel, and with generators driven by turbines which have a constant impulse throughout

the entire revolution, operation in parallel becomes a simple matter.

Switches.—The handling of high-voltage current in large quantities is quite a serious question, and the switches and switching devices of a large alternating-current station have become one of the most important parts of the plant. In the more recent installations, the switch contacts are broken in oil and each switch is built in a brick fireproof compartment. The bus-bars are divided into several sections, so that in case of a short circuit any section may be isolated. All switches are opened and closed by means of a motor running on an auxiliary circuit controlled by the switchboard attendant. No high-voltage current is brought to the switchboard.

Central Station Plans.—In order to indicate the general trend of modern practice in central station design, there are published with this article several power station and sub-station plans:

Figs. 1 and 2 are plan and cross section of the Manhattan Power Station, New York City.* This installation is the latest large American installation, and represents the highest development of an engine-driven station. It contains 40,000 kw, divided into eight 5000 kw units, and covers about 82,400 sq. ft., or 2.06 sq. ft. per kilowatt. The cubical contents of the building are about 8,580,000 cu. ft., or 215 cu. ft. per kilowatt capacity.

Plan and cross section are shown of the Chelsea Station, London,† now under construction, to be equipped with ten 5500-kw turbine-driven units and one smaller unit, making a total capacity of 57,000 kw. These turbines are of the horizontal shaft type, and this is the first large station to be entirely equipped with steam turbines. From a published report the ground area is 1.36 sq. ft. per kilowatt, and the cubical contents of the building 139 cu. ft. per kilowatt. These measurements include an office building adjoining the station.

Figs. 3 and 4 are sketches showing the proposed arrangement of a station to contain eight 5000-kw steam turbines of the vertical shaft type. This has the same capacity as the Manhattan, and it would be interesting to compare the relative sizes of the two buildings. The turbine station covers an area of 58,860 sq. ft., or 1.47 sq. ft. per kilowatt. The cubical contents of the building are 5,403,000 cu. ft., or 135 cu. ft. per kilowatt. This station also contains space for 12,000-kw sub-station capacity.

THE TRANSMISSION.

Transmission Voltage.—In a few words the advantages which alternating-current transmission offer lie in the possibility of transmitting large amounts of power over long distances with comparatively small wire. Since the size of the wire necessary decreases as the transmission voltage increases, there seems to be no reason why for city use, where heavy loads must be transmitted, the limiting transmission voltage should not be the limiting voltage at which current can be produced in the generator, except that voltages above 15,000 require cables of high cost. It is unquestionably the best practice to carry the high-tension cables underground in conduits. There are some large cities where alternating current at a pressure of 5000 volts or higher is carried on overhead wires strung along city streets, but although quite a sum of money is saved in the initial cost of feeders, the true economy of such an installation is doubtful. Serious interruption to traffic and perhaps injury to the central station and sub-station machinery are invited by short circuits and grounds from fires, storms, lightning and accidental crosses with other wires, while the danger to human life is such that the railway company is liable at any time on account of some fatality to be ordered to place the high-tension wires underground at a greater expense than if it had been done in the first installation.

Transmission Cables.—As by three-phase transmission a minimum of copper transmits a given amount of power with a given loss, this is the system which has been generally adopted for transmission. Where the feeders are placed underground, three conductor cables are used, the three conductors being separately insulated and then surrounded by a lead sheath. Formerly rubber was the insulation used for this purpose, but paper has come rapidly to the front and at present paper insulation is preferred by many to rubber. Paper does not soften under heat like rubber, and the cable has the advantage of being cheaper than rubber and of having a somewhat greater overload capacity. The weak part of any cable is the joint, and great care should be taken in splicing to exclude all moisture. This is especially true of paper insulated cables.

In estimating the sizes of cables for carrying the high tension current it is usually necessary to figure the cable for ampere carrying capacity instead of for drop in voltage, as is customary in long-distance transmission. This is on account of the short transmission distances as compared with the high transmission voltage. The amperes per phase for three-phase transmission may be determined very simply by dividing the watts to be transmitted by the transmission voltage multiplied by the square root of three.

The cross sections of the copper may be taken very conservatively at 1000 circular mills per ampere for rubber insulated cables and 900 circular mills per ampere for paper insulated cables. The copper cross section should be checked by estimating the drop in voltage at maximum load, but for the comparatively short distances of city work it will usually be found that the drop in voltage is very small in a cable properly proportioned for the current it is to carry. The largest size three-conductor cable which it is advisable to install in an ordinary duct is one in which each conductor has a 0000 section.

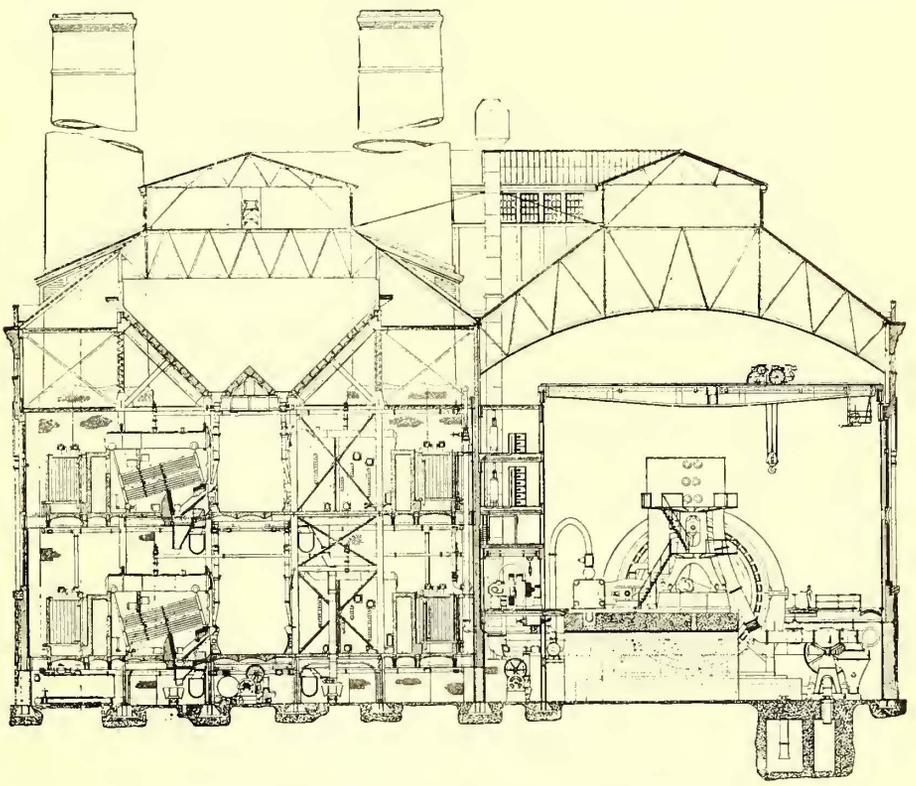


FIG. 2.—CROSS-SECTION OF MANHATTAN POWER STATION

Tables Nos. 1 and 2 give data and cost of rubber and paper insulated three-conductor, lead-covered cables with 00 conductors, for voltages ranging from 5000 to 20,000. It will be observed that above 10,000 volts for rubber and above 15,000 volts for paper insulated cables the cost increases so rapidly as almost to make these the limiting voltages for underground distribution.

Figs. 5 and 6 are respectively a cross section and a photograph of a three-conductor, lead-covered cable.

In some installations one cable for each rotary has been run between the power plant and the sub-station. In other instances a standard size of cable has been adopted for the system, and a number of cables run to each sub-station corresponding to the estimated load. An extra cable should always be provided, so that the maximum load of the sub-station may be carried with one cable out of service.

Conduit.—Several forms of duct have been used for underground conduits. The old wooden pump-log ducts have been abandoned because the wood rots and the juices in the wood act chemically on the lead covering of the cable. The ducts at present laid are usually of cement-lined iron pipe, tile in either single or multiple duct, and concrete tubes. It pays to imbed the ducts well in concrete, so that an excavation under the conduit line will

* Reproduced from the Street Railway Journal, Jan. 5, 1901.

† See Street Railway Journal, July 18, 1903.

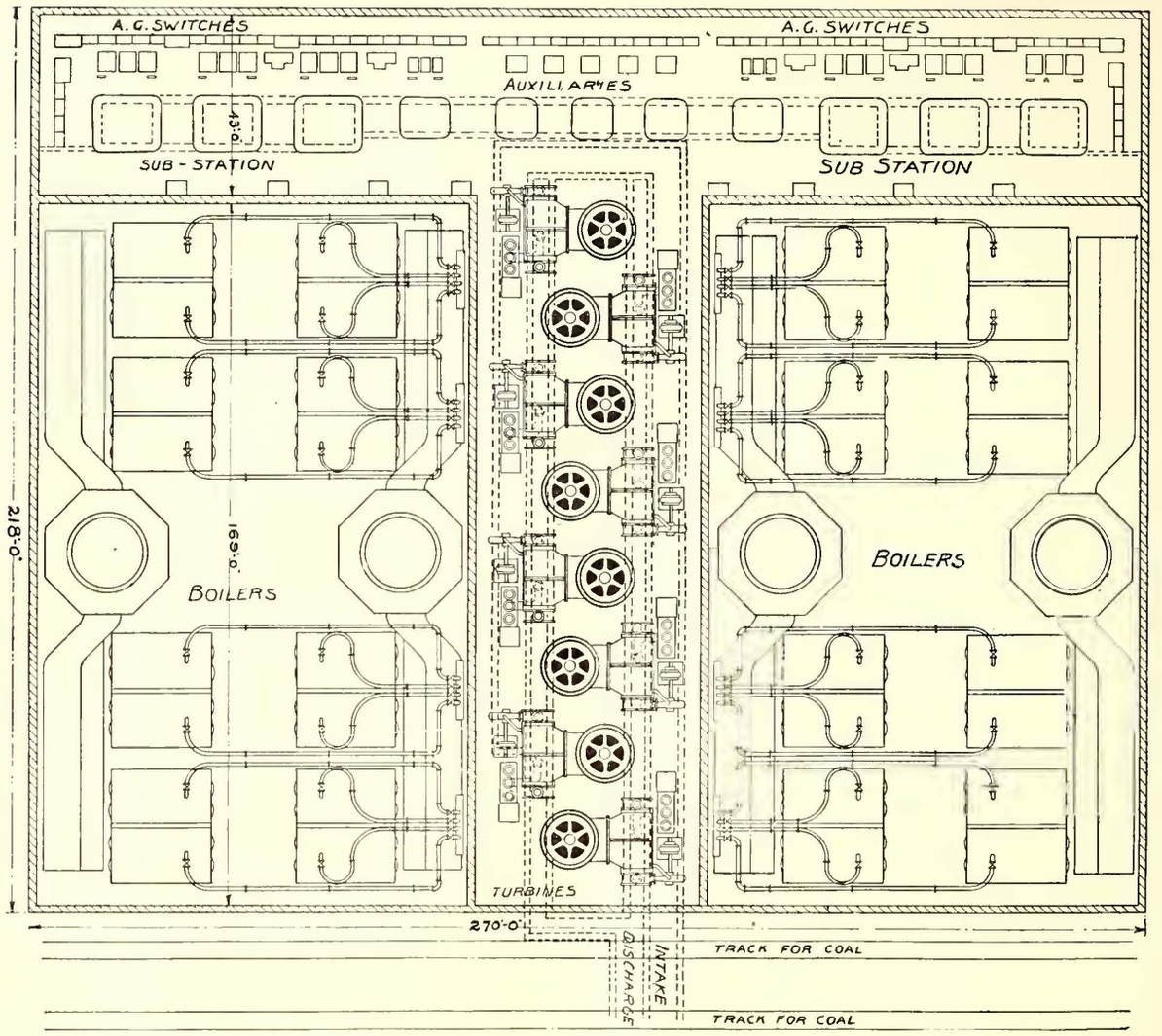


FIG. 3.—PLAN OF PROPOSED TURBINE STATION AND SUB-STATION

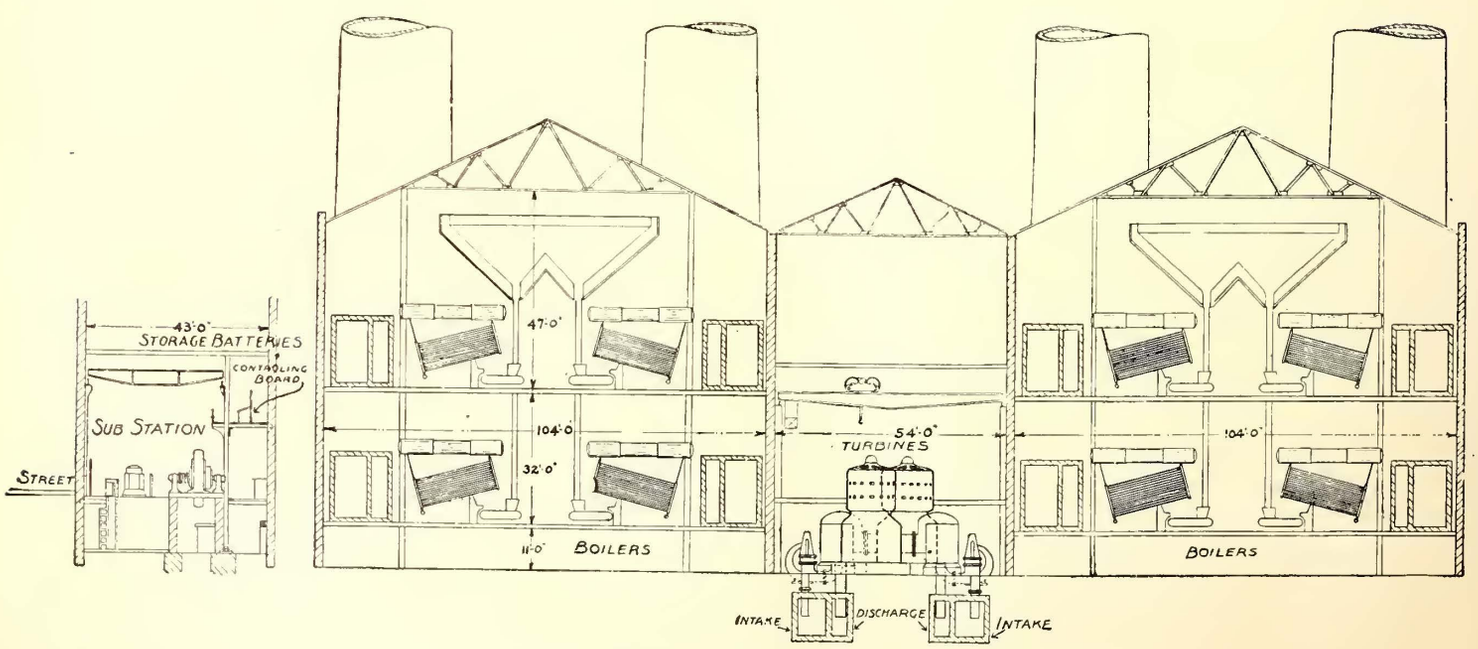


FIG. 4.—CROSS-SECTION OF PROPOSED TURBINE STATION AND SUB-STATION

not cause settling. The spacing of the brick manholes is usually determined by the obstructions met with in the street, but may be put down as averaging about 400 ft. apart. In some recent installations great precautions have been taken to avoid the danger of fire and damage to other cables, arising from a short circuit in one of the high-tension cables. The high-tension cables have been kept to themselves and at the manholes they have been wrapped with asbestos cloth. The destructiveness of a short circuit on underground high-tension cables has not proven as great as was anticipated. In one instance a laborer drove a pick through a 6600-volt three-conductor cable without experiencing any shock, or producing any great amount of pyrotechnics. It was fortunate for the laborer that the pick had a long wooden handle. The lack of destructiveness in the arc is probably due to the quick action of the automatic circuit breakers at each end of the cable, and also to the fact that although the pressure is of great intensity, the current flow is small. Fig. 7 is a photograph of several sections of duct for underground conduits.

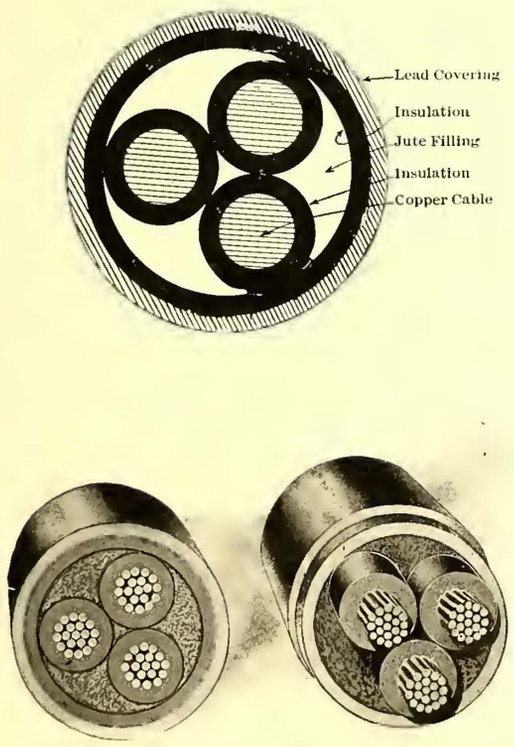
Sub-Stations.—The location and number of sub-stations might form the subject of an interesting discussion as to the relative costs of interest on feeder investment, sub-station equipment and maintenance and operation of sub-station, were it not for the fact that for city use the location of the sub-stations is pretty closely determined by a study of the density of the traffic. The congested points are closely marked, but where doubt exists as to the wisdom of several locations, an estimate of the costs in either case, together with the expense of maintaining and operating the sub-stations, will quickly determine which is the better plan.

TABLE I.—RUBBER INSULATED LEAD COVERED, THREE NO. 00 CONDUCTOR CABLES
For three-phase, alternating current underground distribution. Cables to be carried in tile or concrete duct, one cable in each duct

Working Voltage	Outside Diameter of Cable	Thickness of Envelope of Each Conductor	Thickness of Envelope Around Conductors	Thickness of Lead Covering	Weight per Foot	Cost per Foot	Test Voltage for 1 Minute	Minimum Radius of Bending	Working Capacity Each Conductor Amperes per Sq. In. of Cross Section Temp. Rise, 30° C.
5,000	1 13/16 inches	3/32 inch	3/32 inch	3/32 inch	4.86 lbs.	$0.64	15,000	10 7/8 inches	1,150
7,500	2 "	4/32 "	4/32 "	4/32 "	5.50 "	0.91	22,500	12 "	1,150
10,000	2 9/32 "	5/32 "	5/32 "	1/8 "	7.24 "	1.16	30,000	13 5/8 "	1,150
12,500	2 15/32 "	6/32 "	6/32 "	1/8 "	8.27 "	1.37	35,000	14 3/4 "	1,150
15,000	2 3/4 "	7/32 "	7/32 "	1/8 "	9.29 "	1.62	40,000	16 5/8 "	1,050
17,500	2 31/32 "	8/32 "	8/32 "	1/8 "	10.22 "	1.79	45,000	17 3/4 "	1,050
20,000	3 5/32 "	9/32 "	9/32 "	1/8 "	11.15 "	2.08	50,000	19 "	1,050

TABLE II.—PAPER INSULATED LEAD COVERED, THREE NO. 00 CONDUCTOR CABLES
For three-phase, alternating current, underground distribution. Cables to be carried in tile or concrete duct, one cable in each duct

Working Voltage	Outside Diameter of Cable	Thickness of Envelope of Each Conductor	Thickness of Envelope Around Conductors	Thickness of Lead Covering	Weight per Foot	Cost per Foot	Test Voltage for 1 Minute	Minimum Radius of Bending	Working Capacity Each Conductor Amperes per Sq. In. of Cross Section. Temp. Rise 35° C.
5,000	1 7/8 inches	7/64 inches	7/64 inches	1/8 inch	5.5 lbs.	54.8 cts.	15,000	15 inches	1,150
7,500	2 5/32 "	5/32 "	5/32 "	1/8 "	6.52 "	61.6 cts.	22,500	17 1/4 "	1,150
10,000	2 3/8 "	6/32 "	6/32 "	1/8 "	7.26 "	66.4 cts.	30,000	19 1/2 "	1,150
12,500	2 1/8 "	7/32 "	7/32 "	1/8 "	8.04 "	72.9 cts.	35,000	20 1/2 "	1,150
15,000	2 3/4 "	8/32 "	8/32 "	1/8 "	8.84 "	78 5 cts.	40,000	22 "	1,050
17,500	2 31/32 "	9/32 "	9/32 "	5/64 "	10.60 "	88.5 cts.	45,000	23 3/4 "	1,050
20,000	3 1/16 "	10/32 "	10/32 "	9/64 "	11.28 "	93.2 cts.	50,000	25 1/2 "	1,050



FIGS. 5 AND 6.—CROSS-SECTION OF THREE-CONDUCTOR CABLE

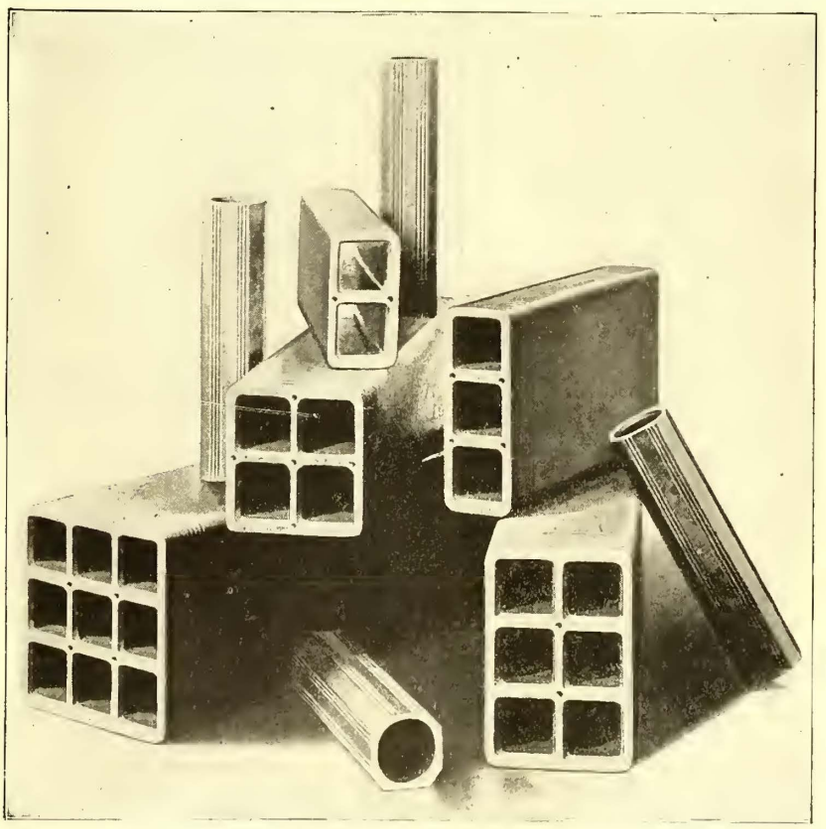


FIG. 7.—DUCTS FOR UNDERGROUND CONDUIT

In interurban construction there are two different opinions maintained regarding sub-stations. One is that sub-stations should be miniature power stations, contain a large quantity of apparatus, in charge of skilled attendants, and be spaced at rather long intervals along the road; the other idea is that sub-stations should be frequent, contain little reserve, and should be taken care of by the station agent or some other employee, whose principal duties are not the caretaking of the sub-station. In city practice, however, there is no question but that the sub-station should be designed and built with as much care as that used in the power plant construction, that it should contain reserve apparatus enough to tide over any ordinary breakdown, and that it should be constantly in charge of skilled attendants.

The high-voltage current entering the sub-stations is handled by brick-enclosed, oil-break, motor-operated switches, just as in the power station. From the switches it passes to transformers, where its voltage is decreased to that suitable for driving the converters. This current, fed in at the alternating-current end of the rotary converters, produces the 575-volt or 600-volt direct-current which is sent to the direct-current bus-bar for transmission to the trolley wire. The transformers are cooled either by water circulating around the shell or by air blown through the windings.

Rotary Converters.—A size of rotary converter which has been largely adopted for city work is 1000 kw, although one large installation has 1500 kw rotaries. There seems to be no reason why rotary converters should not be built in as large sizes as direct-current generators, which have been successfully built in sizes of 2500 kw. The rotary converter is just as reliable a machine as the direct-current generator, and there should be the same reserve capacity in sub-station as allowed in a direct-current station; that is, one reserve machine to every three or four units. Where the load is subject to sudden fluctuations, it is customary to place a reactive coil in the transformers and provide the rotaries with series windings on the pole pieces, in addition to the shunt windings. For city use rotaries have simple shunt fields, and if they are kept well loaded at all times, their direct-current voltage is uniform. The sub-station of a large city system has such a large output that the momentary fluctuations noticeable in a small system are lacking. The load varies with the time of day; the attendants usually have plenty of time to prepare for any change in load, and there is no reason why they should not keep the rotaries well loaded.

Storage Batteries for Sub-Stations.—Storage batteries have been installed in many of the large sub-stations for the purpose of steadying the load on the rotary converters, taking care of the peaks of the load and creating a reserve capacity in the sub-station in case of a breakdown of the machinery. If it is possible, with any reasonable degree of accuracy, to draw the load curve for a proposed sub-station, the question of whether it is more economical to install rotary converters or storage batteries to take care of the peaks may be determined in advance. Most railway load curves show peaks in the morning and evening, some portions of which may be taken by batteries working up to their one-hour rate, provided the duration of the peaks is not too long. In case the shape of the peak is such that no portion of it is of shorter duration than three or four hours, the cost of a battery for handling it would probably be excessive. It should be taken into account that a sub-station battery carrying the peak of the load not only takes the place of a certain amount of rotary capacity, but exercises a valuable smoothing-out effect on the load, replacing an equivalent amount of station capacity at the central power plant; so that the investment in battery should be compared with the investment in rotaries, high-tension feeders, and in generator and steam plant capacity thus dispensed with at the power plant. Figured at the one-hour discharge rate, the relative first cost of storage battery as compared with rotary converter, feeder and steam plant is approximately $90 per kilowatt for the storage battery and $130 per kilowatt for the converter plant, steam plant and transmission line, the latter figure being $30 for the rotary plant and $100 for the steam plant and transmission line. This estimate for rotary and steam plant is based on the nominal ratings of the machines and does not take into account their overload capacities. A battery worked on the peak at its one-hour rate is likely to cost about the same or somewhat less than the apparatus which it displaces.

The value of the storage battery as a reserve in heavy sub-station work depends upon the comparative amount of storage battery and rotaries which has been installed. If the sub-station contains a small amount of battery and a large amount of rotary, the reserve value of the battery is likely to be small; if, however, the short duration and sharp nature of the peaks has warranted a comparatively large battery installation, the battery may be of sufficient size to handle the entire load of the sub-station during the lighter hours of the day for a period long enough to tide over a breakdown, provided that this period is not longer than half to three-quarters of an hour. While the battery may replace those rotaries which would be operated for an hour or two on the peak, it cannot be depended upon to take the place of those machines which run throughout the entire day. The reserve feature of a storage battery is especially valuable because it may be put into service immediately, and in this it has the advantage of the steam plant, where time is required to get boilers ready for steaming.

In laying out a sub-station, it would be well to design the building with reference to the future installation of storage batteries, even if it is not intended to install them at once. No general statement can be made in regard to the advisability of their installation, as that should be figured out for each special case.*

Low Tension Switchboard.—The feeder board for the sub-station and the 500-volt feeders leading from it to the trolley sections are practically the same as those used in connection with a direct-current station, and all of the devices installed in the best direct-current stations for the detection and isolation of trouble on the trolley sections should also be placed in the sub-stations.

THE RELATIVE ADVANTAGES OF ALTERNATING AND DIRECT-CURRENT GENERATION AND TRANSMISSION

With a desire of learning exactly what are the conditions in the cities of the United States, a circular letter was mailed to roads in all cities of more than 100,000 inhabitants. The information is tabulated in Table 3 for those railways from which answers were received. It will be observed that the use of alternating current for city work is at present largely confined to the operation of suburban roads from city power stations. With the exception of New York, most of the other cities have a mixed system, direct current being used for city work and alternating current for suburban work. Brooklyn and Philadelphia are now building alternating-current stations, and Chicago will probably soon begin the change to alternating-current distribution. With the single exception of New York, all cities of more than 200,000 inhabitants have from three to eight power stations. Whether this condition is more economical or more desirable than distribution from a single power station is a problem which must be solved for each special case. The number of American roads using alternating current for purely city work is at present very small, but it is likely that within the next few years many city roads will change partially, at least, to the alternating current system.

In Table 4 is tabulated general data regarding the alternating-current installations in the large cities. It is difficult to tabulate such data because special conditions exist in nearly every case. It will be noted that three-phase distribution and a periodicity of 25 cycles per second is nearly universal.

A discussion of the relative advantages of alternating and direct-current generation and transmission involves a discussion of:

(1) The relative economy and reliability of generation and transmission, and

(2) The relative advantages of one and several power stations.

The transmission losses in the feeders and return circuit from a direct-current station depend entirely upon the quantity of copper which it is deemed advisable to put into the feeders. For a city transmission where the feeders are long, and where concentrated loads are likely to occur at long distances from the power station, the transmission losses are probably between 15 and 20 per cent at maximum load in a well-installed system.

In an alternating-current transmission, the losses at maximum load are likely to be about as follows:

High-tension feeders	3 per cent
Transformers	2½ per cent
Rotary converters	5 per cent
Low-tension feeders .....7 to 10 per cent	

making a total transmission loss between the generator and the trolley wire of 17½ to 20½ per cent, which is about the same as that estimated for the direct-current transmission. From these figures it will be seen that if the generating plant in the direct-current station is as economical as that in the alternating-current station, alternating-current generation and transmission should be no more economical than that by direct current.

As to the relative reliability of alternating and direct-current transmission, the latter has many advantages, owing to its greater simplicity. In the direct-current transmission the current is sent straight from the direct-current switchboard to the trolley feeders, while in the case of alternating-current transmission, there are interposed in the circuit, in addition to everything required in direct-current transmission, the alternating-current switches, the high-tension feeders, the step-down transformers and the rotary converters. A failure of any piece of apparatus in this chain, or a mistake of any operator, is likely to cripple the system. With equal standards of workmanship and with an equal quality of op-

* Sub-station plans are shown of the Manhattan Railway, which are reproduced from the Street Railway Journal of Jan. 5, 1901.

erating skill in the two cases, the direct-current system would be the more reliable.

The real problem which confronts most railroad companies in large cities is the question of the substitution of an alternating-current plant equipped with modern machinery in large economical units to replace several direct-current plants badly located fireproof, and if the plant is constructed on the unit system, it would be a very great calamity which would cripple more than one unit. An accident throwing out of service one unit would not be so serious as an accident incapacitating one power station, and thereby crippling the service in one part of the city. It is likely, however, that the greatest advantages of the one central

TABLE III.—GENERAL DATA CONCERNING POWER STATIONS IN THE LARGE CITIES OF THE UNITED STATES

City	Name of Railway Company	Population of City	Square Miles of Territory	Mileage in City Limits	Mileage Outside City Limits	Number of D. C. Power Stations	Capacity of D. C. Stations, Kilowatts	Number of A. C. Power Stations	Capacity of A. C. Stations, Kilowatts	Remarks
New York	Metropolitan Street Ry. Co	1,850,093	40	230	----	----	------	1	38,500	Another A.C. station soon to be put in operation
	Manhattan Ry. Co		40	84	----	----	------	1	40,000	
Chicago	Chicago City Ry. Co	1,698,575	40	175	-	3	11,580	----	------	A.C. station proposed to replace present stations
	Union Traction Co		110	80	50	5	17,250	----	------	
Philadelphia	Philadelphia Rapid Transit Co	1,223,697	----	445	30	7	31,500	2	17,000	A. C. station under construction
Brooklyn	Brooklyn Rapid Transit Co	1,166,582	200	520	----	6	28,160	1	16,200	
St. Louis	St. Louis Transit Co	575,238	65	315	44	4	26,800	1	2,500	
	St. Louis and Suburban Ry. Co		125	41	52	2	3,075	1	2,400	
Boston	Boston Elevated Ry. Co	560,892	116	----	----	8	36,844	----	------	
Baltimore	United Railways and Electric Co	508,957	----	----	----	----	------	----	------	
Pittsburg and Allegheny	Pittsburg Railways Co	451,512	375	424	179	6	19,200	2	13,050	
Cleveland	Cleveland Electric Ry. Co	381,768	----	----	----	3	16,150	----	------	
St. Paul and Minneapolis	Twin City Rapid Transit Co	366,350	150	232	20	6	6,500	1	5,600	
Buffalo	International Railway Co	352,219	----	202	156	2	3,900	1	3,000	Also rents power from Niagara Falls
San Francisco	United Railroads of San Francisco	342,782	68	249	27	5	7,695	1	4,800	
Cincinnati	The Cincinnati Traction Co	325,902	75	181	35	5	15,000	----	------	
New Orleans	New Orleans City R. R. Co	287,104	----	----	----	----	------	----	------	
Detroit	Detroit United Ry. Co	285,704	----	189	311	6	12,060	2	2,000	
Milwaukee	Milwaukee Electric Ry and Light Co.	285,315	----	----	----	----	------	----	------	
Washington	Washington Ry. and Light Co	278,718	----	107	38	4	4,750	1	600	
Newark	Public Service Corporation	246,070	----	----	----	----	------	----	------	
Kansas City, Mo. and Kan.	Metropolitan Street Ry. Co	215,170	----	167	15	5	8,950	1	9,000	A. C. station under construction
Jersey City	Public Service Corporation	206,433	----	----	----	----	------	----	------	
Louisville	Louisville Railway Co	204,731	20	122	18	1	6,000	----	------	
Providence	The Rhode Island Co	175,597	----	163	101	1	7,500	1	3,500	Combined A. C. and D. C. station under construction
Indianapolis	Indianapolis Street Ry. Co	169,104	----	----	----	----	------	----	------	
Rochester	Rochester Railway Co	162,435	68	93	59	2	2,620	1	600	A. C. for use on suburban roads
Denver	Denver City Tramway Co	133,859	67	145	3	3	5,000	1	1,500	
Toledo	Toledo Railway and Light Co	131,822	29	100	2	1	4,000	----	------	
Columbus	Columbus Railway Co	125,560	----	82	25	2	------	----	------	A. C. station proposed
Worcester	Worcester Consolidated St. Ry. Co	118,421	----	60	80	4	7,475	----	------	Change to A. C. for suburban lines under consideration
Syracuse	Syracuse Rapid Transit Ry. Co	108,374	25	56	----	1	4,090	----	------	
New Haven	Fair Haven and Westville R. R. Co	108,027	25	47	53	2	2,975	----	------	
Paterson	Public Service Corporation	105,171	----	----	----	----	------	----	------	
Fall River	Massachusetts Electric Companies	104,863	650	123	207	10	13,317	2	14,000	Largely an interurban system
St. Joseph	St. Joseph Ry., Lt., Heat & Power Co	102,979	----	----	----	----	------	----	------	
Omaha	Omaha Street Railway Co	102,555	50	120	10	2	3,500	----	------	
Los Angeles	Los Angeles Railway Co	102,479	25	100	----	1	5,000	----	------	Suburban system run independently
Memphis	Memphis Street Railway Co	102,320	50	58	14	1	3,000	----	------	
Scranton	Scranton Railway Co	102,026	140	32	45	2	2,660	----	------	

with reference to the load and containing more or less antiquated apparatus. It may be argued in favor of the operation of several power plants, as against one, that the power plants being located in different parts of the city, there is little likelihood of the same fire, flood, cyclone or other calamity destroying all of them, and thus entirely crippling the road. This, and the fact that the plant is the fact that better supervision may be obtained, as it is much easier to get one good set of operators than several, and in times of trouble it is much easier to keep one plant in operation than several. The economy of generation where the same quality of apparatus is installed would not vary greatly, as the cost per kilowatt for the generation of power decreases very slightly

TABLE IV.—DATA CONCERNING THE USE OF ALTERNATING CURRENT IN VARIOUS LARGE CITIES OF THE UNITED STATES

Name of Company	Location	No. of Alternating Current Generating Stations	Capacity of A. C. Stations. Kw.	Generating Voltage	Periodicity	Generation 1, 2 or 3 Phase	Transmission Voltage	Transmission 1, 2 or 3 Phase	No. of Sub-stations	Capacity of Sub-stations. Kw.	Remarks
Metropolitan Street Railway Co	New York	1	38,500	6,600	25	3 phase	6,600	3 phase	8	41,000	Second A. C. station under erection
Manhattan Railway Co	New York	1	40,000	11,000	25	3 phase	11,000	3 phase	8	63,900	
Philadelphia Rapid Transit Co	Philadelphia	2	17,000	13,200	25	3 phase	13,200	3 phase	Undetermined	Undetermined	Change to A.C. transmission contempl'td
Brooklyn Rapid Transit Co	Brooklyn	1	16,200	6,600	25	3 phase	6,600	3 phase	6	22,500	Intended to use both A. C. and D. C.
St. Louis Transit Co	St. Louis	1	2,500	6,600	25	3 phase	6,600	3 phase	1	2,400	
St. Louis and Suburban Ry. Co	St. Louis	1	2,400	6,600	25	3 phase	6,600	3 phase	2	2,400	
Pittsburg Railways Co	Pittsburg	2	----	1,100 / 2,200	60	2 phase	5,000 / 10,000	3 phase	8	3,200	
Twin City Rapid Transit Co	Minneapolis	1	5,000	3,500	34	3 phase	3,500 / 12,000	3 phase	4	4,800	
International Railway Co	Buffalo	1	3,000	11,000	25	3 phase	11,000 / 22,000	3 phase	8	10,200	A. C. also rented from Niagara Falls Co.
United Railways of San Francisco	San Francisco	1	9,600	13,200	25	3 phase	13,200	3 phase	3	7,000	
Detroit United Railway Co	Detroit	2	2,000	400	25	3 phase	16,000	3 phase	7	3,550	
Washington Railway and Light Co	Washington	1	600	6,600	60	2 phase	6,600	2 phase	3	1,200	
Metropolitan Street Railway Co	Kansas City	1	9,000	6,600	25	3 phase	6,600	3 phase	4	8,000	Ultimately one D.C. and one A.C. station
Rochester Railway Co	Rochester	1	600	375	25	3 phase	11,300	3 phase	2	500	
Denver City Tramway Co	Denver	1	1,500	2,300	25	3 phase	2,300 / 26,000	3 phase	3	2,000	A. C. for use on suburban roads
Massachusetts Electric Companies	Boston	2	14,000	13,200	25	3 phase	13,200	3 phase	10	12,750	Change to A. C. transmission in progress
Rhode Island Company	Providence	1	3,500	11,000	25	3 phase	11,000	3 phase	5	4,000	A. C. for use on suburban roads
Louisville Railway Co	Louisville	1	3,300	13,200	25	3 phase	13,200	3 phase	3	2,900	A. C. station under construction

direct-current system is the simpler and the more easily comprehended by ordinary power plant men, are about the only arguments which may be advanced for the several power plant plan.

In a large city convenient locations for water, coal and railroad facilities are not easy to obtain near the center of load, and it is obviously much easier to obtain one good location for a central power plant than several good locations to supply different parts of the system. A central power station should be absolutely after a large output has been reached, and it is assumed that in either case the plants would be of large size. To choose between the direct and alternating-current systems, very careful estimates of the cost of installation and operation should be made in each case, and decision should be reserved until after these estimates are compared.

In some of our largest cities, where heavy loads must be taken care of at long distances from the central station, or where the

central station cannot be located near the center of the load, or where reasons exist, such as cheap coal, water transportation, etc., for locating the central station away from the center of load, alternating current distribution from a central station will probably be found the more economical; but if a location for an economical power plant may be obtained near the center of load, and the total city load is comprised within a radius of 5 miles from this point, as is the case in most cities of less than 250,000 inhabitants, it is probable that direct-current generation and distribution from this central station will prove the more desirable. Where doubt exists, preference should be given to the direct-current system on account of its greater simplicity, unless there is likelihood of a great expansion of the system in the near future, when direct-current transmission might prove burdensome. In case the direct-current system is adopted, suburban lines too long or too heavy for 500-volt transmission may be supplied by alternating current generated in the power plant for their use, or by means of boosters. If the suburban lines are of moderate length or if they require normally only a small amount of power, and make unusual demands upon the power plant only at intervals, such as on holidays and pleasant Sundays, which is the condition on many suburban roads, these lines can best be taken care of by means of boosters, and the same boosting system may be useful in operating some of the city lines. A company which installs an alternating-current transmission system on its heavy city lines merely to furnish power for a few light straggling suburban lines more economically, would place itself in the illogical position of allowing the tail to wag the dog.

It is difficult to make any recommendations as to the choice between alternating and direct-current distribution in merely an abstract discussion. All that can be done is to give the arguments pro and con, with the advice that each case of generation should be figured out for itself, and no plan adopted until its advantages had been thoroughly demonstrated. The discussion in this paper has been on current generation and distribution for use in large cities. The question of long distance transmission has not been taken up, and no attempt has been made to discuss the question of the supply of current for interurban roads, or for cities where the principal part of the load comes from interurban or long suburban roads. For these cases, alternating-current transmission unquestionably offers great advantages.

THE RIGHT OF WAY

BY HERBERT H. VREELAND

It has always seemed to me, when the question of the right of way of street cars has been under discussion in our societies, that it has been approached from the wrong point. This defect in the discussion seems to arise from a lack of clear statement of what is meant by "right of way." Street railroads, in the sense that steam railroads enjoy this privilege, have no "right of way." A steam railroad operates along a strip of land, owned in fee, which it holds and uses for its special purposes against all intruders, and it can only be obstructed by trespassers. The case of a street railway is entirely different. It has a franchise to go along a rigid and appointed route on thoroughfares which are used in common by pedestrians and vehicles of every description.

This being the case, the question of "right of way," in so far as it is applicable to street railroads, becomes one not of right of way but of precedence, since the general public has equal rights on the road. These roads or streets being dedicated to public use, it is the duty of the authorities to see that they are so policed as to obtain for the greatest number of people the fullest and freest use of the facilities which they afford. If street railroad men would view the topic from this point of view and insist that the streets are for the use of the people instead of corporations or individuals, the whole question, in a short time, would take on a different aspect. A railroad company is permitted primarily to exist, not for the aggrandizement of its owners or operators, but for the accommodation of the public. An individual citizen who enters and pays a fare does not thereby relinquish any of his rights to free passage along a public street, and there is hardly an hour of the day or night in which he can enter a car on a street anywhere in a city without finding company, so that the vehicle in which he rides represents not only his individual right, but the assembled rights of all his fellow passengers; and so it has always seemed to me, viewing the question from the standpoint I have indicated, that a crowded car, full of people, should, by mere preponderance of the number of individuals it contained, have a superior right of passage to a vehicle with a single individual in it, or to a van containing merchandise. If, before public bodies, it was unanimously insisted by railroad men that the reason they demanded "right of way" was because of their passengers, I think it would disarm much of the resistance which has met the attempt to secure police co-operation.

A good analogy between the rights which all street railroad operators claim for their vehicles is to be found in the rules of the road concerning United States mail vans. These have the right of way everywhere, and it is a misdemeanor to obstruct their free movements. The reason of this is not because the wagon is labeled "United States Mail" or because of any superior authority vested in the driver, but because the vehicle contains hundreds—it may be thousands—of business communications involving complicated business interests. For the same reason, I have always held that a street car containing a crowd of people, necessarily in haste or they would find a cheaper and more leisurely way of reaching their destination, had rights superior to other vehicles on street surfaces.

Added to all this is the fact that these public conveyances are restricted in their movements to a fixed way, whereas the others, in addition to being lighter and more easily moved, have a flexibility of route denied to tramcars.

FREIGHT AND EXPRESS ON ELECTRIC RAILWAYS

BY J. B. McCLARY

There is no more vital subject before the street railways of the country to-day than the one assigned to the writer by this association, that is, "Freight and Express on Electric Railways." The main idea of the railway business is to make money, and any manager who attempts to operate a line without taking on everything he can find or think of that is permitted by his charter to increase his earnings, is standing in his own light. Some of the answers to my circular letters for information as to the experience of the companies were amusing, among them several underscored *"No's"* in answer to the question, "Do you handle freight?" and followed by reasons which would indicate that the parties making the answers had a supreme contempt for the idea. Others would answer that they did not, but were deeply interested in the subject and would await the publication of this paper with much interest.

Several requested advance copies of any table which might be compiled from the answers to the circulars, as they were themselves seeking information on the subject.

One enthusiastic manager courteously answered all questions, even to the figures showing his profits, and added, "This is velvet," and his "velvet" amounted to many thousands of dollars. Right here I want our people to stick a pin. It is in the word used by our enthusiastic friend.

That it is "velvet" there is no doubt, if you would engage in the business and not let expenses eat it up. There is no excuse for this, for almost under any conditions now known to the fraternity, freight and express can be cheaply hauled on the electric railway, that is, of course, where it is permitted, or rather not prohibited by charter or statute.

From the timid requests of a passenger to the conductor or motorman to "Please let me carry this box on the platform," to magnificent freight trains operated separately from passenger service or trailers attached to passenger cars, is the evolution of the freight and express business on electric railways in the past dozen years. The electric railway is responsible for more suburban towns than any other factor. Civilization itself has no more potent aid than the trolley car. Indeed, the electric motor is civilization's maid of honor, and when with the trolley cars we administer to man's need and comfort, we should not neglect anything that man wants that is within our range. From observation and research, I am sure of one thing, and that is that the personal opinions and characteristics of a railway manager directly or indirectly effect the happiness and comfort of the community served by his road. The relations of a railway to the public are varied and complex. Let a car break down and it will be very interesting to know how much each individual passenger was discommoded and the real cause of his discontent. Hence, I say we can add to the comforts or discomforts of our customers by merely following to a certain extent our personal inclinations, or be bound by our prejudices in doing or not doing things that are requested or demanded by our patrons. I am led to these remarks by the answers of over fifty managers that they did not handle freight, when I know or believe they would profit by it if they should engage in the business. The deduction follows that they would please the community if they did. Of course, local conditions have a great deal to do with this matter; in fact, no general rule can be laid down for the guidance of the street railways, except that of expediency. There is only one general prop-

osition in connection with this question, and that is that the people want everything good that can be had. That electric railways can serve the public in transporting passengers to their satisfaction is proof that they can surely serve the same people in hauling freight and express matter, and do it safely and profitably.

Upon investigation of 182 roads, we find that seventy-one roads handle freight and express, forty-five roads admit that it is profitable and that they intend to increase their facilities for handling their business, thirty-seven say that this is a very attractive feature of electric railroading, while nine answer that while they carry freight, they do not think well of it. Thirty-five roads use the steam railroad classification of their states or railroad districts, others have rate sheets of their own based upon local conditions and generally much lower than the steam railroads. Thirty-eight have depots at terminals and along their lines, and nine say they have none. Twenty-four are silent on this subject. Eighteen handle steam railroad cars on their line. This is particularly a fine feature, provided the track is good and the special work will allow it. Of course, this cannot be done in many cities and towns, but on the outskirts and suburbs, where factories and mills are located, it can be made to pay handsomely. Fifty roads have separate freight cars or trains, three have trailers attached to passenger cars, and eight handle packages on passenger cars. One hundred and eleven answered that they do not handle freight at all. Seventeen of these admit that they believe it should be done, and four of the 111 request information, stating that they are interested in the idea. Compiling our 182 letters, we have the following:

Handle freight and express on electric railways	71
Do not handle freight and express	111
	182
Profitable	45
Doubtful	9
Leased to local express companies	5
Non-committal	10
Non-profitable	2
	71
Attractive	37
Steam railroad classifications	35
Depots	38
Handle steam cars	18
Separate freight trains	50
Trailers	3
Use passenger cars	8

Thirty-three freight-carrying roads do not handle steam cars. Six have flat rates. The biggest development seems to be in the Middle West. Thirty-seven roads reported the gross earnings from freight and express for 1902 as aggregating over $1,000,000, the amounts ranging from $1,000 to $1,000,000 in round numbers, or an average of over $27,000 per road. The operating expenses of the freight department do not seem to be very accurately kept, or at least the same details in accounting are not adhered to as are other features of the business. This is of course a matter of private concern to each company, but our Accountants' Association will get this straight pretty soon, as they do all other important matters connected with railway work.

The most expensive plan we find is that of running wagons to collect parcels from shippers and to deliver them to the consignees. We are unable to find that this pays as great a profit as where it is not attempted. In a large city the most attractive plan, it would seem, would be to let a separate express or parcel company do this and pay the railroad company a certain amount for cars or space, or a per cent of the gross receipts and the railroads have nothing to do with it, except to merely haul the goods for the express company. Something on this order is done in St. Louis, Baltimore, Cleveland, New Haven, Portland (Oregon), and New York. Figures, however, that would be of interest to the association are not available from these cities, but it seems to be a safe proposition and everybody satisfied with the results.

The method of handling freight and express on electric railways is the next thing to be considered. The data obtained forms the most interesting part of this paper. As to rates, we have mentioned that thirty-five roads heard from use steam railroad classifications. There may be some very good reason for this, but it seems to the writer that if otherwise practicable, this need not be done. In Indianapolis and some other places the tag system is in use. This is very good. Tickets or tags are sold to merchants, farmers and others, and when a package is to be shipped by express or freight, the shipper merely consults a schedule of rates and attaches to his package a ticket that will carry the package to its destination. These tags are sold in certain quantities, having values of different denominations, and work satisfactorily, the tag going to the auditor in the place of cash.

The Rockford, Ill., road has a nice system in use. This was described in a recent issue of the Street Railway Review:

The express business of the company, which is in charge of Mr. J. H. Groneman, general passenger and express agent, was started on June 16, 1902, and, although but barely a year old, this branch of the company's business has already reached very creditable proportions. While this business has been well advertised locally, its rapid development has been largely due to the energetic management of Mr. Groneman, who has constantly made a personal canvass of all the shippers and merchants of Rockford and the surrounding territory. Every possible effort has been made to give prompt service and to offer every possible accommodation to the merchants and other shippers in the vicinity of the road, and the success of this undertaking is shown by the fact that, whereas it was at first almost impossible to fill one express car making two round trips daily between Rockford and Belvidere, this business has now entirely outgrown the capacity of one car, and two other cars of considerably larger size are being built as rapidly as possible to take care of this constantly increasing branch of the company's business. One of the methods employed to favor customers and to increase the express business of the company is, we believe, entirely novel and has been found very effective. For example, if a dealer in Belvidere finds that he is short of any line of goods for which he has a demand, instead of looking for the goods himself he telephones an order for what he wants to the company's express agent in his town. This order is telephoned by the local agent to the general agent in Rockford, who purchases the goods and ships them to Belvidere by the next electric express. In this way the dealer in Belvidere receives his goods in the shortest possible space of time, often not even knowing where they have been purchased. While the electric express has no traffic arrangements or other agreements with connecting steam roads, express consigned to different points is taken by the company and is afterward rebilled over other roads to its destination. The company has adopted the Illinois classification and charges practically the same rates as the steam roads, depending upon prompt and obliging service rather than cheap rates as inducements to shippers.

When freight is delivered to one of the company's agents the shipper signs the bill of lading which is made out in duplicate, the agent's stub being retained in the book in which it is bound and the duplicate being held by the shipper. The agent then makes out the way-bill, which is also in duplicate, a portion of one

Form 2

ROCKFORD & INTERURBAN RAILWAY COMPANY

From ..... To ..... Date ....., 190..

Way Bill No.	Car No.	Conductor's Name	Conductor's No.	Time

* When a through rate is used and the shipment is to be reway billed en route, the subdivisions must be shown in the rate column in road order, noting opposite each proportion the initial of the road to which it accrues.

Consignor, Connecting Line Reference, Original Car and Way Bill Number and Point of Shipment.	Marks, Consignee and Destination	Number of Packages	Articles and Classification, Conditions (O. R., C. R. Rel., Gtd., Etc.)	Weight	Rate and Authority *	Express	Advances	Prepaid	

WAY BILL. (SIZE OF ORIGINAL, 14 IN. X 4½ IN.)

of these way-bills being shown herewith. One of these way-bills remains in the book of the local agent, while the other accompanies the goods shipped. An express bill is also made out in triplicate showing the articles and marks, the weight, rate, express and advances. One of these triplicate forms called the "Delivery Ticket" is shown herewith. The other two similar forms are called the "Express Bill" and the "Cash Stub." One of these blanks is held by the local agent, one is given to the consignee when the goods are delivered, and the third is held by the general express and passenger agent and forms part of his cash account. The cash stub is in reality a bill, and where monthly accounts are kept with shippers it is only necessary to present this cash stub, which must agree with the delivery ticket held by the shipper, as both are carbon copies. This triplicate form therefore is very useful in that it prevents any dispute as to the amount of the bill rendered. Express matter is only delivered to the company's express stations in Rockford and Belvidere, and from these stations it is delivered to the consignee by local express

men. All regular shippers by this line fill out blanks shown in the accompanying illustration authorizing the company to deliver

ROCKFORD & BELVIDERE ELECTRIC RAILWAY COMPANY

Dear Sirs:
Please deliver to M.....
all express and freight consigned to me at .....
station. .....
Date, ..., 190

EXPRESSMEN'S ORDER FOR RECEIVING GOODS

all freight consigned to them to parties designated. The agents at Rockford and Belvidere make a daily report of all the express matter received and forwarded, this report being turned into the general office each morning covering the business of the previous day. Each agent keeps his own cash book and his own records of express received and forwarded. In addition to the daily report of express just mentioned, the agents also send in monthly an abstract of the month's business. The growth of the express business and the variety of express matter carried will be shown by a few of the principal items taken from the company's express records. These amounts cover the three months of October, November and December, 1902:

Fruit, including apples in barrels	71,305 lbs.
Sugar	14,090 lbs.
Groceries	101,744 lbs.
Flour	59,860 lbs.
Meat	63,734 lbs.
Beer	122,547 lbs.
Lumber	51,549 lbs.
Sewing machines and furniture	97,748 lbs.

We find a good form of receipt to shippers is used by the Schenectady road as follows:

ORIGINAL.

....., 190..

BY ELECTRIC EXPRESS CO.

Received from .....
The property described below, in apparent good order, except as noted (contents and condition of contents of packages unknown) marked, consigned and destined as indicated below, which said company agrees to carry to the said destination, if on its road, otherwise to deliver to another carrier on the route to said destination, charges to be collected in accordance with schedule of rates fixed or agreed for service designated by shipper under Class A, B or C, as explained below.

Class A Express Wagon Service both ends of line	Class B Freight No Wagon Service	Class C Express Wagon Service one end of line

Consignee, ...
Street and No., ...
Destination, ...

Marks		Value or C. O. D.	$	
No. Packages	Description			Weight Subject to Correction

NOT NEGOTIABLE

The delivery of said article to and its receipt for transportation by the Electric Express Company are on the express conditions, as printed on the back hereof, which are accepted and approved by the shipper.

Name of shipper, ...

Prepaid	Collect	On Account

The conditions upon which the above-mentioned property is received for transportation are printed on back hereof.

Electric Express Company,
Per, ...

Continuing, the Schenectady description below, finds a very attractive circular used by "The Electric Express Company," which is supposed to be an organization inside of the railroad company:

ELECTRIC EXPRESS COMPANY

Instructions for Shipping

This company is doing both an express and freight business, and our charges are based on the kind of service desired. We have, therefore, classified our service as follows:
"Class A"—Express service, includes collection and delivery.
"Class B"—Freight service, no wagon service whatever.
"Class C"—Freight service, includes wagon service one end.
In order that we may determine what class of service is desired it is very necessary that shippers enter on shipping orders the class under which goods are to be handled.
Unless specified on shipping order, Class "B" or "C," all shipments brought to our office or collected by our wagons will be treated as express, and charged for under "Class A."
It should be understood that express matter receives first attention at our hands, and while freight service is just as fast, preference in loading and delivery will be given to express business.
Receipt books will be furnished on application, and we respectfully request shippers to make out their own shipping orders, entering on the duplicate the class of service wanted, as per schedule given above.
Special attention should be given to blank spaces headed "charges," crossing out "collect" space when prepayment is desired.
Rates and further information will be furnished by agents or communications may be addressed to

Electric Express Company,
E. J. Ryon, Manager.

Schenectady, N. Y., March 25, 1902.

The Schenectady receipt from consignees, No. 2, is a most excellent form and is appended for the guidance of roads seeking information as to forms.

SHIPPING ORDER.

....., 190..

TO ELECTRIC EXPRESS COMPANY,

Please ship the packages enumerated below, which are in good order, marked, consigned and destined as below, to be carried to said destination, if on your road, otherwise to deliver to another carrier on the route to said destination, charges to be collected in accordance with schedule of rates fixed or agreed for service designated by shipper under Class A, B or C, as explained below.

Class A Express Wagon Service both ends of line	Class B Freight No Wagon Service	Class C Express Wagon Service one end of line

Consignee, ...
Street and No., ...
Destination, ...

Marks		Value or C. O. D.	$	
No. Packages	Description			Weight Subject to Correction

ELECTRIC EXPRESS COMPANY TAKE THIS.

The delivery of said article to and its receipt for transportation by the Electric Express Company are on the express conditions, as printed on the back hereof, which are accepted and approved by the shipper.

Name of shipper, ...

Prepaid	Collect	On Account

For Consignee:
Received from the Electric Express Company, in good order, the packages referred to and set forth in the foregoing shipping order.

....., Consignee.

The Elmira Water, Light & Railroad Company also uses the tag and stamp system.

The tariff sheet of the Des Moines, Iowa, Interurban Railway is reproduced in full as one of the simplest, yet most complete, in use.

Miles	Merchandise in Cents Per 100 Lbs.				Special Car Load Classes in Cents Per 100 Lbs.					
	1	2	3	4	5	A	B	C	D	E
5	12	10	8	6	4.7	4.8	4.7	4	3.3	2.71
10	12.5	10.5	8.5	6.5	4.97	5.2	4.97	4.22	3.51	2.75
15	13	11	9	7	5.23	5.38	5.23	4.44	3.7	2.96
20	14	11.5	9.5	7.5	5.51	5.56	5 51	4 67	3.85	3.09
25	14.5	12	10	8	5.71	5.82	5.71	4.84	4.04	3.23
30	15	13	10.5	8.5	5.91	5 95	5.91	5.06	4.18	3.34
35	15.5	13.5	11	9	6.12	6.14	6.12	5.34	4.32	3.46

Note 1.—Minimum charge, 25 cents.
Note 2.—Stations where there is no agent, charges must be prepaid.

Miles	Car Load Classes in Cents Per 100 Lbs.				Live Stock in Cents Per 100 Lbs.				In Cents Per Ton of 2000 Lbs.		
	Wheat, Flour, Millet, Flax Seed and Hungarian	Corn, Oats, Barley, Other Grain and Mill Stuffs	Hard and Soft Lumber, Lath, Shingles, Sash, Doors and Blinds	Salt, Lime, Cement, Plaster, Stucco	Horses and Mules in Car Loads; Minimum Weight, 20,000 lbs.; 31-ft. car inside	Fat Cattle in Car Loads, 19,000 lbs.; 31-ft. car inside	Hogs in Car Loads, Weight, 15,000 lbs.; 31-ft. car inside	Sheep in Car Loads, Weight, 10,000 lbs.; 31-ft. car inside	Hard Coal	Soft Coal—Lump and Nut	Soft Coal—Pea and Slack
5	4.27	3.56	3.33	3.09	5.1	4.87	5.39	8	57	28	24
10	4.46	3.72	3.48	3.22	5.46	5.25	5 7	8.36	60	32	27
15	4.65	3.88	3.62	3.35	5 81	5.62	6	8.74	64	36	29
20	4.84	4.04	3.78	3 48	6 18	6	6.34	9.12	68	40	32
25	5.03	4.20	3.93	3.61	6.62	6.37	6.65	9.5	72	44	35
30	5.22	4.37	4.08	3.75	6.89	6.75	6.96	9.88	76	48	38
35	5.41	4.53	4.04	3.88	7.24	7.12	7.29	10.26	80	50	41

Approved:
H. H. Polk, President.

J. F. Johnston,
General Freight Agent.

The Citizens' Railway & Light Company of Muscatine, Iowa, uses a stamp system, sample below:

Below will be found the list of commodity rates of the Camden Interstate Railway Company:

CAMDEN INTERSTATE RAILWAY COMPANY

Freight Department

COMMODITY RATES

Effective Jan. 1, 1903,

Between Huntington and All Points West to Ashland.

Rates subject to change without notice.

Apples, per bbl.	$0.10	Lime, per ton	1.25
Beer, per bbl.	.20	Laundry, per basket	.25
Beer, per half bbl.	.10	Liquor, per bbl.	.35
Beer, per case	.10	Liquor, per case	.10
Baby buggies, each	.25	Meal, per 100-lb. bag	.05
Bicycles, each	.25	Meats, fresh, per 100 lbs.	.25
Bread, per basket	.25	Meats, cured, per 100 lbs.	.08
Bananas, loose, per bunch	.03½	Meats, per 200-lb. box	.15
Bananas, packed, per case	.25	Meats, per 300-lb. box	.20
Bananas, packed, per half case	.15	Molasses, per bbls.	.50
Brick in flour bbls.	.25	Nails, per keg, five and over	.05
Boots and shoes, per lb	.15	Nails in 300-keg lots	.04
Cabbage, per flour bbl.	.10	Notions, per 100 lbs.	.20
Cabbage, per sugar bbl.	.15	Oil, per bbl.	.35
Calves, each	.50	Oranges, per box	.10
Cement, per 100-lb. sack	.08	Organs, each	1.00
Cement, per Louisville bbl.	.20	Pianos, each	2.00
Cement, per Portland bbl.	.25	Plaster (same as cement)	
Cider, per bbl.	.35	Potatoes and all vegetables, per flour bbl.	.10
Coffee, per case	.08	Potatoes....10c., 15c. and 20c. per bag	
Canned goods, per 100 lbs.	.06	Pop and seltzer, per case	.10
Dry goods, per 100 lbs.	.15	Sewing machines	.25
Dynamite, 400 lbs. or less	2.00	Sugar, per 100 lbs.	.07
Eggs, per crate	.05	Shingles, per M	.50
Empty crates returned	.03	Salt, per bbl.	.15
Empty pop crates returned	.05	Stoneware, per 100 lbs.	.15
Empty beer cases returned	.05	Trunks, each	.25
Empty beer kegs returned	.05	Tar, per bbl.	.35
Fertilizer, per bag	.20	Varnish, per bbl.	.35
Flour, per bbl.	.10	Varnish, in 100-lb. cans	.10
Feed (mill), per ton	1.00	Vinegar, per bbl.	.35
Grapes, per basket	.02	Wire cable, per 1000-lb. reel	3.00
Glass, packed, per 100 lbs.	.15	Wire, barbed, per 100 lbs.	.06
Groceries, assorted, packed	.15	No single-package shipment less than 25 cents.	
Hay, per bale of 100 lbs.	.15	Special prices on car lots upon application to E. R. Cole, G. F. A., or T. H. Clay, Agent.	
Hay, per ton	2.00		
Hardware, per 100 lbs.	.08		
Ice, per 100 lbs.	.10		
Lime, per bbl.	.15		

EXPRESS CAR

In closing this paper it might be interesting to learn how the freight and express is handled in Birmingham.

The company maintains a large and commodious depot at a convenient distance from the heart of the city, where all freight for the suburban lines is received. Besides this central depot, there are five other depots with agents along the lines and at terminals. The business at the terminals is so heavy that the agents have to have an assistant and a freight handler. At the central station the help required is an agent, a bill clerk and five freight handlers.

Anything is received for shipment from a package of yeast cakes to a hogshead of sugar, and if shippers desire to do so, they may prepay shipment, and if not, goods are sent collect; that is, where they are going to an agency station, and shipments are always prepaid when shipped to stations where there is no agent, and the B. L. is stamped as shown below:

Form 55.

BIRMINGHAM RAILWAY, LIGHT & POWER COMPANY

..... Division.

Birmingham, Ala., ..., 190..

Received from .....

consigned to .....

.....Station .....

the following packages (contents and value unknown), in apparent good order:

Marks	Articles	Weight	Charges
	There is no agent at the above named station. The Birmingham Railway, Light & Power Co. will not be responsible for the articles named in this receipt after they are unloaded.		
	..... Agent		

No liability will be assumed for wrong carriage or wrong delivery of goods marked incorrectly, or with initial or number. The undersigned expressly state that they are not responsible for goods put off at way stations, and all goods to way stations must be prepaid. All goods shipped released unless otherwise specified.

....., Agent.

This, of course, renders the company not liable should the shipments be stolen or molested after they are put off.

No C. O. D. business is done, and we take this occasion to warn our friends against it, as it will be a never-ending source of expense and annoyance. This is particularly true in instances where perishable goods are shipped C. O. D. If there is any contention about it so that the goods cannot be delivered promptly they may spoil, and then someone will want the railroad company to pay for them.

The towns where the most freight is shipped have four trains per day, others three and the smaller ones only two. The smallest towns are served by freight trains, consisting of two, three or four cars, as the needs demand. These cars are drawn by large motor cars built in the company's shops, and on these trains the motorman serves as conductor and checks out the freight, the same being handled by the brakeman.

Bessemer, a large suburban town 14 miles from Birmingham, gets its daily supply of meat, bread, fruit and vegetables from Birmingham every day, and a train is run out of Birmingham every morning at 5 o'clock known as the "Fresh Meat Special."

The company has several connections with steam railroads and handles solid car load shipments to the suburban towns. This pays exceedingly well, as there is practically no expense attached to it.

The forms and office method of handling freight are the same as used by standard railroads.

When a package or packages are offered for shipment a bill of lading in duplicate is presented and the goods checked; the bill of lading is signed, one copy being retained by the consignor and the other by the agent. These bills of lading are made up in books of 100 each, and these books are distributed among the shippers. From the stub retained by the agent the way-bills are made up and a copy of same is made on tissue paper. This copy goes to the auditor, who checks it up and charges to each agent the amount due from each agent, a separate account being kept with each agent. The agents remit their receipts daily to the auditor, and he checks the accounts of each agent to see that everything has been remitted.

The receiving agent takes his way-bills, which are sent out in advance of the freight train, and makes out a combination freight bill and receipt, the two being a folded sheet perforated in the middle. When the consignee calls for his freight the agent signs the bill, which shows the receipt for the money, and the consignee signs the receipt which the company holds to show delivery of goods.

In addition to these forms the agent at the central station makes out a recapitulation sheet, showing total amount of business transacted on all lines during the day, and each agent makes out one of these sheets and these are forwarded to the auditor, who, by this means, can keep an accurate record of all business done.

The central depot agent also sends daily a recapitulation sheet, itemized as to divisions, to the manager of the railway department. The sheet each day covers all business for the previous

days of the month, and the sheet for the last day of each month, of course, shows the total business for the month.

BIRMINGHAM RAILWAY, LIGHT & POWER COMPANY

Express Trains to All Suburban Towns.

Freight Depot, First Avenue and Sixteenth Street.

ONE OF THE EXPRESS TRAINS

RATES

Bar fixtures, per 100 lbs	$0.15	Marble, crated or boxed, owner's risk, released, per 100 lbs	.15
Billiard tables, per 100 lbs	.15	Organs, crated or boxed, owner's risk, released, per 100 lbs	.15
Beer, per 100 lbs	.06	Organs, not crated or boxed, each	.50
Beer, bottled, in casks or boxes, per 100 lbs	.08	Oils, in barrels or cans	.08
Buggies, crated, per 100 lbs	1.00	Produce, fruit, etc., per 100 lbs	.08
Bellows, per 100 lbs	.15	Pianos, boxed, owner's risk, released, per 100 lbs	.15
Boots and shoes, per 100 lbs	.08	Sewing machines, crated, owner's risk, released, each	.15
Coffins, per 100 lbs	.15	Sewing machines, not crated, each	.25
Crockery, per 100 lbs	.15	Soda water, in cases, per 100 lbs.	.10
Chickens and other poultry, per coop	.25	Stoves and stoveware, per 100 lbs.	.15
Chickens and other poultry, per coop, extra large coop	.35	Split baskets, per 100 lbs	.25
Corpses	.50	Tinware, per 100 lbs	.15
Carpets, per 100 lbs	.15	Trunks, each	10c. to 25c.
Cider and vinegar, in kegs or barrels, per 100 lbs	.08	Terra cotta pipe, owner's risk, released, per 100 lbs	.08
Clothing, per 100 lbs	.08	Terra cotta pipe, not released, per 100 lbs	.15
Dry goods, notions, etc., per 100 lbs.	.08	Wagons, per 100 lbs	.15
Empties, each (Except empty beer kegs, 2½c. each.)	.05	Whiskey, wines, etc., in bottles or kegs, per 100 lbs	.03
Eggs, per 100 lbs	.08	Whisky, wines, etc., in bbls. or boxes, per 100 lbs	.15
Fish, fresh meat, etc., per 100 lbs.	.08		
Fruits, per 100 lbs	.08		
Furniture, per 100 lbs	.15		
Glassware, per 100 lbs	.15		
Groceries, per 100 lbs	.08		
Grain, per 100 lbs	.05		
Hats, per 100 lbs	.08		
Hay, per 100 lbs	.05		
Hardware, per 100 lbs	.08		
Household goods, owner's risk, released, per 100 lbs	.15		
Harness, per 100 lbs	.08		
Iron and iron pipe, per 100 lbs.	.08		
Iron safes, per 100 lbs	.08		
Jugs, jars, etc., crated or boxed, owner's risk, released, per 100 lbs.	.15		
Loaded shells, per 100 lbs	.08		
Lumber, per 100 lbs	.08		
Lime, cement and plaster, per 100 lbs., Bessemer Division	.08		
Lime, cement and plaster, per 100 lbs., other division	.05		
Mattresses, per 100 lbs	.08		
Meat, in bulk or box, per 100 lbs.	.08		
Melons, each	.02½		

All empties must be prepaid. All goods must be marked by consignor. No package for less than 10 cents.

Carload shipments, $2 per car to cotton factory, Elyton and Greens, $5 per car to points beyond.

$7.50 per car Bessemer to Birmingham and all intermediate sidings, except Wilkes.

On Ensley Division, $2 per car switching in Pratt City from Birmingham Southern Railway.

$7.50 per car Birmingham to Ensley or Pratt City.

On East Lake Division no freight will be handled in carload lots except from Wahouma to East Lake. Price, $2 per car.

On Gate City Division loaded cars are handled at East Birmingham only, at $2 per car.

Special rates on carload shipments. All rates are subject to change without notice.

SCHEDULE

Ensley, Pratt City, Thomas and Wylam

Lv. Birmingham 6 a. m.
" " 9 a. m.
" " 1 p. m.
" " 4 p. m.

Bessemer

Lv. Birmingham 5:30 a. m.
" " 10:45 a. m.
" " 2:45 p. m.

East Lake

Lv. Birmingham 10:45 a. m.
" " 3:15 p. m.

Gate City

Lv. Birmingham 10:45 a. m.

For any further information desired, call 273 Bell phone.

Go to East Lake, an Ideal Pleasure Resort. Superb Cars, Fast Schedule, Excellent Track. Beautiful Theater and Numerous Attractions.

An attractive card advertising the freight business and naming the rates on the principal articles for shipment is tacked up in the warehouses and offices of the various merchants.

A freight solicitor is employed, who is provided with an advertising card and a stub book which contains requests signed by suburban merchants requesting their freight shipped by the Birmingham Railway, Light & Power Company's fast freight.

The freight business is steadily on the increase and new facilities have to be brought into service from time to time to take care of the business.

The freight business pays very well indeed, as only about 20 per cent of the gross receipts are necessary to conduct the department.

Owing to the careful system of checking very little freight is lost or damaged.

Summing up our conclusions, we make the assertion that if it pays now in a great many instances, it can be made to pay in a great many more where it is not now paying, and that many roads that are not giving it any attention at present will soon adopt it.

Form 55

BIRMINGHAM RAILWAY, LIGHT & POWER CO.

..... Division

Birmingham, Ala., ... 190..

Received from .....

consigned to .....

..... Station .....

the following packages (contents and value unknown), in apparent good order:

Marks	Articles	Weight	Charges

No liability will be assumed for wrong carriage or wrong delivery of goods marked incorrectly, or with initial or number. The undersigned expressly state that they are not responsible for goods put off at way stations, and all goods to way stations must be prepaid. All goods shipped released unless otherwise specified.

..... Agent.

Form 55

BIRMINGHAM RAILWAY, LIGHT & POWER CO.

..... Division

Birmingham, Ala., ... 190..

Received from .....

consigned to .....

..... Station .....

the following packages (contents and value unknown), in apparent good order:

Marks	Articles	Weight	Charges

No liability will be assumed for wrong carriage or wrong delivery of goods marked incorrectly, or with initial or number. The undersigned expressly state that they are not responsible for goods put off at way stations, and all goods to way stations must be prepaid. All goods shipped released unless otherwise specified.

..... Agent

FREIGHT BILL Slip No. .....

M..... ..... Station, ..., 190..

.....

To BIRMINGHAM RAILWAY, LIGHT & POWER COMPANY, Dr.

	For Transportation on the following Articles of Freight, viz.:	Weight	Rate	Freight and Charges	
Way-Bill					
190					
Consignor					
Original Point of Shipment					
All Bills Payable in Bankable Funds	Received Payment for the Company. ..... Agent.				

FREIGHT RECEIPT Slip No. .....

M..... ..... Station, ...190..

.....

Received of the BIRMINGHAM RAILWAY, LIGHT & POWER CO., In Good Order, the Following-Described Property:

	ARTICLES	Weight	Rate	Freight and Charges
Way-Bill				
190..				
Consignor				
Original Point of Shipment				
All Bills Payable in Bankable Funds	.....			

..... Ala.

..... 190..

To .....

..... Ala.

DEAR SIR:

Hereafter you will please route all my shipments via the BIRMINGHAM RAILWAY, LIGHT & POWER CO.'s fast freight line.

.....

.....

..... Ala., ... 190..

To .....

.....

DEAR SIR:

Hereafter you will please route all shipments to me via the fast freight line of the BIRMINGHAM RAILWAY, LIGHT & POWER CO. Respectfully,

.....

..... Division.

BIRMINGHAM RAILWAY, LIGHT & POWER COMPANY

..... Division. No. .....

Local Freight Way-Bill..... To ..... Date, ..., 190..

Consignor	Marks	Consignee	Articles	Weight	Rate per 100 lbs.	Charges	
						Prepaid	Collect

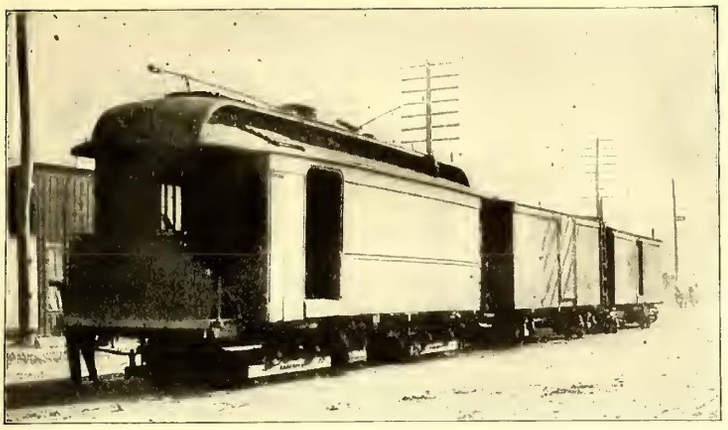
Form 150 Railway Department

BIRMINGHAM RAILWAY, LIGHT & POWER COMPANY

Daily Recapitulation of Freight Received and Forwarded

Birmingham, Ala., ..., 190..

	To Bessemer	To Woodward	To Bessemer Div. Locally	To Ensley	To Ida	To Wylam	To Ensley Div. Locally	To	To	Total
Freight forwarded										
" delivered										
Previously Reported										
Total to date										
Tonnage forwarded										
" delivered										
Previously reported										
Total to date										
Articles forwarded										
" delivered										
Previously reported										
Total to date										
Steam Cars Handled		Numbers and initials.								
Previously reported										
Total to date		..... Gen'l Frt. Agt.								



ONE OF THE EXPRESS TRAINS

BIRMINGHAM RAILWAY, LIGHT & POWER COMPANY

Daily Report of Freight

..... Station. ....., 190..

No. of Way Bill	To	Prepaid	To be Collected	Total

....., Agent.

ELECTRIC WELDED JOINTS

BY WILLIAM PESTELL

Probably no one thing contributes more to the expense of operating an electric railway than bad joints in the track. First comes the wear and tear on cars, trucks, motors and equipment from the constant pounding; the loss of voltage due to the breaking of bonds with its inevitable consequence, baked-out motors, reduced schedule speeds, increased coal consumption and chances for electrolysis, then the expense of taking up paving, renewing splice-bars, bolts, etc., in an almost hopeless attempt to make the rail fit for further service. It is usually found that by the time a general overhauling of the track is decided upon the rail-ends are so badly pounded out that the simple raising of the joints and renewing of splice-bars and bolts does not extend the life of the rail to a commercially practical extent. This is particularly so in the case of girder rail in paved streets. T-rail is usually more accessible and less costly to repair, consequently does not get into as bad condition before repairs are made, and can by the use of some of the patented joints be put in such condition that many years are added to its useful life.

In 1892 the Johnson Company organized a department for electric welding of track, working under the patents of Prof. Elihu Thompson, of Lynn, Mass. In 1893 and 1894 the Johnson Company welded about fifty miles of track in the cities of Boston, Cleveland, Brooklyn, Johnstown, Detroit and St. Louis. The track welded had been laid for some time and was in bad condition, so that the first work attempted was repair work rather than construction.

It was early found that the voltage was not maintained at all points on the line at the necessary 500 volts the apparatus was designed for, and a booster was introduced to compensate for the line losses and make up the deficiency. Storage batteries were also used with the first apparatus to help maintain the voltage and prevent an excessive demand on the station for current. It was soon found that sufficient current could be obtained from the line without the use of batteries, and they were abandoned.

The first welds were made by welding a short vertical bar directly over the joint, as shown by Fig. 1. This weld was made under pressure, but the pressure was not continued after the weld was completed, and the metal became porous in cooling, leaving a mechanically weak joint. A great deal of the tendency to porosity in the metal was undoubtedly due to the burning of the rail and bars at the small points of contact then used. To overcome the tendency of burning and porosity in the metal, a form of weld, Fig. 2, was devised, two distinct welds being made at each joint, practically butt-welding the rail-ends together. As in the previous case, the welding was done under pressure, but the pressure was immediately released when the weld was completed, the welding company not yet realizing the importance of continuing the application of pressure until the weld had practically set. As in the case of the first weld, the second weld was porous and weak mechanically, and in addition, the heat being applied directly at the head of the rail, bulged same, so that it became necessary to plane it down to a working surface after welding.

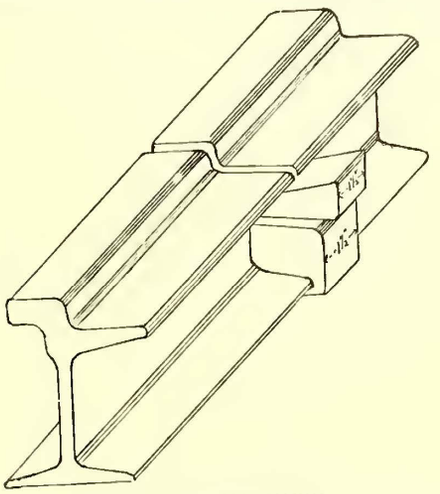


FIG. 1.—FRONT VIEW

A great number of breaks occurred in both these types of welds, and in each case the track opened up from ¼ in. to ½ in. The breaks occurred soon after welding, usually during the first twenty-four (24) hours. The welding company was led to believe from the nature of the breaks and from the opening in the track after breaks occurred that they were due to strains in the rail from contraction after welding.

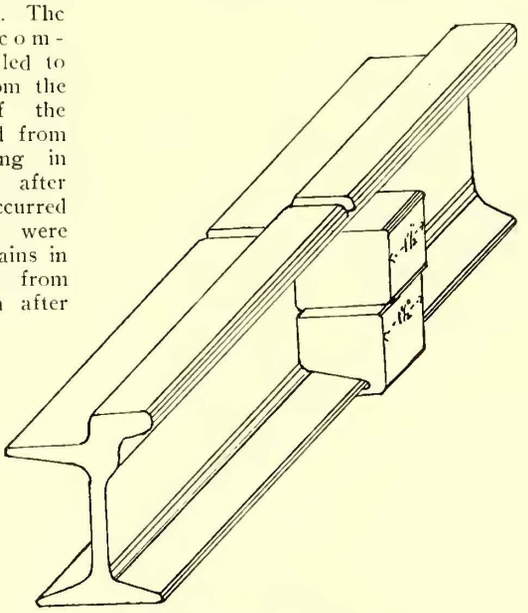


FIG. 1.—BACK VIEW

They soon devised a machine to compress a length of track before and during welding, the idea being to put enough compression into the track while welding to prevent any tendency to contraction strains after welding. While this reduced the breaks to some extent, breakage was still excessive, and the porosity of the metal at the fracture led the welding company to believe that a change had taken place in the metal from the passage of the electric current through it, and commercial welding was discontinued until some method of overcoming the defects could be devised in the company's shops. Experiments were carried on continually both from a chemical and mechanical standpoint from 1895 to 1897, and it was proven conclusively that the heating of the metal by electricity had no more injurious effect on it than heating by any other source. At the latter part of the experiments it was discovered that by making the weld under pressure and increasing the pressure as the weld was completed, continuing pressure until the weld had practically cooled, the metal was left in a dense condition, free from porosity and of high tensile strength. It was also found that any part of the weld that had not been subject to the condition mentioned was of a porous nature and weak mechanically. This led to the making of projections, or bosses, on the bars, as shown in Figs. 3, 4, 5 and 6, the bars being placed one on each side of the rail and welded in their places directly to the web of rail, the center weld being made through a loose piece of metal dropped on the bar, rather than a boss on the bar.

The welding plant consisted of five cars—the sand car, welding car, rotary converter car, booster and motor car, and motor and emery-wheel car for finishing. The cars are run on the track by their own motors and can be sent from place to place over the

different roads wherever there are connecting lines. The connections of the first welding outfit are illustrated in Fig. 7.

Recent improvements have reduced the number of cars from five to four, and instead of regulating on the direct-current side of the rotary transformer by a motor generator, the regulating is done on the alternating-current side by means of variations in the connections of a regulating transformer. The latter machine is shown diagramatically in Fig. 8. This type of machine has reduced the amount of current taken from the trolley from a maximum of 500 amps. to 300 amps. under adverse conditions. At the present time all welds are made by means of two steel bars, the usual size of which are 1 in. x 3½ ins., and from 18 ins. to 48 ins. long; 18 ins. being the shortest bar found practical to weld even where the holes are not drilled in the rail, the greater lengths depending on the distance of drilled, or punched holes from the end of the rail. It is not safe to weld on bars where holes are nearer than 3 ins. from the end of the bar. The same size bar is used on both 6-in. and 9-in. rail, the strength of the bar being ample to support the joint directly at the weld without the bar mechanically fitting the rail.

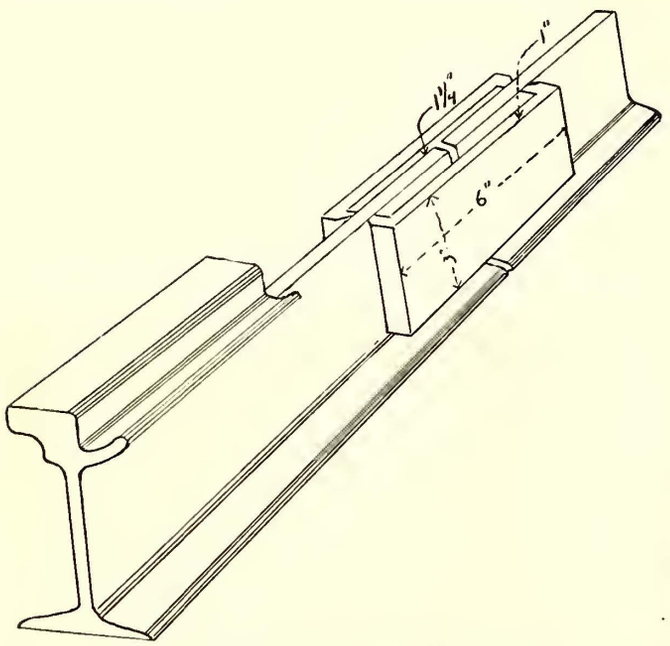


FIG. 2.—LATER TYPE OF WELDED JOINT

The first mile of track welded under the system using long plates was done in the fall of 1897 on the Johnstown Passenger Railway Company, Johnstown, Pa. Rail was 6-in. girder, 78 lbs. to the yard, 78-225 Johnstown Company section. Breaks to date, three (3), street macadamized, no paving. Next welding, Nassau Electric Railway Company, Brooklyn, N. Y., Fifth Avenue, from Atlantic Avenue, to Thirty-Ninth Street, Marcy Avenue, from Fulton Street, to Flatbush and South H Street, a total of nine (9) miles. The Brooklyn rail was 9-in. girder laid in paved streets; at the end of the first year there were eight (8) breaks.

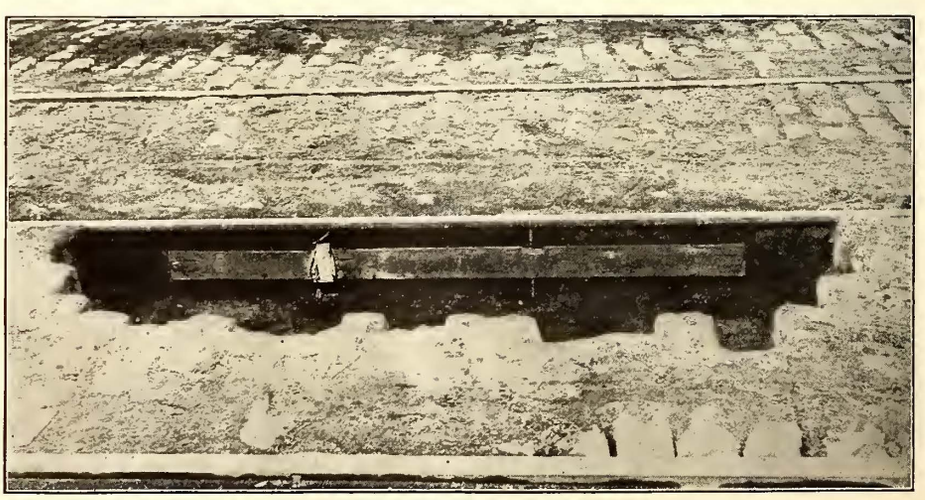
In March, 1901, seven (7) different roads in and about Worcester, Mass., were consolidated under the name of the Worcester Consolidated Street Railway Company, with headquarters at Worcester, Mass., and R. T. Laffin as general manager.

Upon investigation it was found that a number of miles of 6-in. and 9-in. girder rail, while not worn out, was so badly down at the joints that some method had to be devised to raise the joints or renewal of rails would be necessary. After careful investigation it was decided to weld electrically the joints on all 6-in. and 9-in. girder rails that had sufficient wear left to pay for the work. Arrangements were made with the Lorain Steel Company (successors to the Johnson Company) to bring their apparatus to Worcester, and work was started the latter part of April, 1902, the first year being devoted to the laying of new track.

The method of procedure was to take up paving, remove splice-bars and raise shim-joints a sufficient distance ahead of the welder so that no delay would be incurred; paving being taken up one day (where it was necessary to weld at night) and replaced the next day. We at first started to renew ties and line-up track ahead of the welder, but the rail being surface bent (see Fig. 9), it was impossible to raise joints without raising center of rail in about the same proportion, consequently the rail could not be properly lined and no allowance could be made for the rolling action of the cars after welding. In subsequent work, on advice of the Lorain Steel Company, no lining-up of track was attempted before welding, the joints being simply raised and shimmed both between and underneath the rails. It is important to see that the joints are raised a sufficient height, as the rolling action of the cars on the rail tends to straighten out the surface if the raising of joints is properly attended to. Wherever it was necessary to renew ties the work was done immediately after welding, the track being lined-up at the same time. We have found that solid joints stand up better than suspended ones, and would recommend a three-tie joint for all welded work. It is possible where ties are not more than 20 ins. apart under joints, that a suspended joint would be all right. The Lorain Steel Company recommend that no lining-up of track or renewing of ties be attempted until after the first season's run over the welded track, claiming that the roadbed should not be disturbed until the rail had been rolled back to a proper surface. They estimate that a 6-in. rail will be rolled to a proper surface in about one (1) year, while 9 ins. will take from one (1) to two (2) years, according to the traffic over it.

FIG. 3.—BAR FOR WELDING

T. W. Wilson, of the International Traction Company, Buffalo, N. Y., says, in answer to the question what shall we do with expansion, "We forget it the same as we do the joint after it is welded." In this connection I would quote from Louis Bell, "Power Distribution for Electric Railways," "That a continuous rail is entirely feasible now admits of no dispute. Expansion does not and cannot take place longitudinally when the rails are firmly embedded in the paving, even under the extremes of temperatures encountered." Dawson, in his "The Engineering and Electric Traction Pocket Book," says, "It is easy to ascertain the strain on rails due to variations of temperature. Assuming a coefficient of expansion of steel of 0.0000065, and multiplying this by seventy-five, which is a liberal figure for the number of degrees of maximum deviation from the temperature at which the welding



PATCHING JOINT

is done, we get 0.000487, which is that part of its length which a rail would expand when exposed to a rise of 75 degs., or contract when exposed to a fall of 75 degs. in temperature. A steel bar would expand 0.00003 of its length, due to a load of 1090 lbs per square inch. Dividing the estimated expansion by this figure, we get for the strain 16,200 lbs. per square inch.

"As 40,000 lbs. per square inch is a safe value for the elastic limit of steel, it can readily be seen that the elastic limit will never be reached. This means that these expansions and contractions may go on indefinitely, and so long as the joints remain unbroken, no harm will be done to the rail, for stresses within the elastic limit work no harm. Assuming 80,000 lbs. per square inch as the ultimate strength of steel, there is still, as far as the strength of the rails themselves is concerned, a factor of safety of five.

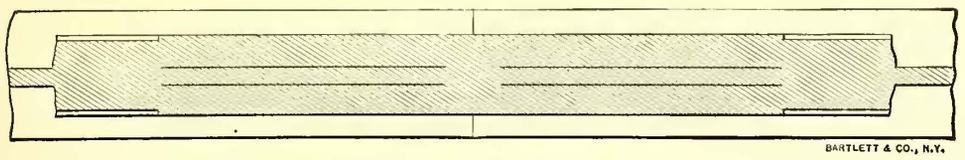
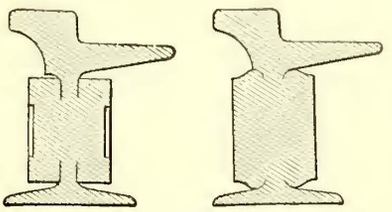
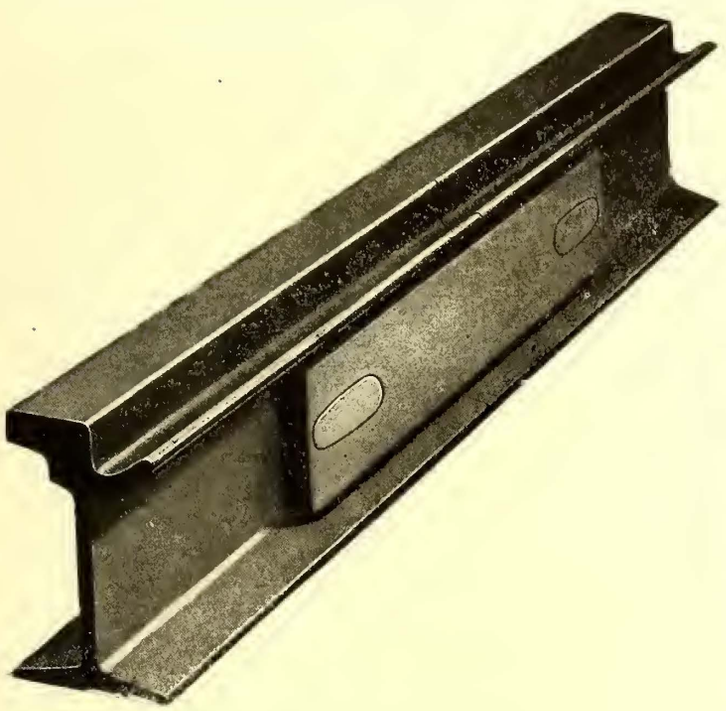


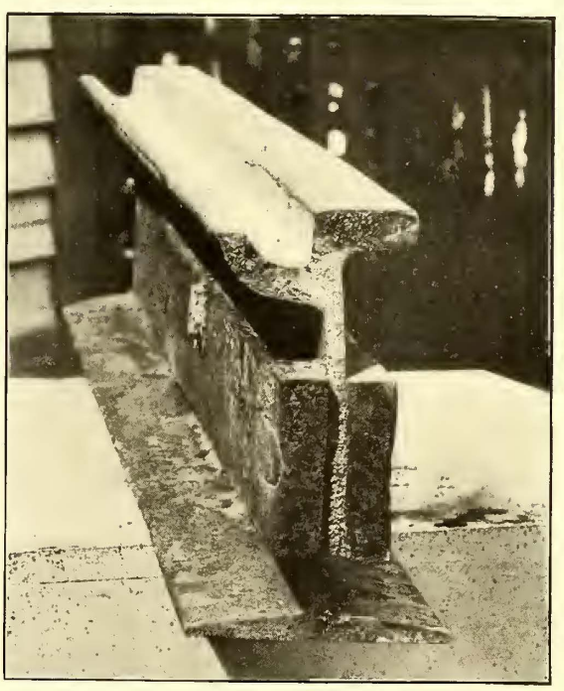
FIG. 4.—HORIZONTAL CROSS-SECTION THROUGH CENTER LINE OF BARS AND RAIL WEB



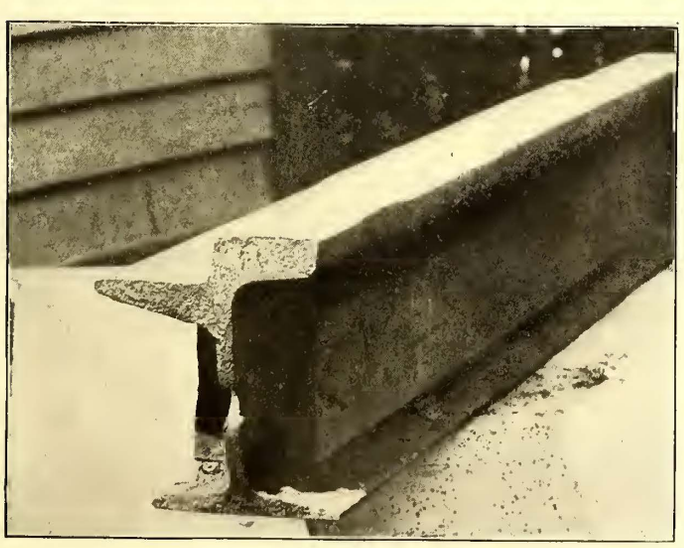
FIGS. 5 AND 6.—SECTIONS THROUGH END AND CENTER WELDS



JOINT AS APPLIED TO 6-INCH RAIL



BROKEN JOINT ON DEEP RAIL, WORCESTER

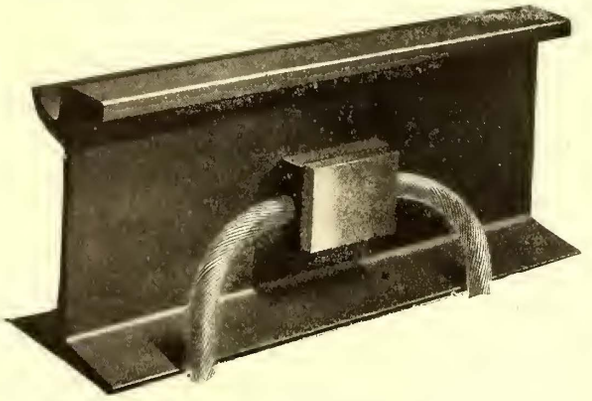


BROKEN JOINT ON SHALLOW RAIL, WORCESTER

"Wherever joints have broken, in no case have they pulled apart more than 2 ins. This would seem to show that the pull which broke the joint was not a cumulative effort extending all along the line, but merely the result of a local strain extending but a short distance on either side of the joint."

Fig. 10 is a map showing the welded track in the city of Worcester, giving some idea of the location as well as the continuous lengths of track welded. The rail welded was principally 9-in. girder, there being about 15 miles P. S. section 201, 2 miles P. S. 222, 4 miles Wharton 2-90, and about one-half mile 6 ins. and miscellaneous. The P. S. section 201 had been in use about nine (9) years, the 222 had been in use from one to four years, and the Wharton 90-lb. about ten years.

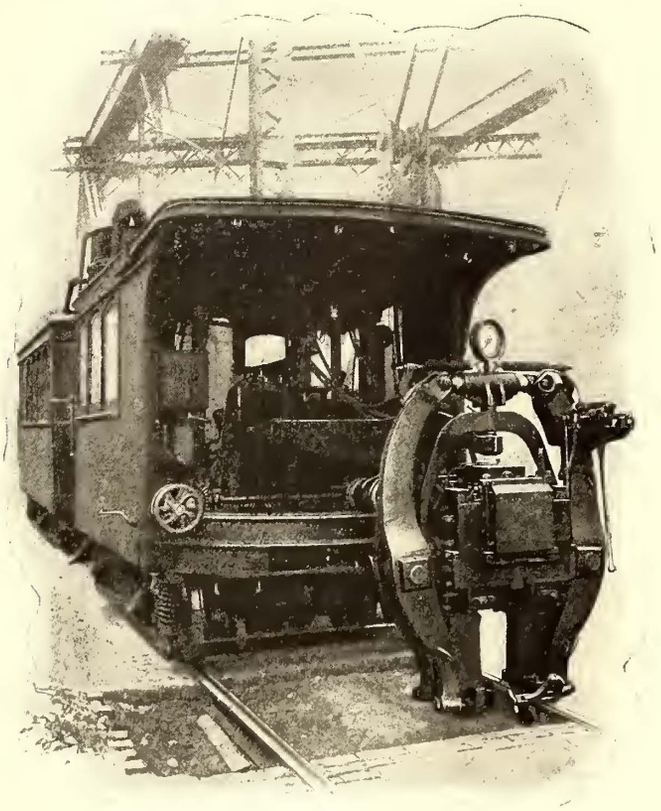
The breaks to date have been twenty-four on P. S. 201, seventeen on P. S. 222, twelve on Wharton 2-90, and one on 6 ins., a total of fifty-four (54) out of 7383, or about 7 of 1 per cent. While this seems a small proportion, the record of Rochester, N. Y., of ten (10) breaks out of 7609 welded joints is remarkable, considering the fact that 5308 were welded in 1901 and have done service through two winters. The majority of the breaks occurred



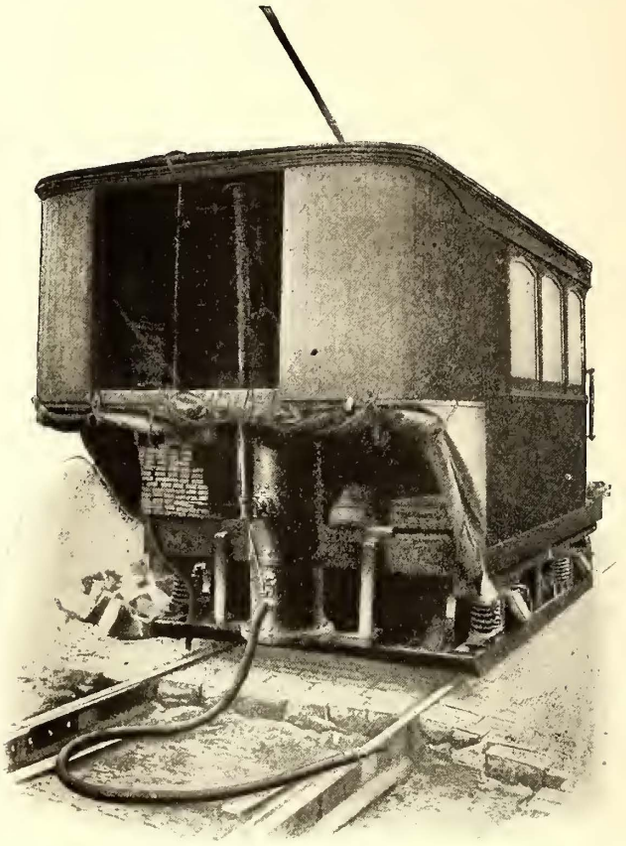
ELECTRICALLY-BRAZED COPPER CONNECTION

during the winter months, and especially during sudden changes of temperature.

In addition to the welding of track, we run 1,000,000 C. M. cable through all special work and to connect to O. H. negative feeders, using the Lorain Steel Company's electrically brazed connection for the purpose. The improvements we have made in our tracks, including new rail and bonding, electrically welded joints and supplementary cables, have reduced our track loss about 75 per cent. The cost of removing paving, welding joints, replacing paving and cleaning up the street is variously estimated by the roads which have done the most welding at from $2,000 to $2,500 per mile on a basis of 30 ft. rail lengths. These figures do not include renewal of ties.



WELDER



SAND BLAST

It is certainly obvious from the results obtained on electrically welded old track that this method is equal to any other known method for extending the useful life of the rail, decreasing the repair bills for track and equipment, and lessening the electrical losses.

From the experience of Buffalo and Rochester, N. Y., and Columbus, Ohio, where new track has been welded, it would appear that in cities where permanent grades have been established and the liability of changes in track location are apparently remote, the electric welding of new track seems advisable. The expense of original construction should certainly be much less than it would be several years later when the joints commenced to go down, and it is a question whether it would not be cheaper than a good splice-bar joint bonded to the same capacity. From tests made by the General Electric Company and the writer on electrically welded joints, the conductivity equals from 130 to 140 degs. on 6-in. girder rail, and from 110 degs. to 120 degs. on 9-in. girder, compared with equal lengths of solid rail.

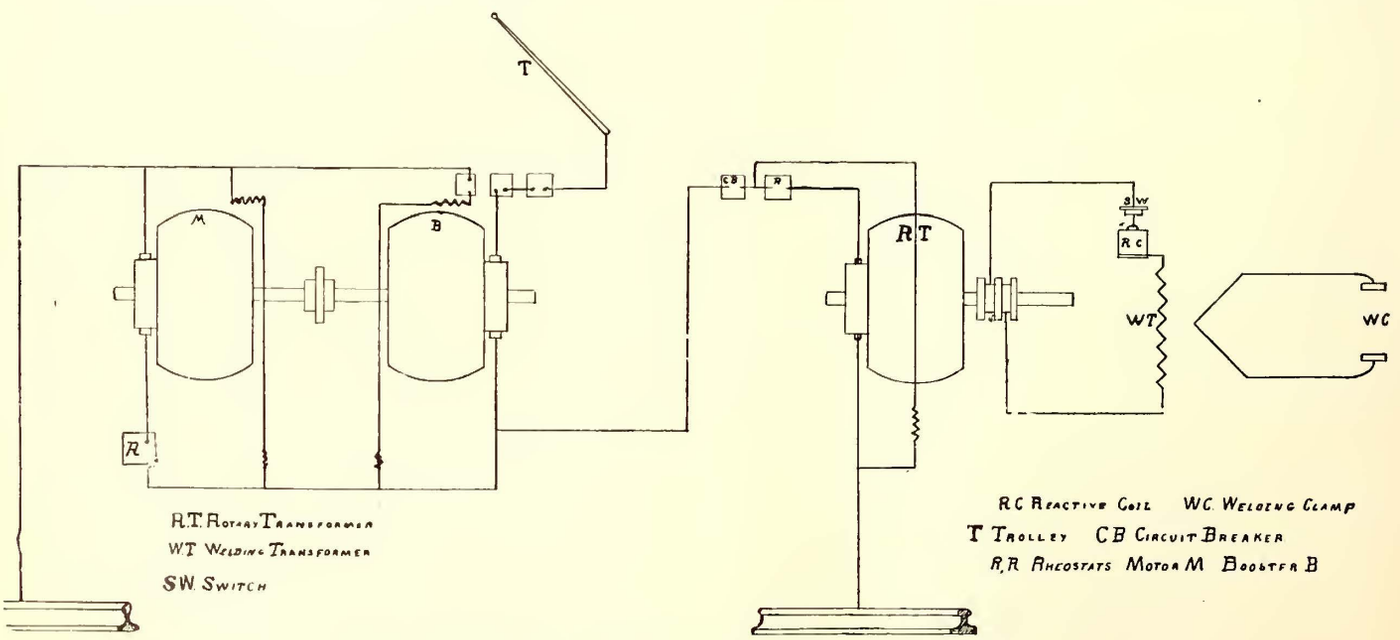


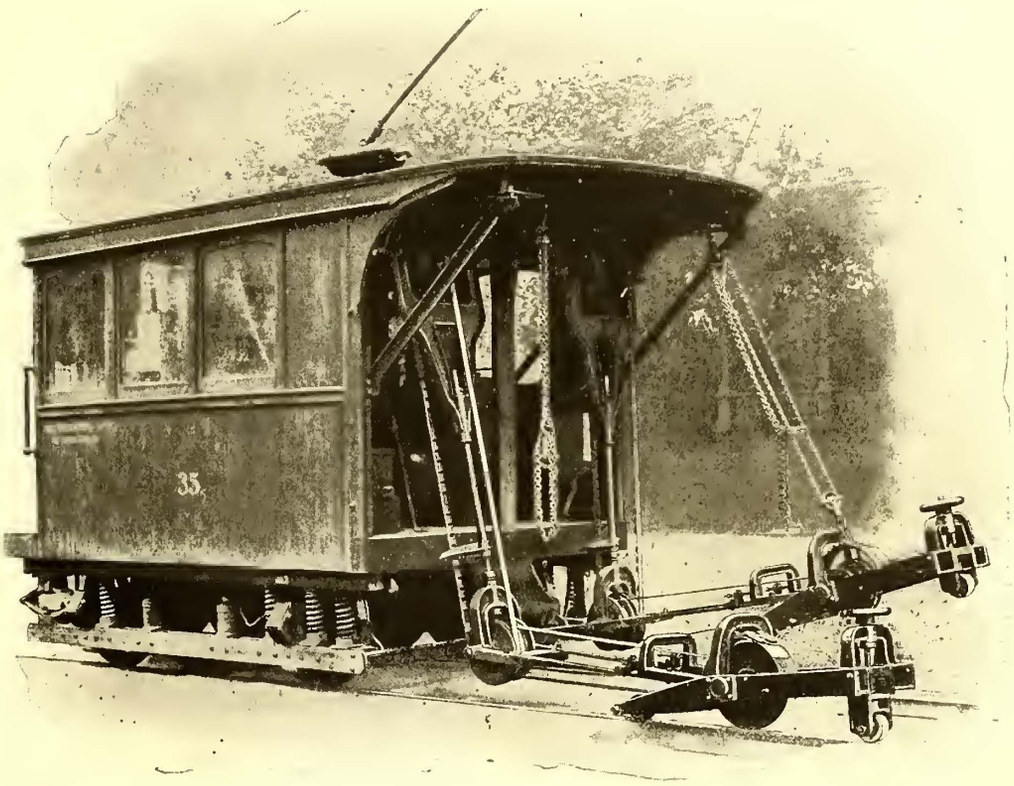
FIG. 7.—DIAGRAM OF CONNECTIONS OF FIRST WELDING MACHINE

Appended are tables showing the mileage of welded track in service, cuts showing sections of welded joints, broken joints taken out at Worcester, and a patched joint on East Merrimac Street, Lowell, Mass. The latter is especially interesting, as it shows the method used to repair a broken joint by the welding process, a short piece of bar being first welded across the break, butting up to the original bar, a chuck being then welded to both bars at the junction, practically extending the original bar beyond the break. The method used when breakage occurs after the welding outfit has left the job is to cut out about a 10-ft. section putting in a new piece of rail by means of splice-bars and bolts and bonding in the usual manner.

TABLE SHOWING MILEAGE OF ELECTRICALLY WELDED TRACK IN THIS COUNTRY TO-DAY

Place	Year	Miles
Johnstown, Pa...	1897	1.
Brooklyn, N. Y...	1898	9.
Buffalo, N. Y....	1899	39.
Buffalo, N. Y....	1900	60.5
Lockport, N. Y..	1900	1.
Buffalo, N. Y...	1901	6.
Rochester, N. Y..	1901	18.
Rochester, N. Y..	1902	8.5
Columbus, Ohio..	1902	18.
Worcester, Mass..	1902	22.
Lawrence, Mass..	1902	4.2
Lowell, Mass.....	1902	6.8
Lowell, Mass.....	1903	14.
Total miles welded.....		208

The table on page 525 is a record of the number of joints which have been welded on the lines of the International Railway Company, of Buffalo, in different years.



GRINDER

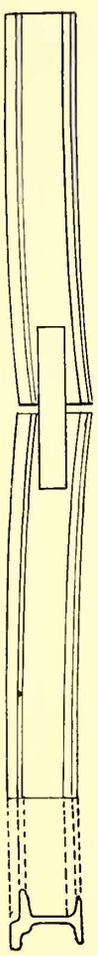


FIG. 9

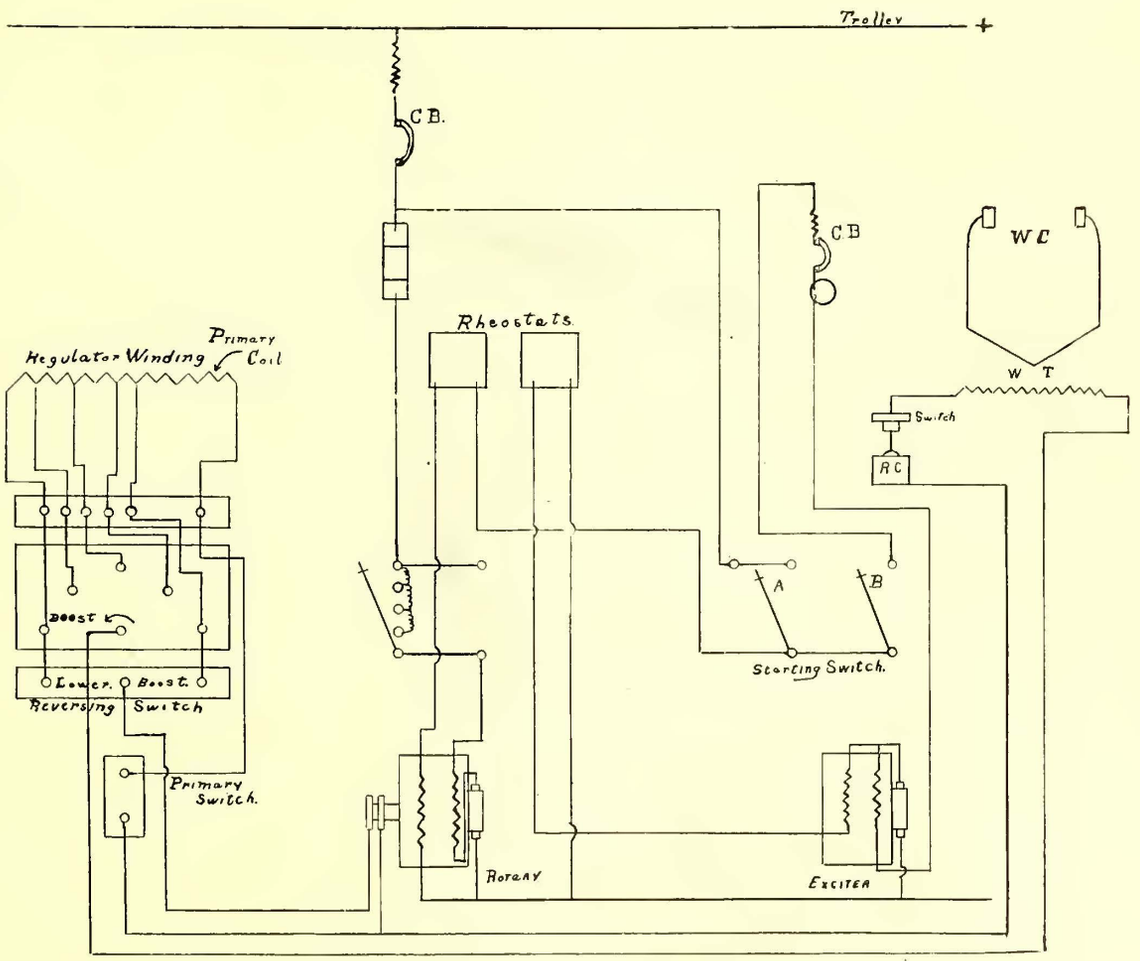


FIG. 8.—DIAGRAM OF CONNECTIONS OF LATER WELDING MACHINE

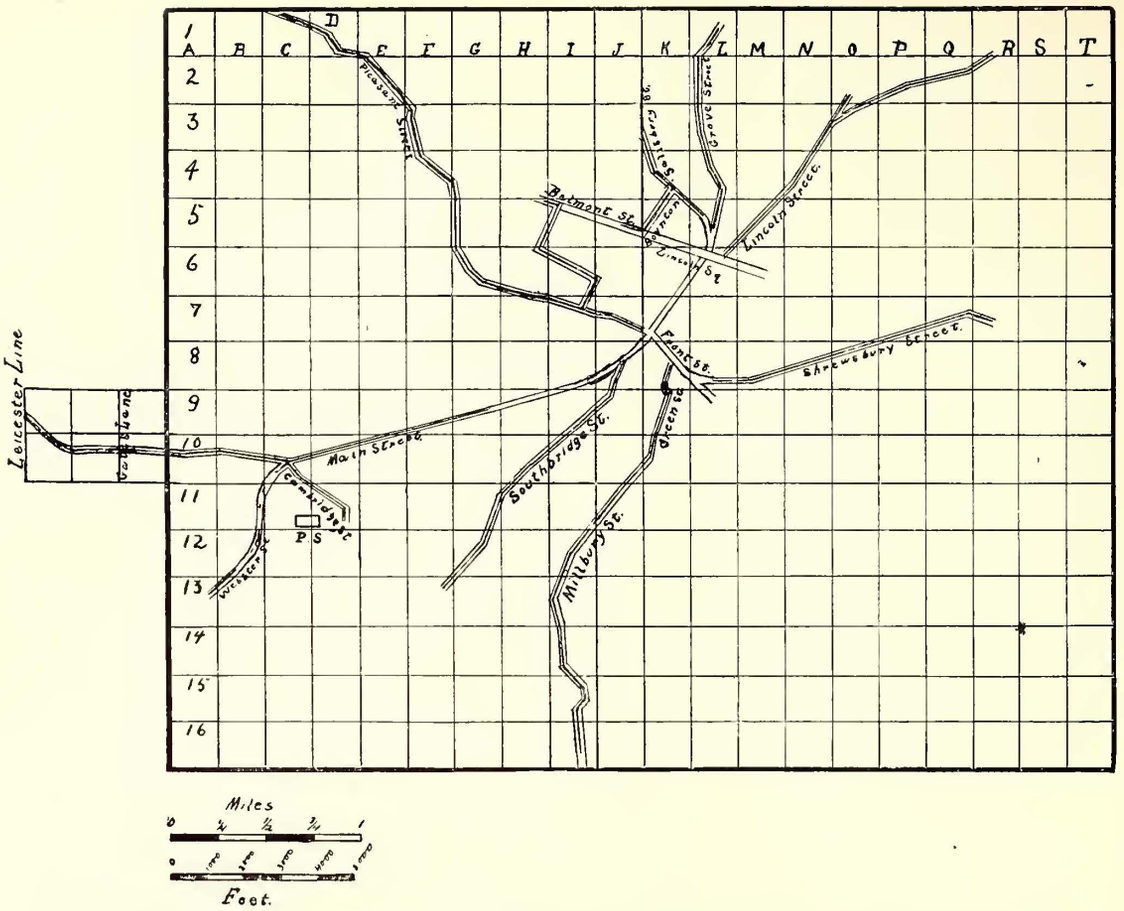
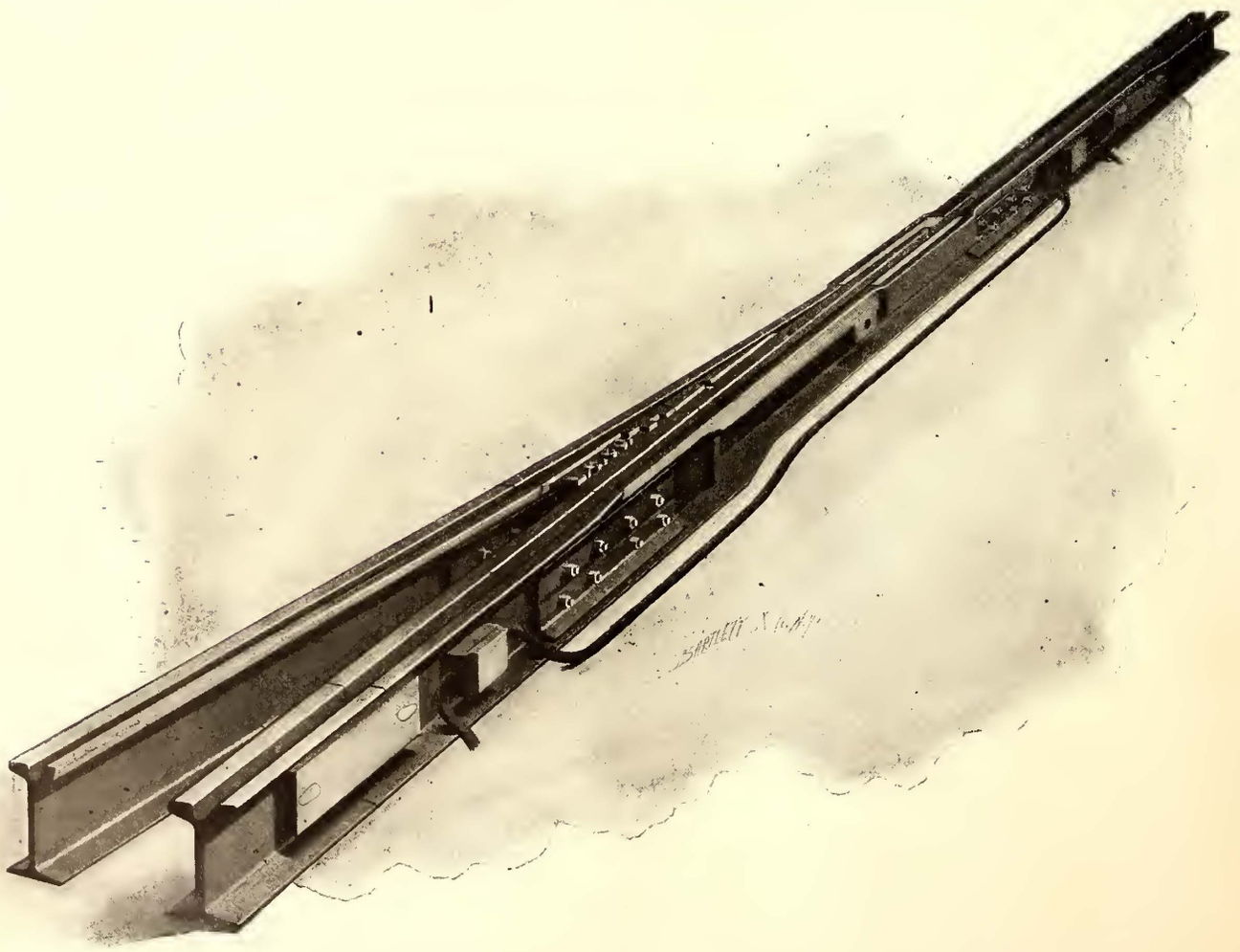


FIG. 10.—MAP OF WORCESTER, SHOWING SECTIONS WITH ELECTRICALLY-WELDED JOINTS



PROCESS OF BONDING AROUND SPECIAL WORK IN CONNECTION WITH ELECTRICALLY-WELDED TRACK, SHOWING COPPER CABLE PASSING FROM WELDED RAIL AROUND SWITCH PIECE

INTERNATIONAL RAILWAY COMPANY, BUFFALO, N. Y.

FIRST YEAR

	Joints welded in 1899	No. Broken
Old, 6-in.	4,787	18
Old, 7-in.	8	0
Old, J. Co., 9-in.	2,658	49
Old, P. S. Co., 9-in.	74	3
New, 6-in.	0	0
New, 9-in.	3,822	45
Total	11,349	115

SECOND YEAR

	Joints welded in 1900	1899-1900	No. Broken
Old, 6-in.	11,973	16,760	127
Old, 7-in.	566	574	7
Old, J. Co., 9-in.	1,894	4,552	25
Old, P. S. Co., 9-in.	146	220	6
New, 6-in.	619	619	2
New, 9-in.	2,234	6,056	16
Total	17,432	28,781	183

THIRD YEAR

	Joints welded in 1901	1899-1900	No. Broken
Old, 6-in.	482	17,242	8
Old, 7-in.	0	574	1
Old, J. Co., 9-in.	356	4,908	7
Old, P. S. Co., 9-in.	0	220	1
New, 6-in.	0	619	0
New, 9-in.	597	6,653	3
Totals	1,435	30,216	20

MAINTENANCE AND CHAMPERTY IN PERSONAL INJURY CASES

BY MICHAEL BRENNAN

I have chosen for this short paper a title that may appear to savor too much of antiquity, viz.: Maintenance and Champerty in Personal Injury Cases.

Maintenance at the common law was an officious intermeddling in a suit that in no way belonged to one, by maintaining or assisting either party with money or otherwise to prosecute or defend it. It was an offense against public justice, as it kept alive strife and contention and perverted the remedial processes of the law into an engine of oppression. A man might, however, maintain the suit of his near kinsman, servant or poor neighbor out of charity. Otherwise the punishment was fine and imprisonment.

Champerty was a species of maintenance and was punished in the same manner. It derived its name from the fact that it was a bargain with a plaintiff or defendant, *campum partire,* to divide the land sued for between them if they prevailed at law. The champerter was to carry on the litigation at his own expense and to take as a reward part of the land.

Blackstone says: "It is a practice so much abhorred by our law that it is one main reason why a chose in action is not assignable at common law, because no man should purchase any pretense to sue in another's right."

This practice was severely condemned by the Roman law and was punished by a forfeiture of a third of the goods of the guilty party and perpetual infamy.

The common law prohibition against maintenance and champerty in the various States of the Union has been substantially abrogated, and it is fair to say that in practice there is no legal punishment meted out to the champerter in any State of the Union.

As titles to land have become settled, there is nothing to do for the real champerter or divider of land, and it has been necessary for him to turn his attention to fresh fields and pastures new.

The marvelous growth of railroads in this country and the multiplication of factories and industrial establishments have necessarily increased the number of accidents accruing to employees and others. This condition of things has given rise to the existence of a class of lawyers in all large centers of population, who make a specialty of pressing cases of personal injury, and whose fees are contingent upon ultimate success, whether by compromise or at the end of a suit. In the city of New York there are on the present calendar 29,697 cases for trial, and of this number 5766 are against the surface street railway corporations. Mr. Godkin, in Hamilton's System of Legal Medicine, states that "probably half the jury cases heard in New York State alone in any one year are actions for personal injuries resulting from alleged negligence."

Mr. Bailey, in his excellent treatise on Accident and Injury, published in 1898, states that Mr. E. Parmelee Prentice has recently examined the records of the Chicago courts having jurisdiction of such cases. He states that in the year 1875 there were altogether about 200 personal injury cases pending in Cook County, and it is safe to say there are pending now in the Chicago courts 3600 of such cases. It is needless to add that only a small percentage of such cases ever come to trial or even get on the docket for trial.

The prosecution of personal injury cases has become a systematized business. Many firms employ runners, who maintain close business relations with surgeons, policemen, saloon-keepers and others, whose business brings them in touch with an accident shortly after its occurrence, so that these runners, who are furnished with blank contracts by their patrons, reach the hospital almost as soon as the ambulance, and secure a contract from the injured person, giving to the law firm fifty per cent of the damages to be recovered before the surgeon's knife has left its case.

It is undoubtedly from this well-known practice that the expression "ambulance chaser" has been coined. The incredulous may think this statement exaggeration, but it is too mildly drawn. The writer knows of an accident within the last year in the city of Detroit where by reason of a collision between two cars, a man named "A" had his foot crushed. It so happened that there was a damage lawyer on one of the cars, who was an eye witness of the accident. The ambulance was telephoned for and the first man to mount the steps after the injured man had been placed in it was the damage lawyer, who had a contract in his pocket signed by "A," giving him fifty per cent of the damages to be recovered, before the hospital was reached. I am compelled, however, to relate, that in this case the truth of the old adage that the early bird catches the worm did not prevail, as after the injured man had recovered he settled personally with the railway company, claiming that he was imposed on by the lawyer while he was only partially conscious.

Under our American jurisprudence, the offices of attorney and counselor are merged and the same lawyer consults with his client, hunts up witnesses, drafts the pleadings, examines the law, prepares the brief of facts and the law applicable to the case, and then goes into court and examines the witnesses and pleads before judge and jury.

In most European countries the offices of attorney and counsel are sharply divided, the attorney attending to the case outside the court and preparing pleadings and briefs, and the barrister, advocate or counsel taking charge of the conduct of the case at the trial or hearing. An advocate is supposed to stand at the bar demanding justice—and his relations to his client are not so close as those of the attorney—in fact, at one time he received for his compensation a *quiddam honorarium* (an honorary sum) and he could not receive any legal fee for his services from his client by an action at law.

In the United States, where one man commences at the beginning of the case and follows it to the end, there is a more intimate relation between him and his client—and where that relationship is made closer by the fact that the attorney owns a portion of the claim—it is a difficult thing for him to do his duty both to his client and to the court.

That such a lawyer does not do his duty to the court as a general rule is only too well known to those who are called upon to defend the interests of corporations which are unfortunate enough to be defendants in personal injury cases before our trial courts.

As long as litigants can rely upon the almost universal prejudice that exists in the minds of petit jurors against corporations, the temptation to bring actions to recover damages for personal injuries, no matter how trifling the injury and flimsy the pretext, will continue very great.

This temptation is sustained and aided by the personal pecuniary interest in which the plaintiff's attorney has in the cause of action—and everything tends to aid in the result sought after. No matter how trivial the injury may be—the plaintiff is egged on so to speak by his lawyer and his physician. Even when there is no external objective symptoms of injury—the expert medical witness is promptly on hand to swear that the moving cause of the accident would produce all the ills that flesh is heir to.

The expert witness under the present lack of judicial restraint which exists in the United States has become a stench in the nostrils of the judges of the land.

The late Judge John Baxter, of the United States Circuit Court for the Sixth District, said that liars were divided into three great subdivisions:

1st—The ordinary liar.

2d—The damned liar.
3d—The expert witness.

Judge Peckham, in Roberts vs. N. Y. E. R. R. Co., 128 N. Y. 464, uses this language:

"Expert evidence, so-called, or, in other words, evidence of the mere opinion of witnesses, has been used to such an extent that the evidence given by them has come to be looked upon with great suspicion by both courts and juries, and the fact has become very plain that in any case where opinion evidence is admissible, the proper kind of an opinion desired by any party to the investigation can be readily procured by paying the market price therefor."

The best men, both in the medical and legal professions, have struggled for years with the question of expert testimony, yet little progress has been made, especially in this country, on this subject. In France the court may order an investigation and report by experts whenever it deems it advisable. If the parties cannot agree upon the experts the court appoints them. They are at least three in number, and are generally, though not necessarily, selected from a list of specialists termed *"experts assermentes."* The order directing the investigation contains a statement of its precise objections and appoints a referee or *juge commissaire.* Barristers or advocates are not allowed to appear before the experts, but the parties are represented before them by solicitors. The report must be signed by all three of the experts, and if there be a dissent, the dissenting opinion and the reasons for it are set forth in the body of the report. The judges, however, are not at all bound by the report if it is opposed to their conviction.

In Germany, under the code of civil procedure, after the issues are framed on which expert testimony is sought, the parties may agree upon the experts and the court appoints those agreed upon. Sometimes the court submits to the parties the names of a number of experts and allows each side to object to a certain number of them, and then appoints those remaining.

In Prussia, it is the custom to appoint a physician and surgeon for every county, and an appeal lies to a medical college in each province, if the experts disagree or the parties desire it. There is also an appellate commission for the whole kingdom.

Several of the medical societies of Chicago recently appointed a joint committee of eighteen reputable physicians to draft a bill, which was presented to the Legislature of Illinois, and which was backed by the recommendation of the State Medical Society for that State. The chief provision of that bill was:

> That the judges of the Circuit and Superior Courts of the State of Illinois be and the same are hereby authorized to appoint in the month of January in each year, persons who shall act as expert witnesses in the medical and other sciences in giving opinion upon the evidence as presented in a hypothetical form on criminal causes that may be on hearing in the courts presided over by the said judges. Said expert witnesses shall hold their said appointments for one year or until their successors are appointed and qualified. * * * When expert opinion is desired in any cause pending in a criminal court, the trial judge presiding in any such case may, at his discretion, summon for duty under this act such expert witnesses to the number of three. Such expert witnesses shall be paid for their services by the county in which the trial for which they are summoned is held in such sums as may be named by the judge.

An attempt has also been made in Pennsylvania to pass a statute on the subject of expert testimony, but thus far without success. The State Bar Association of Michigan recently adopted a resolution recommending the appointment of legal expert witnesses by the trial judges and providing for their compensation by the court, and that such expert witnesses should have abundant opportunity to investigate the facts of the case on trial as far as they had a bearing upon the opinions they were expected to deliver.

The Hon. Seymour D. Thompson, in an able lecture delivered before the Michigan State Bar Association on "Damage Law and Damage Lawyers," made a suggestion in relation to contingent interests in damage cases held by lawyers, viz., that in all cases where the attorney had an interest in the result of a lawsuit, that he should be obliged, in order to preserve his lien, to file a statement of his claim in the particular case.

It seems to me, however, that a more complete and radical remedy should be applied, and that remedy is the re-enactment of the old common law prohibition against maintenance and champerty. It is true that some inconvenience and suffering might result therefrom, but the law cannot take care of every ill, and the greatest good for the greatest number should be the rule; in that way our courts would be purified and the terrible incentive to the perpetrator of fraud on corporations, and the commission of perjury in the trial of cases would be removed.

With a view to making connection with the electric railway in Tokyo, the Keihin Electric Railway Company has applied to the authorities to diminish the gage of its lines from 4 ft. 8½ ins. to 4 ft. 6 ins. It is reported that the company intends to employ large passenger cars, 44 ft. long.

CENSUS STATISTICS AND THE STANDARD FORM OF ELECTRIC RAILWAY ACCOUNTING

BY W. M. STEUART, CHIEF STATISTICIAN, DEPARTMENT OF MANUFACTURERS, UNITED STATES CENSUS OFFICE

There are many obstacles to the compilation of accurate statistics concerning industrial enterprises, but the two we are particularly concerned with are the absence of standardization in accounting and the disinclination of individual owners, companies, and corporations, to furnish information. Both of these impediments to good statistical work have been met, and, in a measure, overcome in gathering and compiling the statistics for street and electric railways, contained in Bulletin No. 3, recently published by the United States Census Office. This bulletin will be followed at an early date by a report which will contain an elaborate discussion of the statistics, a history of the industry tracing the development of the modern street railway system, the features peculiar to the interurban lines, and, in fact, will present every phase of the industry that is pertinent to a statistical discussion. I presume you have studied the bulletin and that you will give some attention to the final report.

The bulletin is certainly the most complete presentation of the street railway interests that has ever been published. The conditions prevailing in the industry are entirely different from those that existed at the time of the eleventh census, 1890. The electric road was then just being introduced, its possibilities were not realized, in fact, we are just now beginning to appreciate them. There could, therefore, be no more opportune time for taking a census of the industry than the year selected. In another decade the industry will have assumed much graver responsibilities, and the conditions will again be radically different. The changes that have occurred and the advances made during the past ten years are astounding, but they have by no means reached their limit. The changes in ownership and management were so rapid during the six months that the canvass was in progress that it was almost impossible in some cases to catch the right man to make the report. He had sold out, consolidated, reconsolidated, made a new issue of stock, or was remodeling the entire system. In some cases, a week or more was consumed in locating the party who could make the report. Every road appears to come out of the general mix up in better condition, so far as the physical equipment is concerned, but the finances of some are rather distressing.

The census of 1902 caught the industry in the fullness of its youth, but because of its vigor, it was difficult to control it in a cool and dignified statistical style. It would not stand still long enough to be measured. I am in hopes that the next enumeration will catch it when it is nearer maturity and when it will be more tractable, and reliable figures can be obtained for its most minute details. The census reports give you a complete picture of the street and electric railway industry as it existed during the year. This is the first time we have ever had the opportunity of studying, in such a convenient form, the finances of the roads in each section of the country and of examining the physical equipment of each individual system. It is only by a careful analysis of the conditions prevailing in each company that you can devise a system of accounting that is capable of practical application to all. Each of you has, no doubt, a thorough knowledge of the physical equipment and finances of the road with which you are connected, and possibly have the facilities for comparing these conditions with the conditions existing in a limited number of other companies, but the census reports give you an opportunity for extended comparison and analysis. They enable you to become acquainted with conditions existing in the industry in all sections of the country. They show where it predominates, the magnitude of its financial operations, the number of people it supports, its peculiarities in different localities, the reasons for peculiar features, the character of equipment and service, the extent of its patronage by the public, the advantages derived by the public, and the possibilities of its extension. The reports are a storehouse of information, and they could be made of great service as books of reference for investigations, and for the basis for researches that must be made in order to become thoroughly posted in every detail of the industry.

While it is not my purpose to discuss the statistics, I feel that some reference to them, especially to peculiar features, is necessary in this connection, and, in fact, is indispensable in order to appreciate the difficulties attending a uniform application of your system of accounts. With the exception of the food, clothing, woodworking, and iron and steel industries, there is none of more importance and that is more conducive to our happiness and prosperity than the transportation facilities. For statistical purposes, these industries are divided into three groups, steam railroads, street or electric railways, and transportation by water. While

the steam railroads form by far the most important group, the urban population of the country is more thoroughly dependent upon the electric roads for their immediate necessities. If these roads were abolished and no other means of rapid transportation substituted, I imagine that New York city would, for all practical purposes, very quickly divide itself into three distinct cities, and that a similar sub-division would occur in Chicago, Philadelphia, Boston, and all of our large cities. The suburbs would be about as inaccessible as the rural districts and would disappear or dissolve into separate cities. Not only have these roads become necessities, but I believe a larger proportion of the population depend upon them for their amusement and health than on any other line of diversion. The extent to which they are patronized is indicated by the fact that more than 5,800,000,000 passengers of all kinds were carried during the year. This is sufficient to give more than 200 rides to each inhabitant of the cities and towns having a population of 4000 or over at the census of 1900. They give employment to an army of 140,000 persons, thus making at least 560,000 dependent upon them for their support. The salaries and wages paid annually to their operatives amount to more than $88,000,000. The average annual wages per operative compare favorably with those in other lines of industry, and there are very few that give constant employment to a larger force or have a larger pay roll.

The financial transactions of the companies are rapidly approaching proportions which will outclass those of our largest industries. The authorized capitalization in 1902 amounted to $2,870,629,316, while the gross earnings from operation were $247,553,999, and the net income, after deducting all expenses, both operating and fixed charges, was $30,596,977. The statistics for the physical equipment of the roads indicate the great diversity of industries that are, in a measure, dependent upon them for their prosperity. The construction of 22,577 miles of track was a great stimulant to the steel rail market, while the building of 67,000 cars made a great demand on the numerous industries dependent upon such work. The manufacture and installation of the engines and boilers to generate more than a million horse power reported for the power plants of the electric railways was sufficient to keep our largest foundry and machine shops busy for many months. The extent to which the manufacturers of electrical apparatus are dependent upon the roads is indicated by the fact that almost 5000 large generators, transformers, boosters, auxiliary generators, rotaries and motors were in use, also over 16,000 storage battery cells, and this does not take into consideration the electrical equipment of the cars, wiring of the road, or the lighting and telephone facilities.

The Census Office received reports from 987 companies, but if the present rate of consolidation is continued for another decade we can secure reports for two-thirds of that number and still cover the entire trackage. The term company or establishment is rapidly losing its significance in all of our important industries. It is of no statistical value in the report on electric railways. If the word "system" could have been used to designate the number of separate holdings it would probably have conveyed a more exact meaning, but this was impossible because, in some instances, separate reports were made for constituent companies. The two systems in the District of Columbia insisted on making eight reports and would not be satisfied until they were counted eight times. There were nine companies operated by regular steam railroads as an auxiliary of the railroad business, and to which it was impracticable to apply your system of accounting. Eleven companies operated incline planes exclusively and, therefore, cannot be strictly classed as street railways. There were also 53 companies operated exclusively by animal power, 2 by cable, and 3 by steam. Eliminating these and the 170 lesser or non-operating companies, there remain 739 companies with 18,730.28 miles of single track to which your system of accounting could be considered as applicable. But a large number of these companies have complicating features that are difficult to overcome in the application of your system of accounting. For instance, 252 companies generate electric current for sale, and the business was of such importance that separate reports were secured for the light and power plants of 118 companies in which the revenue from the sale of current amounted to $6,469,726. The form of account recommended by you does not take sufficient cognizance of this feature of the industry. It is a feature that appears to be developing very rapidly and should be recognized in any system that is to be made of universal application. After deducting the 252 companies that generate electric current for sale we have 487 companies, and of these 50 operate gas-plants, water-works, or some other industry that has no connection with the railway business. There are, therefore, only 437 companies to which your form of accounting is strictly adaptable. These conditions illustrate the tendency toward consolidation of independent interests, which is a feature of our industrial progress in all lines of industry. All of these conditions should be considered in formulating a system of accounts or preparing a schedule for statistical work. The accounts and schedules must be changed to meet the conditions. The industries will not be conducted so as to fit the accounts or schedules.

The establishment of interurban lines is a feature of electrical railway development which is now attracting the greatest attention. It is the field which offers the greatest possibilities for expansion and for the application of improved and more powerful machinery. The improvements that have invariably followed upon the introduction of an electric road into a community, especially in the suburbs of cities, warrant the conclusion that the construction of such roads will continue with the same degree of rapidity that has characterized their advance during the past decade.

Electric roads run indiscriminately into urban and rural districts; there are none confined exclusively to interurban traffic, and it is impossible to make a separation of the roads so as to show the statistics for those engaged in rural and interurban work unless arbitrary methods are used. The census report gives the miles of track within and outside of city limits, but this can only be accepted as a rough indication of the interurban lines. A road may be considered as engaged primarily in urban business if at least one-half of its track is within city limits. On the other hand, a road may connect two or more cities and be classed as an interurban line, although more than half of its traffic is within the legal limits or suburbs of the cities it connects. In making a separation of the roads, it is found that about 300 companies can be considered as operating interurban lines. Their total single track amounted to 8,853.53 miles and their total earnings from operation for the year to $41,099,887; the total operating expenses were $26,135,031, the net earnings being $14,964,856. The single track of these companies forms 39 per cent of the total for all companies and their operating earnings 17 per cent of the total earnings from operation. The interurban traffic, therefore, forms only a very small proportion of the total electric railway business. There are about 56 companies with 3,212.75 miles of single track that operate what may be classed as fast, long-distance, interurban lines. Each of these companies operates at least 20 miles of road, the average length of single track per company being 57.37 miles. The maximum running speed outside city limits was at least 25 miles per hour. The total operating earnings amounted to $13,657,021 and the operating expenses $7,924,568, the net earnings being $5,732,453. These roads have some features which are distinctive, and the Census Office is now preparing an analysis of their statistics which will be included in the final report.

It is time to say good-bye to the horse car line. It has been electrocuted in almost every city where it was in a flourishing condition a few years ago. While there were 67 companies using animal power and 259.1 miles of track operated by such power, the greater proportion of the track was owned by companies which used other motive power on a portion of the line. There were only 53 companies which used animal power exclusively, and their single track amounted to 158.12 miles, being an average of about three miles for each company. It is strange that the metropolitan district in which the most advanced electrical appliances are in use on the street railways is also the home of the antiquated horse car. Almost half of the trackage operated by animal power is located in Manhattan, and the Dry Dock, East Broadway and Battery Railway is the largest road operated by a company using animal power exclusively. With the exception of New York, the following cities are the only places in which more than five miles of track were operated by animal power in 1902: Hutchinson, Kan., 7.83 miles; Santa Rosa, Cal., 7.33 miles; Chicago, Ill., 6.76 miles; Winfield, Kan., 6.25 miles; Los Angeles, Cal., 5.95 miles; San Francisco, Cal., 5.65 miles; Arkansas City, Kan., 5.50 miles; and Tuscon, Ariz., 5.10 miles.

The cable, which fifteen years ago had such bright prospects, is now antiquated. There are only two street railways operated exclusively by cable power. From the Census Bulletin there appear to be twelve roads of this character, but ten of them are inclined planes.

Steam has never been accepted as a proper motive power for roads of the class covered by this report, and it is doubtful if any of them should have been included. It was difficult to break away from tradition, and the few enumerated have been so classed in prior census reports and technical journals, and they were included so as to preserve the comparison.

I have referred to the different classes of roads and industries other than a legitimate railway business carried on by railway companies, to illustrate the fact that, as a whole, the street railway business is not as clearly defined as most people suppose. The temptation to engage in other lines of industry cannot be resisted, and it is impossible to compile exact statistics for the railway business exclusively. If you believe that your system of accounts is capable of practical application to all companies, and that its use would enable the government to compile exact statistics, I am

afraid you will be disappointed. It can be applied to the majority of the companies and the results of its application will be very beneficial.

As accountants, you are particularly interested in the financial statistics, but I am of the impression that the chief value of the census report lies in its detail presentation of the physical equipment of each road. These tables enable you to make an exact comparison of the power plant and rolling stock of your company with those of every other company doing a similar business. Such comparisons can be of no detriment to any company; on the contrary, they tend to better the conditions in all. Such a comparison cannot be made of the financial statistics without disclosing the operations of individual companies, and, as a number of companies expressed the desire that this should not be done, the only comparisons possible are based on the totals for several companies, in each of which slightly different conditions prevail.

The general tendency in most lines of industry is toward over capitalization, and the conditions prevailing in the electric railway business seem to have been especially conducive to this result. The par value of the common and preferred stock on which no dividends were paid during the year amounted to $667,878,624, or about 50 per cent of the total issued. The practice of some companies to equalize the cost of construction with the amount of capital stock and bonds, and the apparent inability of others to furnish definite information concerning the cost of construction made it impossible to compare the actual cost with the stock and bonds issued. Accepting the figures as reported, it appears that the stock issued and the funded debt outstanding for all roads exceeded the cost of construction by $140,648,022.

The tables presented in the bulletin show the earnings and expenses in the form prescribed by your Association for all roads in each State, and other groupings will be made in the final report which may be more instructive. The grand totals for all roads in the entire country, or for any State, are no indication of the conditions prevailing in any individual company or in companies engaged in particular lines of traffic. A grouping of these statistics for interurban or urban roads, or roads in cities of a given population would indicate the amount of income and expenditure that should prevail in the companies operated under similar conditions. Such tables are now being prepared for the final report, but the work is not sufficiently far advanced for me to give you the results.

To be of value, the totals for the same groups of receipts and expenditures should, in every case, be composed of the same items. The absence of uniformity in this respect is the cause of much uncertainty in accounting, and this is greatly emphasized in the preparation of totals so large as those given in the census reports. No more important service can be rendered the statistical science than the adoption of uniform systems of accounting, but there are comparatively few lines of industry in which the same system can be uniformly applied to all establishments. Your system was devised primarily for companies doing an electric railway business exclusively, but the census investigation developed the fact that there are comparatively few companies that do this. For instance, in reporting the analysis of operating expenses, the majority of the companies, in answering the sub-questions, included the expenses incident to the generation of electric current for sale, but there was an expenditure of $2,188,753 for such work that it was found impossible to segregate. The expenses incident to such work are, therefore, included for some companies and omitted for others. In many cases of this character the companies contended that the system was not applicable to roads operating electric light and power plants. If expenses incident to the generation of current for sale are included in the operating expenses of the road, it is manifestly wrong to use those totals to compute the expenses per mile of track, per car, or per car mile. In fact, there are comparatively few companies for which it is practicable to obtain statistics concerning a year's business that could be used to make such computations with exactness. It is probable, however, that the census totals are sufficient for general comparisons. They are uniform for all sections of the country and can be used to indicate the conditions in one locality as compared with those in another, on the theory that the elements, which are wrongly included, exist in about the same degree in all localities.

In formulating the schedule for street and electric railways, the Census Office endeavored to adopt a series of inquiries which would comply with the requirements of the law, and, at the same time, be easy to answer by all companies, and also develop information of interest and value to those engaged in the industry. The inquiries suggested by your form of accounting seemed to answer these requirements. The numerous items enumerated as the proper ones to be assigned each general sub-division indicated a careful analysis of the industry. The organization had been in existence a number of years and its system appeared to have developed very largely with the industry and had been put into a more exact and positive form by the promulgation of printed schedules. Under these conditions, the form was evidently the correct one to be used, and you are familiar with the negotiations which culminated in its adoption for census work.

The adoption of your schedule was part of an extensive scheme now being worked out by the Bureau of the Census for the collection of statistics of every description. The demands for statistical information have been so pressing during recent years that the Federal and State statistical offices have developed more rapidly than a due regard for their work would warrant. A number of railroad companies in different States complained of the numerous demands for government reports, and expressed the hope that action be taken by the Federal and State governments to secure uniformity in regard to the periods to be covered by such reports. This is particularly the case in Pennsylvania, where the railways are required to make three reports during the year at varying periods, neither one of which, as a rule, conforms to the business year of the company. The work must be systematized so as to avoid duplications, produce uniformity in schedules, and establish fixed periods for the collection of data by the different States and the United States; in a word, to "standardize."

After adopting your schedule the Census Office immediately ascertained to what extent it had been used by the State Railroad Commissions. The Commissions in New York, Massachusetts, Connecticut, Maine, and New Hampshire, were using schedules that followed the form almost exactly. These five States contain 6,386.92 miles of single track, or 28.30 per cent of the total trackage in the United States. This fact alone would have justified the office in using your form, but it was also found that a number of other States had collected information from which the schedule could be partially prepared. Pennsylvania is one of the most important States that had not adopted the standard form, but the Commissioner informed me it was his intention to do so. The adoption of this form by the officers in all States would aid greatly in its uniform application, and it seems to me you should endeavor to accomplish this by persistent work with the State Commissioners.

Under the conditions, the preparation of an acceptable schedule proved to be the easiest part of the investigation. It was necessary to secure a report on this schedule from every street and electric railway in the entire country, of which a great many had never used the form devised by the Street Railway Accountants' Association. This has been accomplished, and, with a few exceptions to which I will refer, reports have been secured from every company, irrespective of its size, location, or character of its motive power. It has been a very difficult work and the experiences of the special agents engaged in collecting the schedules were not uniformly agreeable. While the majority of the larger companies furnished the reports without any hesitation and treated the agents in a manner that was very gratifying, a number contended that the form of account was not applicable to the road, or that it had never been used, would not be adopted because it was faulty, that the furnishing of government statistics was a perfunctory matter, that the companies never gave correct information, and if the agent wanted the report he must call again.

In one case the general manager, on being questioned about the characteristics of his motive power, informed the agent that the mules—he had two of them—would insist on running on the outside of the rails instead of between the tracks. He was assured that the adoption of the standard system of accounts would remedy this evil.

The agent who worked in Delaware and Maryland reported that only one company, the United Railways and Electric Company of Baltimore, had adopted the standard form of accounting. The other companies, as a rule, charged all expenses for additions and betterments to one account and could make no segregation. For operating expenses three accounts were kept, i. e., Maintenance, Operation, and General. Separate items were not shown and had to be estimated.

The tendency with the smaller companies seemed to be to cut short all bookkeeping work by lumping many of the smaller and even some of the larger items. This is satisfactory to the stockholders and to the management. In some cases, the work is done by the manager without a special bookkeeper. To follow a detailed system would necessitate an expense not justified by the interests involved. As a rule it was not difficult to secure reports in detail from the roads in the New England States, but estimates were necessary for some of the items. One of the agents who worked in the eastern part of Massachusetts found difficulty in securing schedules for some of the companies assigned to him, and reports as follows:

"The method of accounting in vogue by the electric street railway companies in Massachusetts is not the same as the Street Rail-

way Accountants' Association of America, but it is more in conformity with a State system—I call it a sympathetic system between State and railway companies. In some cases it would seem that the simplest possible methods were adopted by the railways so long as the State could be answered, while in other cases a double system was practiced, one for the State and the other for the company.

"On the whole, it seems a pretty good guide was available for the railway census purposes of Massachusetts, the facts, in totals, being provided, the segregation had to be made, and no positive exceptions were taken to this, when possible to accomplish with any reasonable amount of effort. It was policy to insist for answers to each question in the census schedule as it undoubtedly resulted in securing data which might not otherwise have been brought out. Only upon satisfactory evidence that exact data could not be obtained were estimates accepted.

"The United States Census inquiry met with general approval, and some regrets were made that accounts were not in a condition more favorable to it. The idea was advanced that if the United States Government would notify railway companies a year in advance, filing a form with such notification, when an inquiry was to be made and to be governed accordingly, it would be agreeably received and given careful consideration."

It is probable that in Philadelphia more roads are controlled from central offices than is the case in any other city, and we supposed their system of accounting would be perfect. Very few of the companies, however, kept their accounts in conformity with the standard form. In a number of cases it was found necessary to estimate the amounts from daily reports received from superintendents or managers. In one case the account books for a considerable property consisted of a day book, a letter file and a check book. The entries on the day book were wages, expenses, and receipts. The president of this company informed the agent that this system and poor management had cost the company $60.000 during the past few years; nevertheless, they had made no improvement. Other companies in Philadelphia appear to keep their accounts in a manner to fit the peculiar conditions existing in their respective properties. There were only one or two cases in which the books were kept in the form contemplated by your system. But in many cases it was found possible to obtain answers to the different inquiries by combining several items shown separately in the account books.

After examining the schedule, the general manager of a company in Missouri stated that the system of accounting was not in strict conformity with the one used by his company, but he thought that his books would enable him to prepare the report. After considerable searching in his private offices, he returned with a bank deposit book, and, to the surprise of the Census Office agent, this was the only book kept by the company. From this they jointly prepared a schedule.

Of the different items specified in your system of accounting, the segregation of the amounts chargeable to "construction and equipment" caused the Census Office the greatest trouble. You will see by the Census Bulletin that it was impossible to obtain amounts in answer to the different sub-inquiries with sufficient accuracy to justify their publication. Referring to this inquiry, the agents in Eastern Pennsylvania reported that in many cases, and particularly in cases of leased roads, there was no sub-division of construction and equipment. In some cases not even the cost of equipment was shown in the books, the road having been built with a view to its immediate lease to an operating company which would use its own equipment for the new section. They were reported as carried on the balance sheet, and, this being more or less arbitrary, it was impossible to estimate the sub-divisions required by the inquiry. It was with great reluctance that the companies estimated the amounts that should be charged to track and roadway construction as distinct from overhead construction. The impossibility of sub-divisions of this character was due primarily to the fact that the construction was generally paid for in a lump sum of stocks or bonds. Reports for construction and equipment of lessee companies necessarily show only the gross amount as carried on the balance sheet. It was practically impossible to obtain reliable answers to the inquiry concerning cost of right of way. This item was generally charged to construction, the constructing company providing for the purchase of the rights of way. In other companies, the land through which the road passed was largely owned by persons interested in the enterprise, and the cost of rights of way was considered in making the issue of "stocks and bonds" to landowning stockholders in lieu of cash payments. These amounts appeared, as a rule, to be greatly in excess of what cash payments to disinterested parties would have been. Amounts charged to organization, engineering, and superintendence were also more or less vaguely defined. The itemized form is only applicable to companies which have constructed their own line, and but comparatively few of the present owners have done this.

If a reliable sub-division of the total cost of construction and equipment could be secured for each company, I believe it would prove to be one of the most interesting and instructive features of the investigation, but the Census Office was loath to base any conclusions whatever on the imperfect answers given to the various sub-inquiries. For a large majority of the companies the sub-divisions were purely estimates prepared by the agent in consultation with the general manager or other officer. It is possible that in time it will be practicable to have this inquiry applied systematically to all street railways. The general tendency now, however, appears to be to equalize the cost of construction with the capitalization.

No provision is made in the Construction and Equipment account for the cost of franchise. In cases where a value was given to a franchise for which no actual expense was incurred it was not considered in the construction and equipment account, but was placed as a sundry item in the balance sheet. Where a road was purchased and an amount was actually paid, as a bonus, or for franchise rights, it was treated as a miscellaneous item in the construction account. Many companies reported an item of other permanent investment, such as stock and bonds of other street railway companies which they did not entirely own, and also of gas, water, ice plants, and ferry systems, that it was impossible to segregate from the railway business and which were therefore included in the balance sheet as other permanent investments. In such cases the amounts included in the income account were the net income from operations, while the amounts paid for interest, taxes, and other fixed charges, included the total amount of such charges, irrespective of the property on which it was paid.

With comparatively few and unimportant exceptions the Census Office was able to obtain satisfactory answers to the different sub-divisions under operating expenses. While the books for a considerable number of the companies did not show the separate items for each of the various sub-divisions under the general groups of "ways and structures," "equipment," "operation of power plant," "operation of cars," and "general," nevertheless the total amounts for these general sub-divisions were obtainable, and it was possible to make acceptable estimates for the various items included under each. A number of companies employed only such general sub-divisions as maintenance, operation, superintendence, etc. In such cases it was necessary to resort to the pay-rolls, and more or less difficulty was experienced in distinguishing between wages and other expenses. Practically all of the large companies in Pennsylvania kept their books, so far as operating expenses were concerned, in conformity with the standard form of accounting.

A peculiar condition of affairs was found at Cape Girardeau, Mo. The promoters and owners of the Citizens' Street Railway Company had operated a system for a number of years, but had not been able to make the system pay expenses and declare the dividends to which they thought they were entitled. They therefore decided to go out of business, but were unable to find any purchaser for the road. Therefore, they concluded to be public spirited citizens, and determined to give the road to some reliable party who would agree to operate it for the benefit of the community. This was apparently a very inducing opportunity to some energetic man, and was immediately taken up. The contract was executed and the whole system, including the rolling stock, horses and equipment was turned over without a dollar's compensation, the only condition being that the road would be kept in running order and operated during business hours. Eight months of operation convinced the new general manager that he had not made a good business transaction. In fact, he was constantly losing money, and not being a man of great financial responsibility, he decided to get rid of the road. He could only accomplish this by leaving the community, and the original owners have not been able to locate him.

The conditions on the Pacific Coast and in most of the Western States were in striking contrast to those in the East. The agent who worked in California reports that of the fifteen or twenty companies from which he obtained reports in and around San Francisco, only three or four had ever heard of the form of accounting recommended by the Street Railway Accountants' Association of America, and none had followed it. It must be admitted, however, that the majority of the companies were small, only four or five falling in the class of large corporations. The business methods used in San Francisco appear to prevail pretty generally over the entire State of California. In some respects the forms of bookkeeping used are antiquated, and the conditions are such in the street railway industry that the companies did not appear inclined to adopt the form recommended by your association. The agent states that corporations sacrificed good business principles and practices for immediate profits to enhance the market value of

stocks that will quickly sell at big margins for promoters. To this end expenses are kept within limits, often below the point of good business economy. One of the favorite places of curtailment is in the clerical force of the central office, which is, as a rule, ridiculously inadequate. In consequence the system of accounting is crude, simple and direct. The books are organized for large, comprehensive groupings, with few of the divisions and none of the refinements that the Street Railway Accountants' Association would have instituted. Three of the largest corporations scheduled kept fairly good sets of books. Their grouping of items was not in conformity to our schedule, but calculations could be made for the segregation of groups so that the totals returned on the schedules were correct and the individual items close approximations. With the smaller companies the grouping was not carried to such a degree of refinement, and most of the items of inquiries for construction and equipment and operating expenses had to be estimated. The totals returned, however, agreed with those shown by the books of the companies. To illustrate: If wages of conductors and motormen, in operating expenses, were consolidated and carried as *one* item on the company's books, as was frequently done, the correct total was preserved in the returns, but segregated into the two items by calculations based on the relative number of the two classes of employees, their wages, and their hours of service.

The indications are that the adoption of the form of accounting proposed by the Street Railway Accountants' Association by the street railways of the Pacific Coast is discouragingly remote. In fact, the results of the census inquiry lead me to believe that your system of accounts has not been generally accepted in the Western States.

An agent who worked in the States of Missouri and Ohio, securing reports from eighteen companies, found that only five of the eighteen had adopted your form of accounting, and in these five companies the system of accounts differed slightly from the standard form. This agent found that one or two companies were using an old form of accounting recommended by the American Street Railway Association some years ago, and which differed, in some respects, from the revised form. Five of the companies canvassed by him used a very simple form of accounting, keeping practically only two accounts, the income account and the expense account. In these companies it was necessary to make estimates for the different sub-divisions of operating expenses.

I have referred thus in detail to the experiences of the special agents employed in collecting the reports from the street railways in the different sections of the country to emphasize the fact that your form of accounting is far from being in universal use. The system, however, has been in vogue but a comparatively short time, and the tendency appears to be, among the railroad companies, to adopt it, and a number informed the office that it was their intention to change their books accordingly. While it is possible that a number of companies will adopt the form, it is also probable that they will not follow it in all of its details. The grouping of items, however, will be such as to enable the preparation of a complete report in conformity with it.

Another difficult feature of this canvass was the disinclination on the part of a few companies to furnish reports of any character. On this point the ideas of the company and the public differ, in some instances so radically that it is apt in the future to retard the compilation of reliable statistics. The present condition of society and industry makes it indispensable that statistical information be collected and published either by the government or by private enterprise. Each and every one of us is exerting his strength to the utmost, both mental and physical, to succeed in the business in which he is engaged, but no one can hope to meet with success unless he is thoroughly familiar with all the details of his industry. An essential part of such knowledge is information concerning the business methods of other persons engaged in the same lines of pursuit and data showing the extent of the industry, its relation to other industries, and to the public. The census is the only reliable source of such knowledge. These statistics show the result of our combined energies in the multitude of industrial enterprises. The man who refuses to contribute to the knowledge by declining to supply data, certainly does not have liberal ideas or is not interested in the general prosperity of the country.

Fortunately this spirit of indifference does not predominate in the street railway fraternity. The majority of the companies were very liberal in their ideas on this subject, but one or two important systems refused to furnish any information or answer certain inquiries concerning financial operations. We presume that these companies have good reason for their action, but I do not believe that they appreciate the uses made of census reports or the value that such reports are to the railway people and the public. After our negotiations with you and, as we presumed, through you placing ourselves in touch with the street railway interests, we were in hopes that every company would co-operate in compiling a report which would be a complete presentation of the industry. I cannot conceive that there is any good and sufficient reason for refusing to supply the data required by the census law. No one other than the sworn officials of the government is permitted to examine the individual schedules, and the published reports contain no information from which the financial operations of the individual companies can be identified. Therefore, competitors, if there are any, cannot obtain information that would be of the slightest advantage. If the reports should show that the electric roads are paying large dividends on watered stock, the public would not, on that account, stop patronizing them. On the contrary, the inclination would be to invest in the stock and encourage your friends to ride on the cars in order to increase the dividends. On the other hand, if there are pernicious practices existing in the industry that are contrary to honest business methods, or detrimental to public interests, I believe you will all agree with me that the sooner the census reports are printed and the methods exposed the better.

There were a number of companies that retarded the early publication of the census reports by delaying the preparation of their schedules, but there was only one that finally and definitely refused to make a report of any character. This was a large system in Kansas, and its action was based on the ground that it was not a street railway and did not desire to be so classed. This reason was persisted in notwithstanding the fact that the company was sent a schedule in which no reference whatever was made to street railways and was assured that it would be classed as an electrical company, and that all other roads in the same State operating under similar conditions had made reports. In addition to this, there were three companies in Illinois that refused answers to all inquiries concerning financial matters. There were also fourteen companies that, for various reasons, were unable to make a report for financial operations. Some of these were steam railroad companies operating electric lines for which separate accounts were not kept, some of them had been recently acquired by the present owners and the books of the original companies were not available. Two companies, one in Colorado and one in Pennsylvania, declared their inability to make a balance sheet, and two stated that they could not make a report as to the number of employees and wages. These constitute the twenty-two companies referred to in the Census Bulletin as not making complete reports.

The adoption of the Census Office of the form of accounting used by the Street Railway Accountants' Association was of benefit to the government, and I believe it was also of great assistance to your Association. It enabled the government to complete the inquiry at an earlier date than would otherwise have been possible, it brought the form to the attention of every company in existence, and they have all made at least one report in conformity with it. The indications are that the form of account will be followed by a number of companies who have not heretofore used it, thus assuring a wider application of a standard form and greatly enhancing the value of statistics that may be gathered for the industry in the future. It remains with you to perfect or change it so as to make it practicable for all companies, and then urge its universal application.

REPORT OF COMMITTEE ON RULES FOR THE GOVERNMENT OF EMPLOYEES

The committee respectfully submits the following as a standard code of rules for the government of conductors and motormen of street railways (except interurban lines), but would call the special attention of the members of the association to Rules 61-62, to determine as to the advisability of their adoption as a standard for general use.

The committee reports these rules as fundamental in their character, and therefore can be used by roads both large and small. If the local conditions of any company are such as to require additions to any of the rules, they can be added by using the same rule number and affixing letters of the alphabet; for instance, if it is desired to add to Rule 36, the addition would be embraced as Rule 36-a.

ALL EMPLOYEES WHOSE DUTIES ARE PRESCRIBED BY THESE RULES WILL BE FURNISHED WITH A COPY, FOR WHICH THEY WILL SIGN RECEIPT, AND WILL BE REQUIRED TO HAVE THE SAME IN THEIR POSSESSION AT ALL TIMES WHILE ON DUTY.

GENERAL RULES

1. Knowledge of Rules—Conductors and motormen are required to be familiar with the rules, and with every special order issued. The bulletin board must be examined daily for special orders.

Employment by the company binds the employee to comply with the rules and regulations, and ignorance thereof will not be accepted as an excuse for negligence or omission of duty. If in doubt as to the exact meaning of any rule or special order, application must be made to the proper authority for information and instruction.

2. Report for Duty—Regular conductors and motormen must report for duty ten minutes before leaving time for their first trip, or, if for any good reason unable to so report, must give notice at least ten minutes before such leaving time.

Extra men must report at such time as ordered, or must give notice at least ten minutes before such time. They must not absent themselves after answering roll call without permission.

3. Personal Appearance—Conductors and motormen must report for duty clothed in full regulation uniform, and must be clean and neat in appearance.

4. Politeness—Conductors and motormen must treat all passengers with politeness; avoid difficulty and exercise patience, forbearance and self-control under all conditions. They must not make threatening gestures, or use loud, uncivil, indecent or profane language, even under the greatest provocation.

5. Habits and Personal Conduct—The following acts are prohibited:

(a) Drinking intoxicating liquors of any kind while on duty.

(b) Entering any place where the same is sold as a beverage while in uniform or while on duty, except in a case of necessity.

(c) Constant frequenting of drinking places.

(d) Carrying any intoxicating drink about the person while on duty.

(e) Carrying intoxicating drinks on the company's premises at any time.

(f) Indulging to excess in intoxicating liquors at any time.

(g) Gambling in any form, including the laying of bets (and playing raffles) while upon the premises of the company.

(h) Smoking tobacco while on duty.

(i) Smoking tobacco while off duty in any part of the company's building, except in the conductors' or motormen's room.

6. Talking to Motormen—Motormen while operating cars are permitted to answer questions of superior officers and to give proper instructions to students only. All other conversation with motormen while car is in motion is forbidden.

7. Run on Time—Cars must never be run ahead of schedule time, but must pass time points and leave terminals promptly on time, unless unavoidably delayed.

8. Railroad Crossings—Cars must be brought to a full stop, at a safe distance, approaching steam railroad crossings at grade, and motormen must not proceed until conductor has gone ahead to the center of crossing, looking both ways, and given the "Come ahead" signal. Before starting, the motorman will look back to see that no passengers are getting on or off; and in no case proceed, even after the conductor's signal, until he has also examined the crossing and satisfied himself that steam cars are not approaching.

When there is more than one track the conductor must remain in advance of the car until the last track is reached.

Where crossing is protected by derail, interlocking plant or flagman (employed by the company) this rule does not apply, special instructions being issued to govern.

9. Starting Cars After Blockade—In the event of a blockade of cars from any cause, all cars in such blockade must not be started at one time, but only singly and at such intervals as will not burden the feeder line.

10. Reporting Defects—Conductors and motormen will report to foreman or inspector any defect in car, track or wire which needs immediate attention.

11. Hearing by Superintendent—A hearing will be given by the superintendent to every employee who desires to complain. Reports or suggestions for the betterment of the service will always receive consideration.

RULES FOR CONDUCTORS

12. Be on Rear Platform—Remain on rear platform when not collecting fares, keeping a lookout for persons desiring to board car.

Keep careful watch of passengers to observe requests to stop car.

When stops are made at principal streets, places of amusement, churches, or at any point where a considerable number of passengers enter or leave the car, conductors must be on rear platform until such point is passed.

13. Announcements.—Announce distinctly the names of streets, public places and transfer points when approaching the same.

14. Removing Trolley—Do not remove trolley from wire at end of run, or elsewhere at night, until passengers have alighted from car.

15. Route Signs—See that route signs are properly displayed on each half trip.

16. Carrying Packages—Passengers must not be allowed to carry bulky or dangerous packages aboard cars.

Do not in any way take possession of, or assume responsibility for, any package which a passenger may bring upon the car, excepting such articles as are to be turned into the Lost Article Department.

17. Watching the Trolley—Keep your hand upon the trolley rope when passing over switches, crossings, or going around curves. Should the trolley leave the wire, the conductor must at once pull down the trolley and signal the motorman to stop. After the car has stopped replace the trolley on the wire, look around and through the car and see if any persons are boarding or leaving same; ring two bells for the motorman to start. See that passengers keep their hands off the trolley rope.

PLATE 1.—POSITION OF CONDUCTOR WHEN ABOUT TO GIVE "DANGER" SIGNAL, FLAGGING TRAIN TO STOP, WITH RED LANTERN —SEE RULE I-6-a

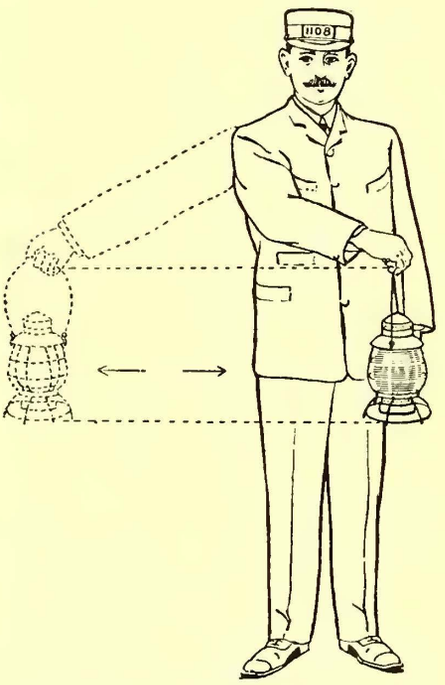


PLATE 2.—PROPER METHOD OF GIVING "STOP" SIGNAL WITH RED LANTERN—SEE RULE I-6-a

18. Keeping Gates Closed—Front and rear gates on closed cars on the side between the tracks must always be kept closed and securely fastened (when running on the road). On open cars the guard chains and guard rails must be kept fastened on the side between the tracks. When gates or chains or their fastenings are broken or out of order, prompt report must be made to foreman, inspector or starter.

19. Housing Cars—When the car is run in the house, either day or night, always shut off lights, remove trolley from the wire (if equipped with overhead trolley) and turn to position ready for leaving, also turn up longitudinal seats of closed cars.

This applies to roads having overhead trolley, ready for leaving, and turn up longitudinal seats of closed cars.

20. Moving Forward—On closed cars, when standing passengers crowd the rear door, request them to "Please step forward in car."

21. Seating Passengers—Standing passengers should be directed to vacant seats, and an effort made to provide them with seats where possible.

22. Assisting Passengers—Elderly and feeble persons, and women and children, should be given assistance getting on and off car, when possible.

23. Dogs in Cars—No dogs should be allowed on a car except such small dogs as can be carried in the laps of passengers.

RULES FOR MOTORMEN

24. Stopping for Passengers—Keep a careful lookout on both sides of the street and bring the car to a full stop for every person who signals, except that when a car has considerable headway, is overcrowded, and another car follows within the same block (or 200 feet), passengers should be requested to take the following car.

Cars will stop on signal only at farther corners, at car stations, transfer points and at points as provided in special orders.

Do not stop cars so as to block cross streets or crosswalks.

25. Churches and Hospitals—When passing a church during the hours of service, and at all times when passing a hospital, do not use the current and do not ring the gong, unless necessary.

26. Reversing Car—Never use the reversing lever to stop car except to avoid a collision or injuring a person or animal, or when the brake rigging is disabled.

Do not reverse the power when the brake is set, but release the brake and reverse the power simultaneously, and, when the reverse lever is thrown in position, apply the current one point at a time, otherwise the fuse will melt or the breaker will release. Sand should be used when making an emergency stop.

27. Passing Cars—Never run against the switch point of crossover when meeting a car, but slacken speed sufficiently to allow the car moving in the opposite direction to pass before striking switch point.

This rule refers particularly to all crossovers having switch points facing opposite to the direction in which the car is moving.

28. Leaving Car—Never leave platform of car without taking controller handle, throwing off the overhead switch and applying brake. Be careful to see that the hands point to the "off" mark before taking off controller handle.

29. Economical Use of Current—In order to effect an economical use of electric current, it is necessary that the continuous movements of starting and increasing speed should be made gradually.

In starting a car, let it run until the maximum speed of each notch has been obtained before moving handle to the next notch.

Do not apply brakes when the current is on.

Do not apply current when brakes are applied.

PLATE 3.—POSITION OF CONDUCTOR WHEN ABOUT TO GIVE "PROCEED" SIGNAL WITH LANTERN—SEE RULE I-6-b

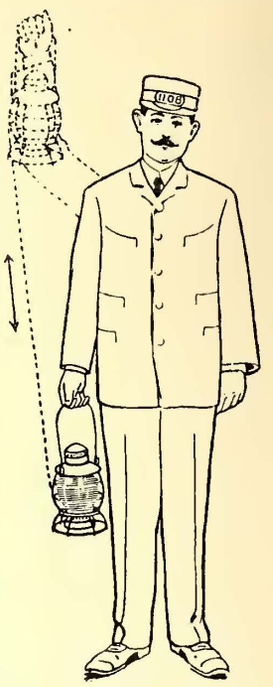


PLATE 4.—PROPER METHOD OF GIVING "PROCEED" SIGNAL WITH LANTERN—SEE RULE I-6-b

A great amount of power can be saved by using judgment and discretion in approaching stopping places and switches by shutting off the power so as to allow the car to drift to the stopping place or switch without a too vigorous use of the brake.

30. Throwing Overhead Switch—An overhead switch must never be thrown until power is turned entirely off, except in case controller cylinder fails to turn when power is on. It must be thrown by hand only.

31. Power off Line—When the power leaves the line the controller must be shut off, and the overhead switch thrown, the light switch turned on, and the car started only when the lamps burn brightly.

32. Release Brakes Before Stop—When brakes are set to make a stop they should always be released, or nearly so, just before the car comes to a standstill.

33. Water on Track—When there is water on the track run the car very slowly, drifting without use of power whenever possible, otherwise there is danger of burning out the motors.

34. Sanded Rails—Never run on freshly sanded rails with brakes full on, except to prevent an accident, as the wheels are liable to be flattened when this is done. On cars provided with sand boxes, in case of slippery rail, always sand the track for a short distance before applying the brakes.

35. "Spinning" of Wheels—Care must be taken, particularly during snowstorms, to avoid "spinning" of the wheels with no forward or back movement of the car.

36. Do Not Slide Wheels—On a slippery rail do not allow wheels to slide; as soon as wheels commence to slide the brake must be released and reset.

37. Do Not Oil Car—Do not oil or grease any part of a car.

PLATE 5.—POSITION OF CONDUCTOR WHEN ABOUT TO GIVE "BACK UP" SIGNAL, BY NIGHT, WITH LANTERN—SEE RULE I-6-c

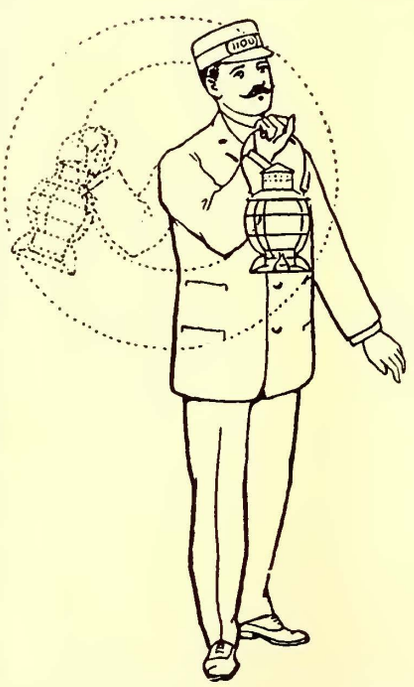


PLATE 6.—PROPER MANNER OF GIVING "BACK UP" SIGNAL, BY NIGHT, WITH LANTERN—SEE RULE I-6-c

Do not allow the current to remain on when car is going down grade, or when passing over section breakers. Endeavor to run car with the least amount of current, allowing the car to drift without the use of the current when it can be done without falling behind time.

SIGNALS AND THEIR APPLICATION

The following code of bell signals will be used in the operation of the car:

38. Bell Signals—From conductor to motorman, to be given on motorman's signal bell:

One Bell—"Stop at next crossing or station."
Two Bells—"Go ahead."
Three Bells—"Stop immediately."
Four Bells—Given when car is standing—"Back car slowly."
From motorman to conductor, given on conductor's signal bell.

One Bell—"Come ahead."

Two Bells—"Watch the trolley and danger signal to the conductor."

Three Bells—"Set rear brake."

PLATE 7.—POSITION OF CONDUCTOR WHEN ABOUT TO GIVE "TRAIN PARTED" SIGNAL, BY NIGHT, WITH LANTERN—SEE RULE I-6-d

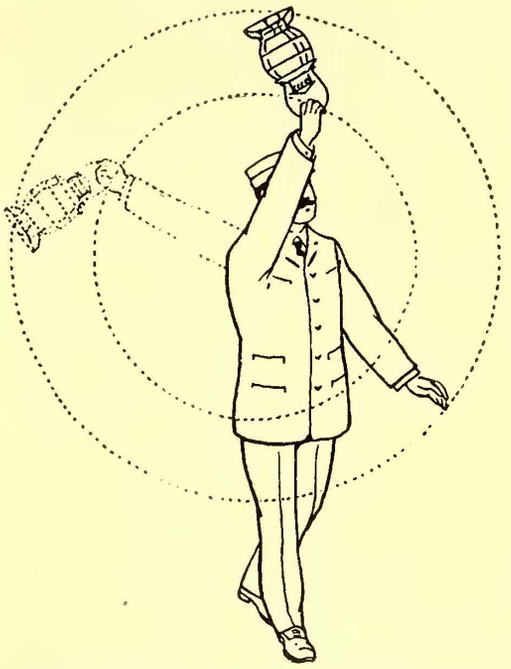


PLATE 8.—PROPER MANNER OF GIVING "TRAIN PARTED" SIGNAL, BY NIGHT, WITH LANTERN—SEE RULE I-6-d

Four Bells—Signal to conductor that motorman desires to back car.

*Five Bells—Warning—"Pull trolley down to roof."

Whenever a car in service is stopped, the motorman will, as soon as he is ready to go forward, give two taps of the gong, after which, if the conductor is ready to proceed, he will give the regular "go ahead" signal—two bells.

The motorman will answer the signal to stop from conductor by one loud tap of gong and two loud taps of gong after receiving the signal to go ahead. If unable to proceed immediately upon receipt of signal motorman will wait for for another "go ahead" signal before starting the car.

When the car is standing and motorman desires to back, for any reason, he will give the conductor four bells, but must not move the car until the conductor has answered with four bells to signify "all is clear behind."

39. Danger Signals—Red lights or flags indicate danger, and when they are placed alongside the track cars must be run slowly and with caution. When placed on the track cars must come to a full stop until such signal is removed.

40. Signals Before Passing Obstructions Near Track—Before passing any vehicle or obstruction close to the track, where passengers or conductor are liable to be injured while standing on the step of an open car, motorman must give two taps of signal bell as warning, reduce speed, and assure himself that all is clear before proceeding.

41. Starting—Motorman must never move car (whether stopped on signal or for any other reason) without signal from conductor, and then only when assured that no one is getting on or off front platform.

Conductor must never give signal to start when passengers are getting on or off.

Conductor must never give signal to back a car unless he is on rear platform and knows track is clear behind the car.

PRECAUTIONARY RULES—ACCIDENTS

42. Safety—The safety of passengers is the first consideration. All employees are required to exercise constant care to prevent injury to persons or property, and in all cases of doubt take the safe side.

43. Persons Between Cars—Cars moving in opposite directions must not pass at points where persons are standing between the tracks, but must be operated so as not to occupy both tracks at such points simultaneously.

44. Patrols—When any police or fire department vehicle is observed approaching (from any direction) cars must be stopped until such vehicle has passed.

45. Ambulances—Ambulances must be allowed the right of way, and when approaching or passing, cars must be kept under control to avoid collision.

46. Warning to Passengers—Conductors and motormen must (in a polite way) endeavor to keep people from jumping on and off the cars while in motion.

If such people attempt to get on or off the car while it is in motion, notify them politely to wait until the car stops. If passengers are leaving car while another car is approaching from the opposite direction notify them politely to look out for car on other track.

47. Standing on Steps—Do not allow any one to stand on the steps or buffers, and never, under any circumstances, permit a woman or child to ride on the steps. They should be fully inside of the car before the signal is given to start.

PLATE 9.—POSITION OF CONDUCTOR WHEN ABOUT TO GIVE "COME AHEAD" SIGNAL, BY DAY—SEE RULE I-9

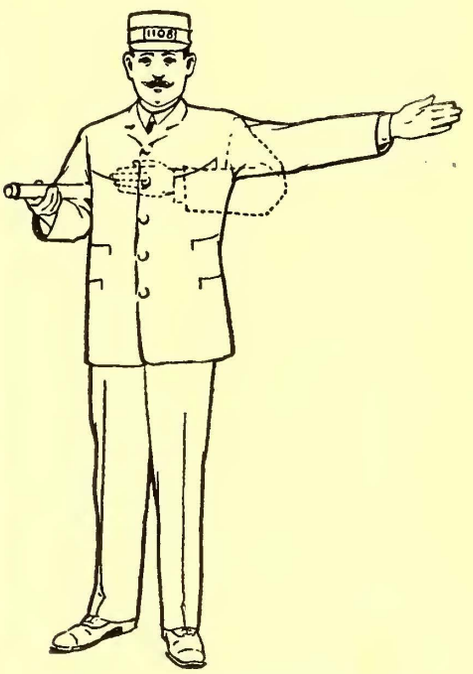


PLATE 10.—PROPER METHOD OF GIVING "COME AHEAD" SIGNAL, BY DAY—SEE RULE I-9

48. Leaving Car—When necessary for conductor to leave his car he must notify the motorman to protect passengers and car. Should passengers board car during absence of conductor, motorman will notify conductor of the number and location of such passengers upon his return.

Cars in commission must not be left unprotected, either conductor or motorman always remaining in charge.

* This applies to roads having overhead trolley.

49. Exercise Care—Motormen are cautioned to exercise great care when a vehicle is passing alongside of track ahead of car. Ring the gong vigorously to attract the attention of the person driving as a warning not to pull in ahead of car, and run cautiously until the vehicle is passed in safety.

50. Passing Cars—When passing standing cars gong must be rung and car brought to slow speed.

51. Render Assistance—In case of accident, however slight, to persons or property in connection with or near any car, the motorman and conductor in charge of the same will render all assistance necessary and practicable. In no case will they leave injured persons without first having seen that they are cared for.

52. Medical Attendance—Motormen or conductors are directed not to employ medical attendance to injured persons, except for the first visit, in cases of personal injury; nor will they visit such persons at any other time afterward, unless specially instructed so to do by an officer of the company.

53. Fatal Accidents—In the event of a fatal accident it will not be necessary to blockade the line awaiting the arrival of the coroner or any other official. If any accident occurs where it is impossible to carry the body to a place of shelter and security, motorman and conductor will put the body on the car and convey it to some suitable place.

54. Reports to be Full and Complete—A full and complete report of every accident, no matter how trivial, and whether occurring on or near the car, must be made by the conductor. Accidents sometimes considered as not worth reporting are often the most serious, troublesome and expensive.

The conductor will obtain the name and residence in full of all witnesses on or near the car.

The motorman will assist the conductor in securing the names of witnesses whenever practicable, and he will be held responsible for any neglect to render assistance.

In all cases full facts must be obtained and stated in the reports as follows:

The date, exact time, exact place, run and car number, and the direction in which the car was moving, the nature of the accident or collision, and the cause of its occurrence.

The full name and address of the party injured or whose vehicle was in collision (giving the name of both the driver and the owner of the vehicle).

Ascertain the extent of injuries or damage, if any, before leaving the spot.

In case there has been an accident on the car, and the conductors change ahead, the conductor taking car on which the accident happened must secure the names of witnesses as above.

In case a person is struck by a car after passing around the rear of a standing car, the numbers of both cars must be obtained, and both crews shall report accident.

If an accident is caused by any defect or damaged condition of car, conductor must report the same and its cause.

Accidents to employees will be reported the same as accidents to passengers.

Any trouble or disturbance of a boisterous or quarrelsome character which occurs on a car, or the ejectment of a person from a car, will be reported as an accident.

55. Telephone Information—In case of accident involving personal injury or serious damage to property, conductor will telephone at once to headquarters, giving notice and particulars of accident.

In case of a blockade, where assistance is required to get cars moving, conductor of car in block must perform this duty. Expense of telephone message will be refunded upon application at office.

56. Report Accidents to Inspectors—Conductors and motormen will make a verbal report to the first inspector or official of the company they meet of any accident, blockade or mishap of any kind.

57. Give Information to Proper Persons.—No employee shall, under any circumstances, give any information whatever concerning any accident, delay, blockade or mishap of any kind to any person except to a properly authorized representative of the company.

58. Responsibility for Damages—Employees will be held answerable for any damages caused by their neglect or carelessness or by disobedience of rules.

59. Disabled Cars—The motorman or conductor of any disabled car, withdrawn from the track, must remain with the car until relieved by proper authority or until car reaches depot.

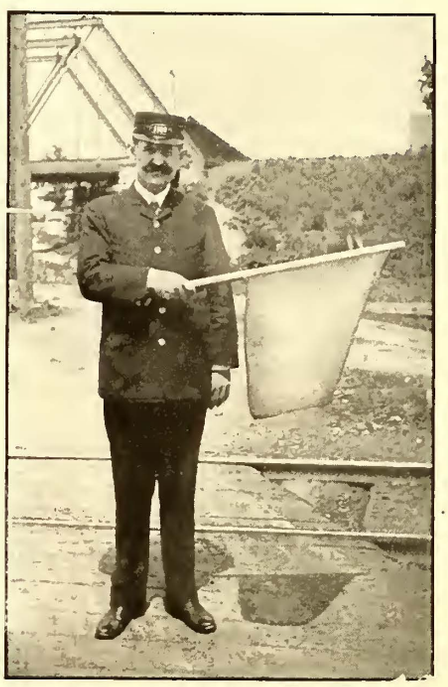


PLATE 11.—POSITION OF CONDUCTOR WHEN ABOUT TO GIVE "DANGER" SIGNAL, WITH RED FLAG, FLAGGING TRAIN TO STOP, BY DAY—SEE RULE I-9

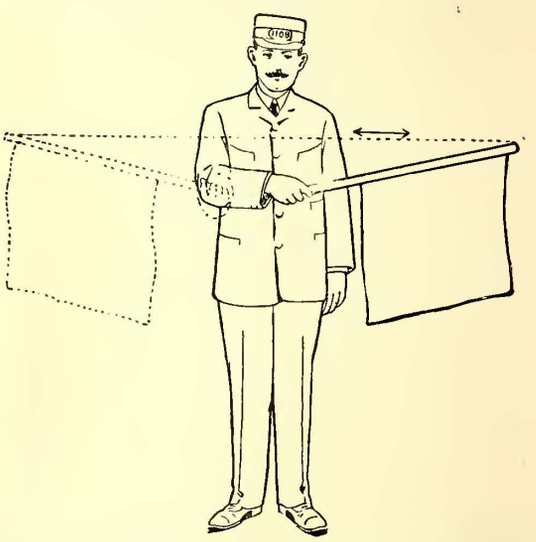


PLATE 12.—PROPER METHOD OF GIVING "STOP" SIGNAL, WITH RED FLAG, BY DAY—SEE RULE I-9

EJECTMENTS

60. Ejectments—No passenger shall be forcibly ejected from a car for any cause whatsoever without order of an inspector, starter or official of the company, unless the conduct of the passenger is dangerous or grossly offensive. In such case the ejectment must be made by the conductor with the assistance of the motorman after the car has been brought to a stop, using "only such force as is sufficient to expel the offending passenger with a reasonable regard for his personal safety.

61. Refusing to Pay Fares—Transfers—When a passenger refuses to pay fare or presents a defective transfer, or ticket, upon which, in the judgment of the conductor, the passenger is not entitled to ride, the conductor must secure the names of as many witnesses to he fact as is possible, whereupon the car must be stopped and the passenger requested to leave. If the passenger fails to comply with such request, the facts of the case must be brought to the attention of the first inspector, starter or official. In all cases the passenger must be given the benefit of any doubt.

When a passenger who refuses to pay fare requests to be allowed to leave the car, the car must be stopped and the person permitted to alight.

62. Intoxication—No passenger will be ejected from a car for mere intoxication, unless said passenger becomes dangerous or offensive; such passenger must be then ejected with great care and must be guided until free from probable injury.

63. Stealing Rides—Any person caught stealing a ride on a car must never be pushed therefrom while it is in motion.

64. Spitting on Floor—No passenger will be ejected from a car for spitting on the floor. If a passenger violates the rule of law prohibiting spitting, the conductor will call the attention of the passenger to the law prohibiting such conduct, and endeavor to persuade passenger to desist.

65. Get Witnesses—In case of ejectment, always get names of witnesses, and make report showing all the circumstances, the same as in case of accident.

66. Where to Eject—Any person ejected from a car must be put off at a regular stopping place.

No passenger will be put off at a point where likely to be exposed to danger.

Particular attention must be paid to this rule during bad and inclement weather, late at night, or when a passenger is intoxicated.

FARES AND TRANSFERS

67. Collection of Fares—Fares must be collected promptly after passenger has boarded car. When more than one passenger or

party boards car at a time the fares must be rung up on the register in the presence of the party who paid it before any more fares are collected. Conductor must ring each fare from the place where he collects it. Thus, a fare paid inside of car must be rung up from the inside, or from the platform if collected thereon.

68. Change—When necessary to give change, conductors must first register fare, and immediately thereafter give change.

69. Register Rings—Conductors must be careful to see that register rings each fare and that dial shows it.

70. Register Out of Order—In case the register gets out of order the conductor must stop using it, make report of fares on back of trip report or on blanks supplied for that purpose, and report the fact to the first inspector or starter met on the road, and subsequently report to superintendent.

71. Transfers in Blockades—In case any line is blocked it is the desire of the company to carry passengers to their destination on other lines. Under such circumstances conductors of parallel or intersecting lines will accept transfer tickets accordingly and will issue a transfer on a transfer if necessary. They will also accept transfer passengers without tickets on orders from any inspector or authorized representative of the company, making report of same on back of trip report.

PLATE 13.—FRONT END REGULAR TRAIN, WITH RED DASH SIGN, BY DAY—SEE RULE I-11

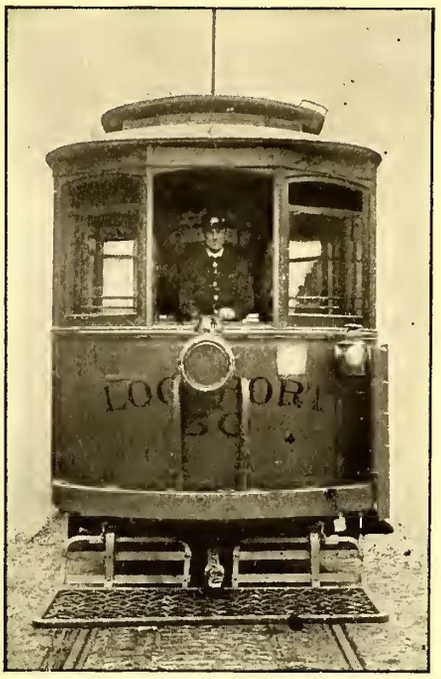


PLATE 15.—FRONT END REGULAR TRAIN, WITH RED LANTERN AND RED DASH SIGN, BY NIGHT—SEE RULE I-11

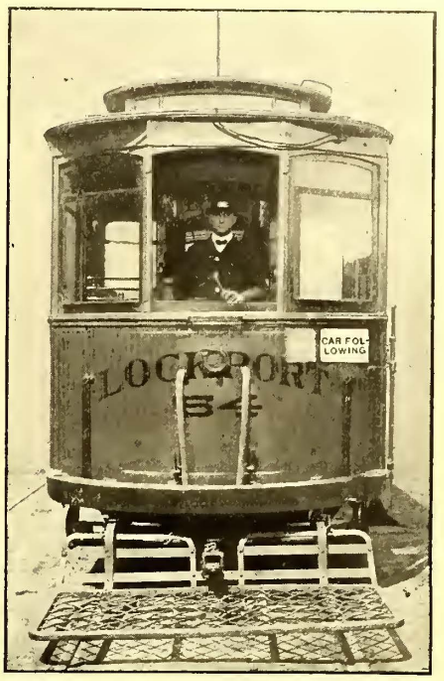


PLATE 17.—FRONT END REGULAR TRAIN, CARRYING SECOND SECTION SIGNALS, GREEN AND RED DASH SIGN, BY DAY—SEE RULE I-12

72. Transfer Point Meetings—Motormen and conductors will be held equally responsible for leaving a transfer point so quickly as to prevent the transfer of passengers from an approaching car on a connecting line.

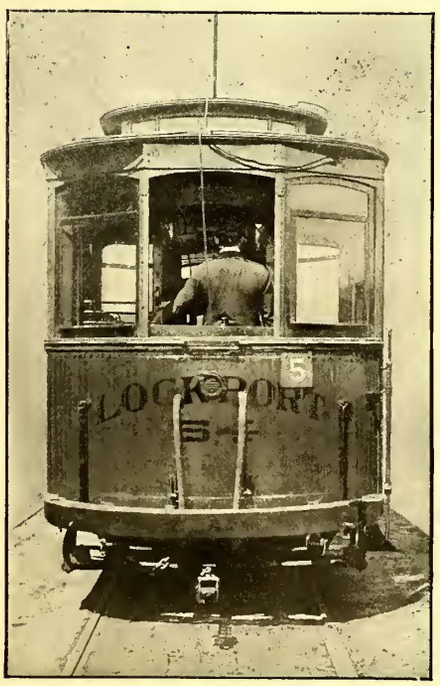


PLATE 14.—REAR END REGULAR TRAIN, WITH RED DASH SIGN, BY DAY—SEE RULE I-11

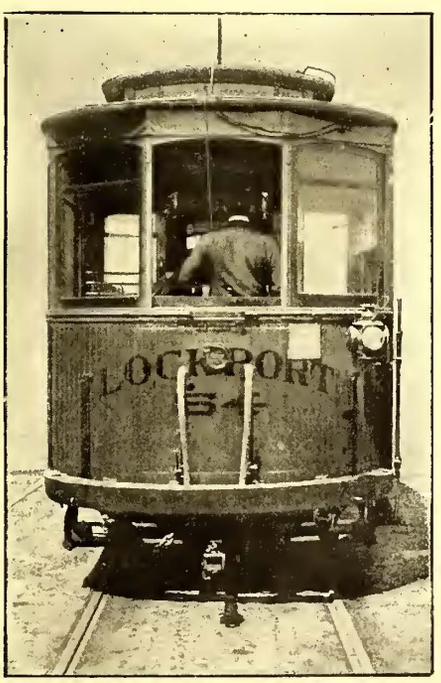


PLATE 16.—REAR END REGULAR TRAIN, WITH RED LANTERN AND RED DASH SIGN, BY NIGHT—SEE RULE I-11

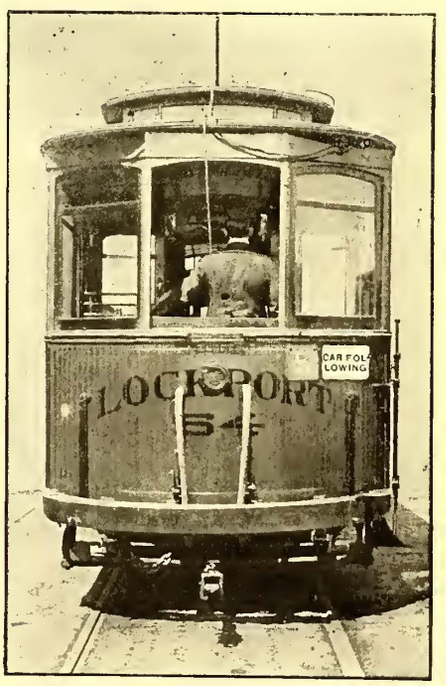


PLATE 18.—REAR END REGULAR TRAIN, CARYING SECOND SECTION SIGNALS, GREEN AND RED DASH SIGN, BY DAY—SEE RULE I-12

INTERURBAN RULES

In addition to the rules hereinbefore given the following rules will be observed by crews of interurban cars:

DEFINITIONS

Train. A car, or more than one car, coupled together, displaying signals.

Regular Train. A train represented on the time-table. It may consist of sections.

Section—One of two or more trains running on the same schedule displaying signals or for which signals are displayed.

Extra Train—A train not represented on the time-table. It may be designated as:

Extra for any extra train, except work extra.

Work Extra—For work train extra.

Superior Train—A train having precedence over other trains; a train may be made superior to another train by right, class or direction.

Right is conferred by train order; class and direction by time-table.

Right is superior to class or direction. Direction is superior as between trains of the same class.

Note—Superiority by direction is limited to single track.

Train of Superior Right—A train given precedence by train order.

Train of Superior Class—A train given precedence by time-table.

Train of Superior Direction—A train given precedence in the direction specified in the time-table as between trains of the same class.

Note—Superiority by direction is limited to single track.

limits, switch, train orders, block, interlocking, semaphore, disc, ball or other means for indicating stop, caution or proceed.

Yard—A system of tracks within defined limits provided for the making up of trains, storing of cars and other purposes, over which movements not authorized by time-table, or train order, may be made, subject to prescribed signals and regulations.

Pilot—A person assigned to a train when the motorman or conductor, or both, are not fully acquainted with the physical characteristics or running rules of the road, or portion of the road, over which the train is to be moved.

RULES

I-1. Employees whose duties may require them to give signals must provide themselves with the proper appliances, keep them in good order and ready for immediate use.

I-2. Motormen will be held responsible for the care and proper operation of the signal lamps and signals as well as the headlight on the front of the car.

Conductors will be held responsible for the care of the tail lights and signals on the rear of the car.

Motormen will see that their cars are provided with the following equipment, viz.:

Two regular run numbers.

Two "Car Following" signs.

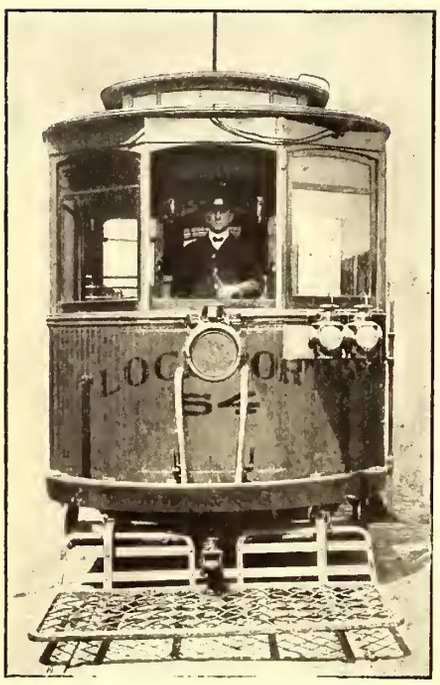


PLATE 19.—FRONT END REGULAR TRAIN, CARRYING SECOND SECTION SIGNALS, GREEN LANTERN, RED DASH SIGN AND LANTERN, BY NIGHT—SEE RULE I-12

PLATE 20.—REAR END REGULAR TRAIN, CARRYING SECOND SECTION SIGNALS, GREEN LANTERN, RED DASH SIGN AND LANTERN, BY NIGHT—SEE RULE I-12

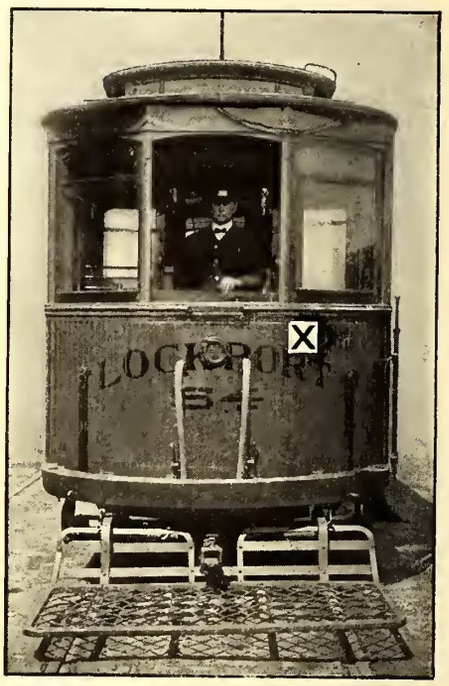


PLATE 21.—FRONT END EXTRA TRAIN, CARRYING WHITE SIGN WITH BLACK X, BY DAY—SEE RULE I-13

Time-Table—The authority for the movement of regular trains subject to the rules. It contains the classified schedules of trains with special instructions relating thereto.

Schedule—That part of a time-table which prescribes the class, direction, number and movement of a regular train.

Main Track—A principal track upon which trains are operated by time-table, train orders or by block signals.

Single Track—A main track upon which trains are operated in both directions.

Double Track—Two main tracks, upon one of which the current of traffic is in a specified direction, and upon the other in the opposite direction.

Current of Traffic—The direction in which trains will move on a main track under the rules.

Station—A place designated on the time-table by name, at which a train may stop for traffic, or to enter or leave the main track, or from which fixed signals are operated.

Siding—A track auxiliary to the main track for meeting or passing trains, limited to the distance between two adjoining stations from which train orders may be received.

Fixed Signal—A signal of fixed location indicating a condition affecting the movement of a train.

Note to definition of fixed signal: The definition of a "fixed signal" covers such signals as slow boards, stop boards, yard

Two "X" signs.

Four combination on classification lamps with oil.

One headlight.

One red lantern.

One red flag.

Conductors will see that their cars are provided with the following equipment, viz.:

One red flag to be carried on rear platform.

One red lantern in such a manner as to be available for immediate use.

I-3. Signs of the prescribed color must be used by day, and lamps of the prescribed color by night.

I-4. Night signals are to be displayed from sunset to sunrise. When weather or other conditions obscure day signals, night signals must be used in addition.

VISIBLE SIGNALS

I-5. Color signals.

	Color.	Indication.
(*a*)	Red.	Stop.
(*b*)	White.	Proceed, and for other uses prescribed by the rules.

I-6. Hand, flag and lamp signals.

Manner of Using.	Indication.
(*a*) Swung across the track.	Stop. (See plates Nos. 1 and 2.)
(*b*) Raised and lowered vertically.	Proceed. (See plates Nos. 3 and 4.)
(*c*) Swung vertically in a circle across the track, when the train is standing.	Back. (See plates Nos. 5 and 6.)
(*d*) Swung vertically in a circle at arm's length across the track when the train is running.	Train has parted. (See plates Nos. 7 and 8.)

A flag, or the hand, moved in any of the directions above will indicate the same signal as given by a lamp, except the "come ahead" signal, when used flagging railroad crossings, which shall be as provided for in Rule I-9. (See plates Nos. 9, 10, 11 and 12.)

I-7. Any object waved violently by any one on or near the track is a signal to stop.

AUDIBLE SIGNALS

I-8. Whistle signals.

Note—The signals prescribed are illustrated by "O" for short sounds; "—" for longer sounds. The sound of the whistle should be distinct, with intensity and duration proportionate to the distance signal is to be conveyed.

Sound.	Indication.
(*a*) — — —	Train has parted. (To be repeated until answered, as provided for in Rule I-6 (*d*.)
(*b*) — — — —	Flagman return from west or south.
(*c*) — — — — —	Flagman return from east or north.
(*d*) — O O	To call the attention of trains of the same or inferior class to signals displayed for a following section.
(*e*) — — O O	Approaching public crossings at grade.
(*f*) O O	An answer to any signal (except train parted).
(*g*) O O O O	Motorman's call for signals from switchtenders, watchmen, trainmen and others.
(*h*) — —	Approaching stations, junctions and railroad crossings at grade.

A succession of short sounds of the whistle is an alarm for persons or cattle on the track, and calls the attention of trainmen to danger ahead.

I-9. In addition to the instructions contained in Rule 9, which apply while cars are operating over city lines, conductors when flagging railroad crossings will use red lantern at night and red flag by day; both in manner prescribed in Rule I-6. The red flag to be carried, rolled up, under right arm, and used only as a signal that crossing is not clear and train may not proceed.

I-10. The headlight will be displayed to the front of every train by night.

I-11. All regular trains will display on outside of front and rear dash, in place provided, a red sign with designating run number signals thereon by day, and, in addition, a red signal light by night. (See plates Nos. 13, 14, 15 and 16.)

I-12. Each section of a train, except the last, will display on outside of front and rear dash in places provided, in addition to its red dash signs and its red signal lights, a green sign with the words "Car Following" thereon by day, and a green signal light at night. (See plates Nos. 17, 18, 19 and 20.)

I-13. Extra trains will display on outside of front and rear dash in place provided a white sign with black "X" thereon by day, and, in addition, a white signal light at night. (See plates Nos. 21, 22 and 23.)

An extra train at night will display on outside of rear dash in place provided, in addition to its other signals, a red signal light. (See plate No. 24.)

PLATE 22.—REAR END EXTRA TRAIN, CARRYING WHITE SIGN WITH BLACK X, BY DAY—SEE RULE I-13

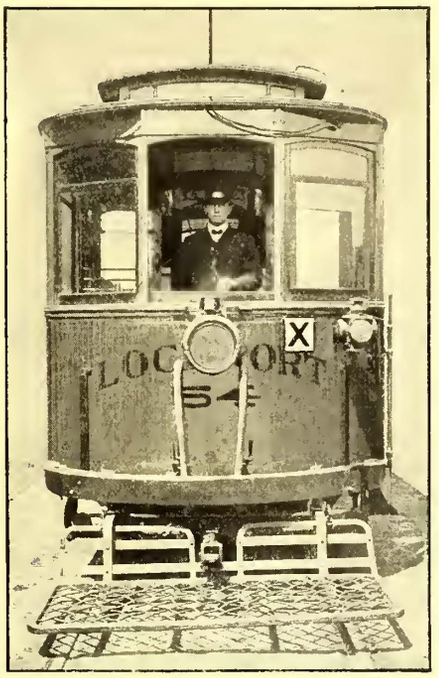


PLATE 23.—FRONT END EXTRA TRAIN, CARRYING WHITE SIGN WITH BLACK X AND WHITE LANTERN, BY NIGHT—SEE RULE I-13

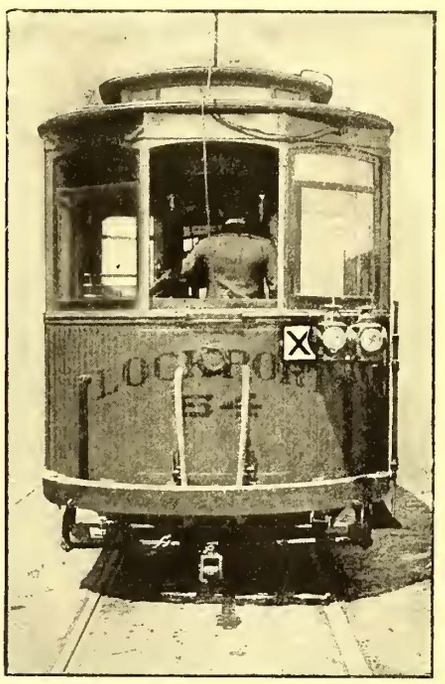


PLATE 24.—REAR END EXTRA TRAIN, CARRYING WHITE SIGN WITH BLACK X, WHITE AND RED LANTERNS, BY NIGHT—SEE RULE I-13

USE OF SIGNALS

I-14. A signal imperfectly displayed or the absence of a signal at a place where a signal is usually shown, must be regarded as a stop signal, and the fact reported to the despatcher.

I-15. The gong must be rung on approaching every public road crossing and until it is passed; and the whistle must be sounded 1000 ft. from the crossing.

I-16. The unnecessary use of either the whistle or the bell is prohibited. They will be used only as prescribed by rule or law, or to prevent accident.

I-17. Watchmen stationed at public road and street crossings must use red signals only when necessary to stop trains.

I-18. Express trains, work trains and extras must keep out of the way of a regular, and clear its time at least 5 minutes.

I-19. A train failing to clear the main track by the time required by rule, must be protected as prescribed by Rule No. I-23.

I-20. Unless some form of block signals is used, cars must keep at least 1 mile apart when running at speed.

I-21. Work extras will be assigned working limits. Within these limits such trains must move with the current of traffic.

I-22. Trains must approach the end of double track and junctions prepared to stop.

I-23. When a train stops or is delayed, under circumstances in which it may be overtaken by another train, the conductor must go back immediately with stop signals a sufficient distance to insure full protection. When recalled he may return to his car.

The front of a train must be protected in the same way when necessary.

I-24. Switches must be left in proper position after having been used. Conductors are responsible for the position of the switches used by them, except where switch tenders are stationed.

I-25. Both conductors and motormen are responsible for the safety of their trains and, under conditions not provided for by the rules, must take every precaution for their protection.

I-26. In all cases of doubt and uncertainty the safe course must be taken to guard against accident.

I-27. When a train crosses over to, or obstructs the other track, unless otherwise provided, it must first be protected as prescribed by Rule I-23 in both directions on that track.

I-28. Trains must use caution in passing a train receiving or discharging passengers, and must not pass between it and the platform at which the passengers are being received or discharged.

E. G. Connette,
T. E. Mitten,
W. E. Harrington,
Robt. McCulloch,

TRAIN ORDERS AND TRAIN SIGNALS FOR INTERURBAN ROADS.

BY CHARLES A. COONS

It is but stating a self-evident truth to say that the first and paramount consideration in the operation of any high-speed suburban or interurban electric road must be the safety of passengers and trains. To this element all others must be subserved even at the expense of the prescribed schedules, but it must be clearly borne in mind also that complete safety is dependent very largely upon the maintaining of schedules and the regularity and punctuality with which trains move. Rules and regulations that are drawn so conservatively as to interfere needlessly with the movement of trains may very easily introduce a new element of danger to say nothing of defeating the purpose for which the road is operated, namely, the moving of passengers and merchandise with promptness and despatch.

Inasmuch as the conditions under which electric interurban railways operate are beginning to approach very closely the conditions pertaining to steam railroad operations, and, taking into consideration that steam railroads have been running many years before electric traction was introduced, it would appear that electric railway managers could profit by studying and adopting many of the rules and methods of operation which have been adopted as standard on the steam roads and which may be considered the survival of the fittest after years of evolution. This is particularly true as regards methods of despatching trains. Years of study and experiment on the part of those responsible for the operation of steam roads in this country have resulted in the adoption by practically all of the prominent trunk systems of certain rules and methods, which, it is suggested, are in the main applicable to electric railway operation.

Time will not be taken here to review in detail the rules as commonly accepted by the prominent roads for the management of the operating department. The members of the convention are doubtless familiar with their general tenor, and to those who care to continue the study into details, it is suggested that copies of the book of rules as used by the Pennsylvania, New York Central, or any of the other large systems, can probably be obtained by application to the respective operating departments. Attention is also directed to the fact that the code of interurban rules presented to this convention by the committee on standard rules is patterned very closely after the rules in vogue on the best managed steam roads.

For the handling of train orders, the steam roads almost universally employ two blanks, known respectively as Form 19 and Form 31. Form 19 is a blank upon which the operator writes the order as he receives it from the despatcher, which is at once repeated back and the "O. K." of the despatcher is then given and proper notation, with time, noted thereon; a copy of this order is handed by the operator to the train crew to whom it is addressed. With order blank, Form 19, no receipt is obtained from the train crew and no means are provided for knowing absolutely that the order has been received and understood by those who are to execute it.

Form 31 is a blank upon which the operator writes the message as he receives it from the despatcher. After the message has been repeated back and the despatcher's "O. K." received, those to whom the order is addressed must sign their names to the blank, after which the operator must again repeat the message back to the despatcher in the presence of the waiting trainmen, and in addition must transmit the signatures of the trainmen and secure the despatcher's "complete" before the order becomes operative. The use of this form gives a considerable element of security, but it is not recommended for electric railway service owing to the delay caused by compelling the trainmen to wait at the station until their signatures have been transmitted and the "complete" response received. With a frequent service of many small units the delays from this source would be very considerable and render the method prohibitive.

As a compromise between Form 19 and Form 31 a modification of both is suggested for use on interurban electric roads. This blank is here designated as Form 21. With this blank the trainmen sign their names to the order at the operator's office; they then each take a carbon copy of the order and immediately proceed with their car, without the delay incident to the transmitting of their signatures as required with Form 31. In detail the method of using the form is as follows: Despatcher telegraphs order for trainmen to operator. The operator takes down the message on Form 21, making at the same time—by means of carbons—as many copies as may be necessary; the operator repeats the message back to despatcher; if correct, despatcher wires "complete" and operator marks the blank "complete." All this is done prior to the arrival of train. When the train arrives the crew thereof goes to the operator's office and fills in on the blank, in places provided, the following information: Number of section (if train is being operated in more than one section), number of run, number of train and time. The order is then signed for by both conductor and motorman, who must each take a copy of same, with their names thereon, in places provided (as a receipt therefor), before they depart. The operator retains one of the copies for file in his office. If one or more units are being operated as sections of a single train number the operator makes a sufficient number of copies to give each conductor and motorman of all the sections a copy thereof. This blank is being used with excellent results by the International Railway Company on its interurban lines, including one single track line 37 miles in length, on which cars are operated at a maximum speed of 55 m. p. h., with cars operating in each direction at intervals of 30 minutes, together with a large number of freight and express trains between regular cars.

It is not out of place to say here a few words concerning the relative merits of the telegraph and the telephone as the medium for transmitting messages from the despatcher to the operators along the line. It is true that most steam roads use the telegraph and most electric roads use the telephone for despatching purposes, and for electric railway operation opinion appears to be divided as regards the relative merits of the two systems. The management of the International Railway Company believes there is little to choose as between the two systems, and that either one will prove adequate if properly installed and properly maintained. The cost of wire and instruments of either system will be about the same, and either system is liable to disarrangement if not properly watched, although the telephone is perhaps more susceptible to disturbing influences than the telegraph. With either the telephone or telegraph system it is desirable to have operators at every regular meeting place to receive and record messages, or in lieu of operators, at least some method of recording the checking of messages as they are received by the train crew.

In further elucidation of the method of despatching with the use of Form 21 the following is added:

All orders issued by despatcher are copied in a book kept by him for that purpose in the following manner: Order when repeated back by operator is copied in this book word for word. All operators receiving an order repeat it back, the despatcher entering it in this book word for word as it comes back from the first operator, and underscoring each word as it comes back from the second operator and so on until all operators receiving the order have repeated it back.

Despatchers and operators are supplied with a form known as a train sheet to assist them in keeping track of the movement of all trains.

A daily register is kept at all single-track terminals for the purpose of trainmen registering their trains therein. On one page northbound trains are entered; on the opposite page southbound trains. Trainmen, in places provided, fill in the following information: Section number, run number, train number, signals carried, time, signature of conductor and motorman (or engineer).

All regular movements of trains are governed by the printed time-table, which is defined as "The authority for the movement of regular trains subject to the rules." The time-table contains the classified schedules of trains with special instructions relating

thereto. All movements of extra and special trains and of regular trains when off schedule are governed by special orders issued by despatcher in the regular way.

The system of train signals in use by the International Railway Company is practically the same as that presented to this convention by the committee on standard rules, and it is not necessary to repeat them in this connection.

In the matter of signals the International Railway Company adheres very closely to the methods accepted by steam railroads. In the adoption of signals, etc., we have considered the fact that steam railroad managements have been advancing in the science of railroading for many years, while the electric road is in its infancy. We naturally felt, therefore, in availing ourselves of their knowledge and experience, we were making a wise move in any event until something better and newer develops.

It should also be noted that the International Railway Company does not use flags as markers. It has been observed that when a train is running at speed the movement thereof causes the flags to hang straight to the rear, consequently, they are not plainly discernible by the crew of an opposing train; in place of flags for designating a car following, run numbers, etc., a metal dash sign is used, these signs being about 8 ins. x 8 ins. They have been found very satisfactory.

After all has been said and done, safety, together with regularity and punctuality in the operation of any electric railway system, do not depend so much upon the methods of despatching, or the rules adopted for the management of employees, as they do upon the way in which the rules are observed by every individual in the organization from the manager down to the switch boy. An indifferent set of rules rigidly and consistently enforced and observed is far better than the best code of regulations, half-heartedly or inconsistently enforced. The operating organization constitutes a huge and complicated machine, and the integrity of the whole depends solely upon the smoothness and accuracy with which each of the individual cogs fits into its allotted place and performs its allotted functions. A rigid, never ceasing, never relenting inspection of every cog is the first requisite to the efficient, economical and safe operation of the huge mechanism in the modern interurban electric railway.

RECENT STEAM TURBINE DEVELOPMENTS

BY W. L. R. EMMET, GENERAL ELECTRIC COMPANY

When the writer agreed, some months ago, to present a paper to this meeting, he fully expected that its subject matter would mainly consist in a record of practical results accomplished with commercially operating machines, and that such matter would be full enough to justify its presentation and discussion. Some months ago a paper was presented to the American Philosophical Society on this same subject, which has since gone the rounds of the press. This paper dealt at some length with our expectations concerning the new steam turbine developments now going on at Schenectady, and which is different in many respects from the machines now being built.

The scant array of established facts in this paper, and the rather liberal presentment of expectations have called forth some criticism, particularly from European turbine builders. Such criticisms are not unnatural under the circumstances, and we are naturally eager to demonstrate to the world the soundness of the claims upon which the General Electric Company and its customers have based such large undertakings.

The writer had confidently expected that before this date the 5000-kw turbine recently installed at Chicago would have been fully tested and verified, and that its results could be here presented to the members of this association who are so deeply interested in the success of developments of this kind. We have fallen a little short of this expectation, through such unforeseen delays as are usual in such cases, but still have produced results which are highly interesting and suggestive, although no complete tests have yet been made. The machine has been installed in the new station of the Commonwealth Electric Company, which is probably the finest and best equipped station in the world, and has been connected to its regular equipment of boilers and condensing facilities. It has been started without any hitch or delay, and has been operated repeatedly at full load, and under a variety of conditions to test its performance. It has operated with a wonderful steadiness and perfection, has governed perfectly from full load to no load with only 2 per cent speed variation, and has in every respect shown itself to be a thoroughly desirable operating machine. A test of steam economy was also very carefully conducted on this machine, very perfect facilities for weighing water and maintaining a steady and accurately measured load having been provided. Unfortunately, the results of these tests were found afterwards to be entirely indefinite, since a large leakage of circulating water, through a misplaced valve, into the steam space of condenser was discovered, which water had been weighed in connection with the condensed steam. When this was discovered it was too late to ascertain with certainty the amount of this leakage at the time of test. The flow with no load, however, indicated that this leakage was very large, and the general inference drawn from our test is that a very fine steam economy was shown. We will, however, refrain from making any positive statements on this subject until we have obtained tests which are absolutely unquestionable. All the conditions in connection with the running of this machine have given very favorable indications. The machine is connected so that the condensed water passes from the hot well through a heater, and is pumped directly back into the boiler. This whole system was in operation and worked perfectly. The water returned to boilers was, of course, entirely free from oil and quite clear, except at light load, when the leakage from the river appreciably discolored it. The plant operated at full load, with four 500-hp boilers fired out of the eight which have been provided for each machine. These boilers were fired with Illinois coal on chain grates, and their performance of the work is, in itself, an indication of good economy.

After this test run the machine was taken apart for the purpose of making a minor internal change, which was thought to be desirable. The machine will not be required for service for some months, and our desire is to get it in the best possible condition in advance of the time when it will be required to carry a large winter load. The machine will probably be ready to run again within about a week or ten days, and conclusive tests will then be made.

In order to properly understand the significance of the successful starting of this machine, it is necessary to review the history of its design, and to compare it with engines of other types: After the experiments with Mr. Curtis' steam turbine inventions had proceeded for several years, certain experimental results were obtained which seemed to justify the production of commercial machines, and it was decided to build a commercial machine for use in the Schenectady Works. A 600-kw machine, with horizontal shaft was designed, the mechanical arrangements being in most respects in accordance with the plans which Mr. Curtis had formed previous to that time for building the turbines. This machine was built and tested nearly two years ago.

These tests showed a high steam economy, and it was very soon after decided that the performance of this machine justified the building of other commercial machines, which could safely be relied upon to perform as good or better results. The question of mechanical design for these larger machines then became a matter of first importance. The steam economy could safely be expected to conform closely to that of the machine which had already been tested, but the whole question of cost and commercial desirability depended upon the mechanical construction adopted for accomplishing the desired results.

It was decided at this time to build a steam turbine unit as large as the largest engine-driven generating unit in the country, and as the result of this decision the design of the machine now in Chicago was made up after a great amount of thought and study. This design embodied many very radical features, as compared with other engines, turbines, or machines of any character. The shaft is vertical; the whole weight of the revolving part is borne by an oil film delivered by a pressure pump to the lower bearing; the delivery of steam to turbine is controlled through a system of electrically operated individual valves worked by a small controller something after the manner of multiple unit train control systems, the centrifugal governor moves the controller. The revolving field is mounted upon the same shaft with the turbine wheels, and the stationary portion of the generator is supported by the stationary portion of the turbine, the whole building up into the general form of a vertical cylinder about 25 ft. high, and about 14 ft. in diameter. The total weight of the turbine and generator is about 400,000 lbs., and its capacity is 5000 kw at full load. It is capable of running at about 75 per cent overload condensing, and at nearly full load non-condensing.

The question as to why the vertical shaft design was adopted for this unit has often been raised, and many doubts and criticisms concerning it have been expressed. It is not easy to explain all the reasons which lead up to its adoption, but it may be said that the compactness and simplicity of this unit, which are its most marked characteristics, are largely due to the merits of this design. With the vertical shaft arrangement all lateral strain is removed from the bearings which align the shaft and all deflection of the shaft is avoided with a minimum number and length of bearings. This matter of properly supporting shaft and keeping it exactly central

and in perfect alignment is an important one where small clearances are desirable with a large diameter in the revolving part. To carry such weights as are necessary in the revolving part of this large unit many very large bearings would be required if the shaft was in a horizontal position. An elaborate system of forced lubrication with artificial cooling would be necessary in connection with these bearings, and a failure of any of these bearings would occasion serious danger to the operation of the machine. If this machine were built in a horizontal position it would be very difficult to so support the wheels that their clearances would not be affected by sagging of shaft or looseness in bearings, and also, it might be difficult to place them with such a relation to each other that the clearance would not be affected by expansion of the shaft. In the vertical design the space between wheels is reduced to a minimum, the supporting structure is perfectly symmetrical and cannot be in any way distorted or put out of line, either by mechanical or steam pressure strains, or by the effects of expansion.

The oil pressure step bearing at the foot of shaft supports the whole revolving element in a balanced position by perfectly symmetrical suspension and preserves the exact relation of level between the stationary and revolving parts. As long as this step bearing fills its functions a multitude of mechanical difficulties and uncertainties are overcome.

At the time this design was adopted there was no good precedent for the support in this manner of such a weight operating at so high a speed, and there were many predictions of failure, examples being quoted where similar methods had failed with water wheels and other machines. It seemed clear, however, that with proper arrangements the operation of this bearing must be stable and reliable, and since forced lubrication was necessary to success in any case, it seemed advisable to put it where it would accomplish the greatest number of good results.

Experience with a number of machines has fully justified our decisions in this connection. The bearings have run perfectly with an inappreciable amount of friction and when properly supplied with oil operate with perfect steadiness and regularity. In one respect these bearings have agreeably surprised us, that is, tney have been much less injured by stoppages of oil than we expected. In the course of our experiments imperfect pumping arrangements have been used, and repeated failures of the oil flow have been experienced, but in no case has any damage to the machine resulted. Even the cast-iron blocks which constitute the step bearing, are as a rule not destroyed. Our experience has been that they cut and heat when the oil supply is removed, but in all cases the surfaces have ground themselves to an operating condition after the oil flow is renewed, so that the machine could be continued in operation. This might not always be the case, but it seems quite certain that the damage could never be as serious as that which would result from a failure of the lubrication system where heavy weights are carried on high-speed horizontal bearings.

In our newer machines we are providing a heavy stationary collar below the lowest wheel which can be used to support the wheels in case the step bearing is removed, and which would serve as a brake to bring the machine to rest in case the step bearing should cut enough to allow the wheels to settle to a dangerous degree. Our experience has been that there is very little tendency to settlement of the shaft in case of such cutting, and this latter function of the collar will presumably seldom be called into requisition.

The oil for step bearings and also for the upper bearings of machines is delivered by a small electrically driven pump which operates continuously from the exciter circuit. In most of the large plants where we are installing turbines, we have recommended in addition to these electrical pumps, a weighted accumulator, with steam pump arranged to keep it full automatically. This accumulator with its steam pump affords an automatic reserve for the lubricating system. Its capacity is such that there would be ample time to shut down the units, even if everything in the station should be stopped by the bursting of a boiler or steam pipe.

The 5000-kw machine in Chicago is the second of our vertical shaft turbines to be put into operation. The first machine of this type was one of 500-kw capacity installed by the Newport & Fall River Street Railway Company. This machine has been in daily operation since last June. During all this time its daily operation has been indispensable to the service of the plant, and there have only been two or three interruptions of a few minutes each which could be charged to its defects. It has, however, developed some minor troubles which have been the cause of some annoyance, and which it has been very difficult to correct, owing to the almost continuous operation of the machine. With new types of machinery which have to be put in service without any period of experimenting some such difficulties and delays can hardly be avoided.

The only serious troubles at Newport have been with parts of governor and with valves which have given out, owing to overstrain of springs or other mechanical causes which are easily corrected. These troubles have occurred as the result of continued service, and are being rectified as rapidly as it has been possible to analyze their causes and apply suitable remedies. Nothing has happened which suggests the possibility of a serious difficulty, and it can be safely predicted that a condition will very soon be reached in which the turbine can operate for an indefinite period with a very small expense for care and renewals.

Our machine at Newport has been tested and has shown results decidedly better than the reported tests of steam turbines of other makes, but the conditions have been such that we have reasons to believe that decidedly better results can be produced with slight changes in nozzles and adjustments of pressure. Up to the present time we have not been able to experiment with this machine or properly analyze its performances, owing to the almost constant requirements of service. We are, however, installing a second machine at Newport, and very soon expect to make a proper analysis of its performances and to bring both machines to a representative condition. All the experience which we can gain with these early experiments if, of course, available for the prevention of similar troubles and mistakes in other plants.

One important matter in connection with the introduction of our turbines has been the establishment of proper condensing facilities in order that the great benefits of high vacuum might be realized to the greatest possible extent. In turbines which we have tested the steam consumption has been reduced from six to seven per cent for every additional inch of vacuum above 25 ins. Such a reduction is, of course, very important and justifies large expenditures upon condensing apparatus. The fact that the turbine may be better than a condensing engine with equal vacuum must not be considered a reason for assuming that a condenser which is good enough for the engine is also good enough for the turbine. The selection of condensing facilities should be governed by the economic possibilities.

We have recently designed for some of our large new turbines surface condensers which themselves constitute the base and supporting structure of the machine. These condensers are of very ample cooling surface, and are so arranged that the maximum degree of vacuum is obtainable with a given amount of water. One feature of our turbine which is very advantageous in obtaining a high vacuum, is that it can be easily so arranged that the air leakage is reduced to zero. The two points where the shaft passes through the casing are fitted with packings which are kept sealed by steam. Another advantage is that there is no oil in the steam, and consequently that the exterior of condenser tubes is kept perfectly clean. Several turbines with condenser bases are now being built, and it is probable that there will be a large production of machines of this type.

I have mentioned above that no oil comes in contact with the steam in these turbines, and I need hardly call attention to the great importance of this fact. The condensed water can be delivered directly back to the boilers and all possibility of trouble in boilers from oil, dirt or scale is eliminated. Even in plants where feedwater is good and cheap, this constitutes a great advantage, since a considerable amount of heat is saved by using the condensed steam on account of its higher temperature. There is, however, no such a thing as perfectly pure and clean natural water, and there are few boilers that in their average working condition are perfectly clean. Cleanliness in boilers improves circulation and evaporation, prolongs life and constitutes, therefore, a very distinct and definite advantage.

The designs of these first machines, started at Chicago and Newport, are now about two years old. They were entered into upon the basis of a very limited experience with the turbine, and nothing to guide us other than the theoretical possibilities which previous tests had demonstrated. The period which has elapsed since the conception of these designs has been occupied in a battle with the innumerable difficulties attendant upon the production on a very large scale of radically new devices. When we became convinced of the practicability and the advantages of our designs, we determined that the possibilities could only be developed quickly through production on a large scale, and by a concentration of force upon the work. We consequently decided upon guarantees which we felt certain of fulfillment, and upon prices which would be attractive to our customers, and have taken a large number of orders for machines of several sizes. We now have on our books contracts aggregating more than 200,000 kw. in steam turbines generating units. A large proportion of these machines are now either finished or well under way.

This immense production has been introduced at a time when our regular manufacturing facilities were strained to the utmost, and when the difficulty of obtaining or sparing good men was very great. The trials and difficulties of such an undertaking are hard to describe. A vast amount of very expensive special machinery

has had to be assigned and built, and almost every step has required thought and experimenting. In such new work the average man cannot be made to advance with the same confidence that he does on established lines. He presupposes the possibility of difficulty or failure, and is constantly being brought to a halt and making mistakes that he would not make under different circumstances. Important processes are handled carelessly, and unimportant ones are unduly deliberated over. The strain is incessant, and an abundance of faith is required in those who would direct such work.

As the work of developing these designs has advanced, experience has shown the possibility of better and simpler methods, and the steady continuance of experiments has extended our knowledge of the theoretical possibilities. Consequently new designs have been proposed and developed, and we now have in production a large number of machines which we consider greatly superior to those which are now being put into service. This process of experimental development will continue, and the production and test of each new machine will extend our knowledge and make possible further advances.

Our machines at Newport and Chicago and other machines of about the same date, are of what we call the "two-stage" type. The Newport machine has two compartments, with three rows of moving buckets in each compartment, and the Chicago machine has two compartments with four rows of moving buckets in each compartment. Our later large condensing machine have four stages or compartments, with two rows of moving buckets in each. All the details of their design have been worked out in such a manner that their construction is greatly simplified, and the steam economy will presumably be much increased.

Thus, such successes as we may accomplish in the future will be the result of the large experience which responsibility for our existing work has entailed. We have been through long trials, and have combatted many predictions of failure, but the facts seem to indicate that we have succeeded, and to promise that we will in future accomplish greater successes.

THE EXCURSION TO SCHENECTADY

Upon invitation of the General Electric Company, an excursion was made from Saratoga on the afternon of Thursday to the Schenectady works. The excursion was one of the largest in which the Association has ever participated. The train of ten cars which left the Saratoga station at about one o'clock was filled with delegates and others, in all about 700. A large number of ladies participated in the trip. Schenectady was reached at two o'clock and the train was run on a siding into the yards of the General Electric Company. Here the party was met by a large number of representatives of the host, headed by Mr. J. R. Lovejoy, and conducted to the gallery of the new turbine building, where a bountiful repast had been prepared. The extent of the building can be realized from the fact that this large number of persons were seated at tables which occupied considerably less than one-half of the gallery area.

The dinner supplied by the General Electric Company consisted of a number of courses, and was heartily enjoyed. At the close of the repast Vice-President Ely expressed the appreciation of the Association to the representatives of the General Electric Company present for their hospitality in entertaining the Association. A trip was then made through a number of the departments of the works, including the motor department, assembly department, in which were several Baltimore & Ohio electric locomotives, and the turbine department, which latter received special attention. While the delegates were inspecting the machinery, the ladies in the party were given a trolley ride by E. F. Peck, general manager of the Schenectady Railway. The cars were decorated expressly for the occasion. The return was made by special train from Saratoga, where the party arrived about 6:30 p. m.

A pleasant incident of the occasion, and one which was known to only a few until after the return to Saratoga, was the presentation to Mr. Lovejoy, by the members of the staff of the railway department, of a handsome silver punch bowl. This occurred during the morning at a meeting held in the office of sales agents of the railway department, called by Mr. Lovejoy to discuss the coming entertainment. The presentation was decided upon, some time ago, as a testimonial of the high regard of the railway sales agents of the company for Mr. Lovejoy, and took place at the termination of the informal discussion on Thursday morning, much to the surprise of the recipient. The gift was greatly admired by those who had an opportunity to see it in Mr. Lovejoy's office during the trip to Schenectady.

Also upon the invitation of E. F. Peck, general manager of the Schenectady Railway Company, a number of those who took part in the General Electric trip to Schenectady made an inspection of the local trolley system in a private car provided for the purpose. This party was made up of about twenty-five delegates, and included Messrs. Vreeland, Ely, W. J. Clark, J. G. White, J. H. McGraw, John I. Beggs and others. A run was made first over the Troy division and the car then came back and made another run over the line which runs almost as the crow flies direct from Schenectady to Albany. Not only did this trip give an opportunity

SOME OF THE VETERANS OF "HORSE CAR DAYS" AT THE CONVENTION

to take a glance at the car houses and other plants of the company, but every opportunity was afforded to inspect the magnificent work that has been done in roadbed and line construction. It may, in fact, be questioned whether there is a better equipped system in the country, or one which is handled with greater ingenuity and progressiveness, the result being that the receipts of the company have been increasing with leaps and bounds. Refreshments were provided on the special car, and at the close of the trip Mr. Peck was most heartily and deservedly thanked by all who had enjoyed the Schenectady Company's hospitality.

OTHER EXCURSIONS

In addition to the trips to Schenectady and Lake George, a number of other trips were provided the visitors to Saratoga. Through the courtesy of the Hudson Valley Railway Company, an entertainment was provided Wednesday evening at Saratoga Lake, which was enjoyed by a number of attendants at the convention. The cars ran every 15 minutes throughout the evening, carrying pleasure seekers to the lake during the early part of the evening, and returning with them after the close of the entertainment.

On Friday afternoon a number of the delegates took advantage of an invitation from the Hudson Valley Power Transmission Company and were driven from Lake George to the immense new water-power plant of the company, located at Spier Falls. The features of this water-power development were described in the convention number of the STREET RAILWAY JOURNAL, and those who participated in the trip were well repaid for the excursion.

A number of delegates also made the occasion to take many of the attractive trips which are so numerous in the vicinity of Saratoga. Among these probably the most popular of the short excursions was that to Saratoga Lake, and the National Electric Company contributed to the pleasure of a number of the delegates by engaging several automobiles and making this run frequently during the convention.

STEAM TURBINES FOR LONG ISLAND CITY

The Westinghouse Machine Company has secured the order for the largest turbo-generators in the world. These will be installed in the Long Island City power house of the new Pennsylvania terminal, and will consist of three 5500-kw turbo-generator units.

EXHIBITS AND EXHIBITORS AT SARATOGA

The exhibition of apparatus in connection with the conventions was fairly representative, although the local conditions made it impossible to show heavy machinery in operation, and this detracted somewhat from the value of the display as a whole.

EXHIBIT OF THE INTERNATIONAL REGISTER COMPANY

There were many interesting individual exhibits, however, and these are illustrated and described in the following pages:

THE CONSOLIDATED CAR FENDER COMPANY, of New York, represented by Albert C. Woodworth, general manager; E. C. Hall, D. Bonenfaut, and G. H. Hollingsworth, exhibited the various types of the "Providence" fender, manufactured by this company. The company had, also, on exhibition the Campbell snow broom and the Millen car step lifter.

THE ST. LOUIS CAR COMPANY exhibited its car seats, arc headlights and interior arc lights for car lighting. G. J. Smith, assistant superintendent, was the company's representative. Mr. Smith found many old friends among master mechanics, to whose ranks he formerly belonged. In fact, Mr. Smith advocated the formation of a street railway master mechanics' association years ago, and is greatly gratified now at seeing his ideas carried out in the American Railway Mechanical and Electrical Association. This was the first appearance of the new interior arc lighting system at a convention. The company expected to have also exhibited one of the new cars built for the Fonda, Johnstown & Gloversville Railway, of Gloversville, N. Y., but was unable to complete them in time. These cars are of a very modern type, and were described in detail in the Souvenir edition of the STREET RAILWAY JOURNAL.

THE FRANKLIN ROLLING MILL & FOUNDRY COMPANY, of Franklin, Pa., manufacturer of the tripartite steel pole, had one of its three-part street poles on exhibition. These poles are made by rerolling old rails, and a given strength of pole can be made at less cost than in a tubular pole. G. V. A. Conger, superintendent of the pole department, was in charge of the exhibit, where sections of metal used in various weights of pole were shown, as well as one full-sized pole.

THE INTERNATIONAL REGISTER COMPANY, of Chicago, was represented by A. H. Woodward, president; John Benham, vice-president; W. H. Brown, secretary, and F. B. Hall, master mechanic. Neatly displayed were samples of the well-known standard types of New Haven and International fare registers. In cases were displayed lines of register fixtures, employees' badges, punches and trolley cords. An interesting feature of the exhibit were the original drawings for the numerous unique and timely advertisements published by the company in the STREET RAILWAY JOURNAL and other technical papers during the last year.

THE VAN DORN & DUTTON COMPANY, of Cleveland, showed samples of its well-known

EXHIBIT OF THE PECKHAM MANUFACTURING COMPANY

EXHIBIT OF THE MAGNETIC EQUIPMENT COMPANY

line of track scrapers, gears, pinions and armature lifts. The Van Dorn-Elliott Electric Company, an affiliated company, showed its armature coils, field coils and commutators. W. A. Dutton and J. N. Elliott were in charge.

THE OHIO BRASS COMPANY, of Mansfield, undoubtedly had more visitors than any other exhibitor. The company had a large stand, devoted exclusively to entertainment. It was richly furnished and decorated with palms and flowers. The great attraction was the fact that the company took free photographs of every caller. Each day, from 8 a. m. to 6 p. m., there were in constant operation two photoscopes, furnished by the General Automatic Photograph Company, of New York. Photographs were turned out at the rate of better than one per minute. Each was encased in a frame appropriately inscribed with the company's name and line, and it proved a souvenir which was retained and worn. Over 7000 of these photographs were taken during the week. The company rented two cottages for the week, and several of the rooms were given up to entertainment. In cottage E were displayed sample cases showing the company's well-known

line of overhead material and rail-bonds. A new bond, known as Type F, was shown in several varieties. In this the wires come out at the sides instead of direct from the ends, giving better flexibility and more room where working close to a bolt. A new soldered bond, known as Type G, was also featured. The leaves are forged together at the end, and it is claimed there is no increased resistance at the ends. The representatives present were: C. K. King, secretary; N. M. Garland, New York manager; J. C. Warren, Jr., New York; A. L. Wilkinson, general sales manager; George A. Mead, chief engineer; E. F. Wickwire, traveling representative; F. Jameson, traveling representative; Max A. Berg and E. R. Mason, of Porter & Berg, Chicago representatives; Otto M. Uthoff, of Watts & Uthoff, St. Louis agents, and W. J. Keenan, of Lettingill, Andrews & Co., Boston, New England representatives.

THE ATLAS RAILWAY SUPPLY COMPANY, of Chicago, made an attractive exhibit of its well-known rail-joint, which is adapted for all types of rails. Those in attendance were: J. G. McMichael, president, Chicago; R. B. Kent, secretary; C. D. Porterfield, New York representative; Mrs. McMichael and Miss Rogers.

THE BRUCK SOLIDIFIED OIL COMPANY, of Boston, Mass., represented by J. W. Bruck, vice-president and general manager, exhibited, solidified in various forms, oil, both in a liquid and solid state. Mr. Bruck demonstrated by actual experiments right in his booth the process of turning liquid oil into a solid state. Liquid oil was turned into a solid mass in less than two minutes, and remained in a column 3 ft. high. This column withstood the rays of the sun without the least sign of melting or disintegrating.

EXHIBIT OF THE MYERS SAFETY CAR STRAP

EXHIBIT OF THE COLUMBUS STEEL ROLLING SHUTTER COMPANY

EXHIBIT OF THE CELLULOID COMPANY

EXHIBIT OF THE BRADY BRASS COMPANY

EXHIBIT OF THE PETER SMITH HEATER COMPANY

EXHIBIT OF THE DETROIT TROLLEY & MFG. COMPANY, MASSACHUSETTS CHEMICAL COMPANY AND THE ALLEN & MORRISON BRAKE SHOE & MFG. COMPANY

EXHIBIT OF THE LUDLOW SUPPLY COMPANY

EXHIBIT OF THE WHEEL TRUING BRAKE SHOE COMPANY

EXHIBIT OF THE STANDARD VITRIFIED CONDUIT COMPANY

This oil is meeting with great success in all parts of the United States. Some of the leading street railway companies in this country have adopted Bruck solidified oil for motor and journal lubrication, as well as power-house service.

THE MAGNETIC EQUIPMENT COMPANY, of Chicago, the concern which has the device for increasing the traction of

EXHIBIT OF THE STAR BRASS WORKS

EXHIBIT OF THE UNI SIGNAL COMPANY AND HOWE MANUFACTURING COMPANY

wheels on rails by means of magnetism, had a small model car equipped with the magnetic adhesion device, which demonstrated the principles covered by this company's patents. C. A. Ballard, treasurer; B. H. Honey, secretary; W. B. Frazier, chief engineer, and W. T. Davidson, general representative, were on hand explaining the apparatus.

THE LE VALLEY VITÆ CARBON BRUSH COMPANY, of New York, represented by J. V. Clarke, president, W. H. Ball, and L. Clarke, had on exhibition all styles of carbon brushes, in all shapes and sizes. The company gave away a sample set of carbon brushes for any style of motors made.

THE GARTON-DANIELS COMPANY, of Keokuk, Ia., was represented by its secretary, J. V. E. Titus, who was able to show to those interested a set of test recently conducted by D. C. and

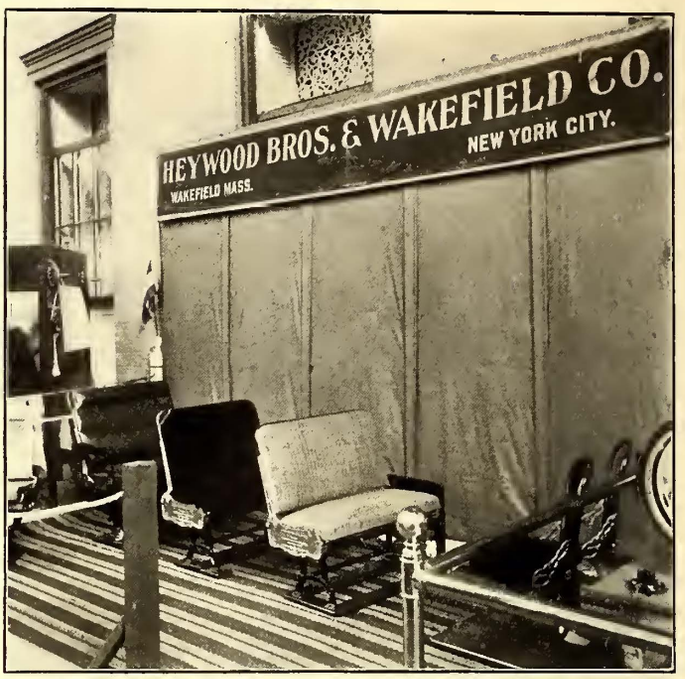


EXHIBIT OF THE HEYWOOD BROS. & WAKEFIELD COMPANY

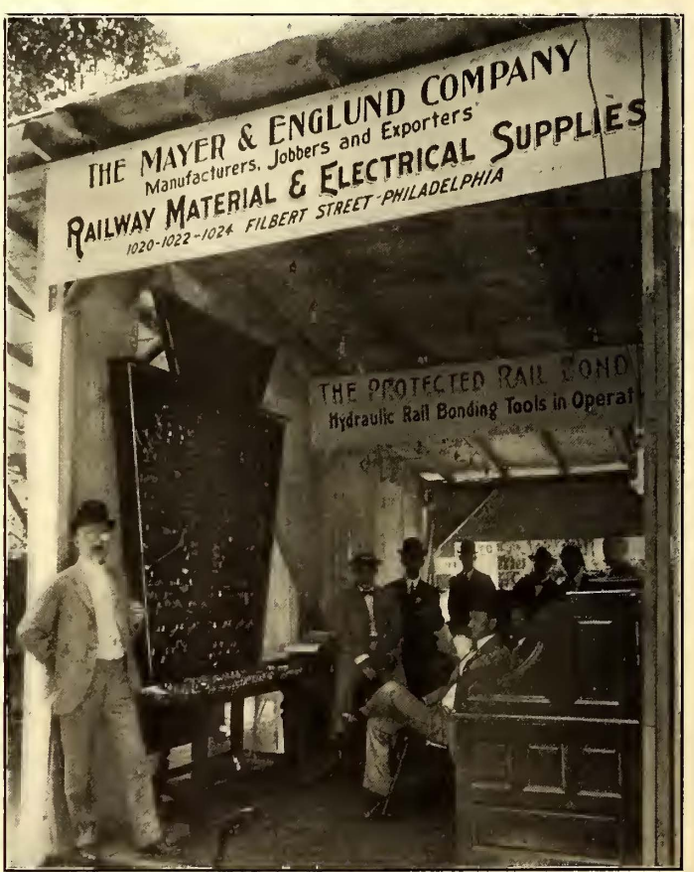


EXHIBIT OF THE MAYER & ENGLUND COMPANY AND THE PROTECTED RAIL BOND COMPANY

W. B. Jackson on cars equipped and non-equipped with the "automotoneer." The tests showed 7½ per cent saving in energy consumption in favor of the cars having the automotoneer, and a great reduction in maximum current used.

THE STERLING-MEAKER COMPANY, of Newark, N. J., represented by J. Albert Stowe, president, and H. E. Beach and E.

W. Hinman, exhibited all types of the Sterling-Meaker registers, Sterling brakes, trolley stands, and various fittings and appliances manufactured by this company. There was also on exhibition a model of a reversible seat fixture for open cars. Most reversible backs have the rubber tips, which strike against the seat. The objection to this arrangement is that, being on top of the back of the seat, mischievous passengers can cut off the rubber or mutilate it until it is useless. The Sterling-Meaker Company has reversed the position of the rubber; instead of having it on the top of the back support, it is placed on the seat itself.

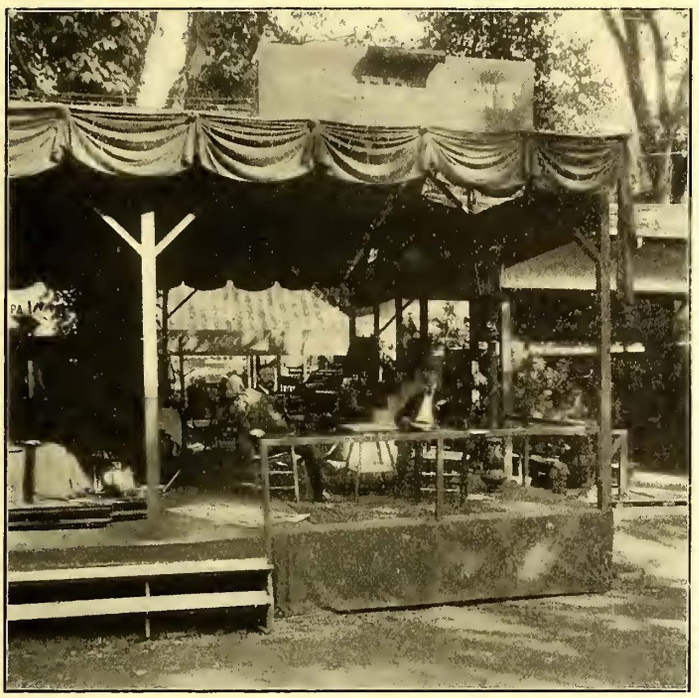


EXHIBIT OF THE WEBER RAILWAY JOINT MANUFACTURING COMPANY

EXHIBIT OF THE PITTSBURG REDUCTION COMPANY

THE RAILWAY JOURNAL LUBRICATING COMPANY, of Chicago, showed the new journal lubricator just put on the open market, and used for some time on the Aurora, Elgin & Chicago Railway, and on steam roads. This lubricates by means of ball-bearing lubricating wheels, which run in oil and carry the oil onto the journal. Stare Brothers, of Chicago, were both present in the interests of this company.

THE ARCHBOLD-BRADY COMPANY, and Fred M. Locke Manufacturing Company, of Syracuse, N. Y., made a joint exhibit of insulators, which was very interesting to the electrical man, because of the extremely high voltages for which some of the recent insulators are designed. As large as some of the 60,000-volt insulators of three years ago seemed, they are dwarfed by recent productions. For example, some of the three and four part Locke insulators now made are 15 ins. in diameter, umbrella-shaped, with two or three petticoat pin sleeves underneath. Besides the insulator exhibit a high-voltage testing plant, such as is used by insulator manufacturers, was in operation, and delegates were shown the effects of high voltage discharges. The transformer used in testing was one from the Worcester Polytechnic Institute in charge of Walter Goddard, of that institution. It is one of the highest voltage large transformers in the country, giving up to 175,000 volts. Fred M. Locke, W. K. Archbold, Paul T. Brady, M. A. Dunne, and J. R. McIntyre were in attendance.

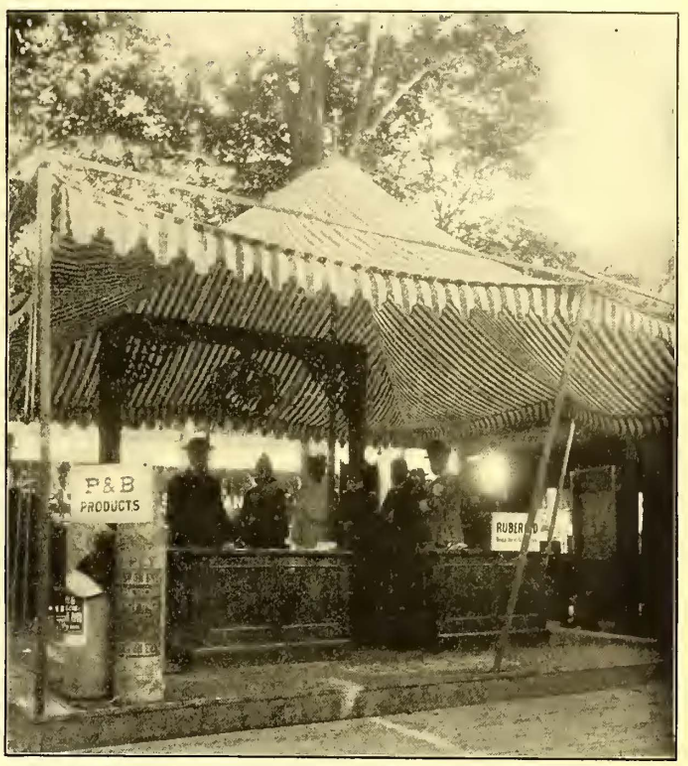


EXHIBIT OF THE STANDARD PAINT COMPANY

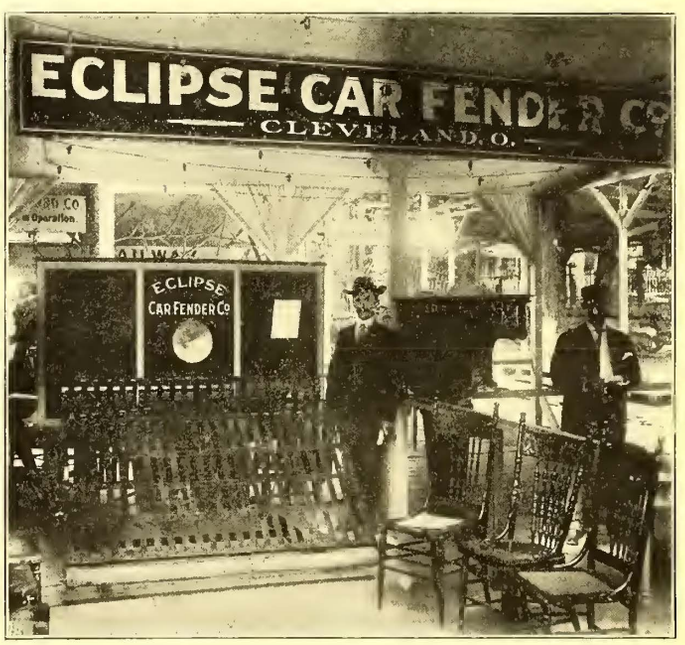


EXHIBIT OF THE ECLIPSE CAR FENDER COMPANY

THE BUCKEYE ELECTRIC COMPANY, of Cleveland, was represented by W. R. Bonham, of the Chicago office.

THE WALWORTH MANUFACTURING COMPANY, of Boston, had its interests looked after by H. L. Rideout.

THE POSITIVE RAILWAY SANDER COMPANY, of Lancaster, Pa., was one of the new concerns appearing at this conven-

tion for the first time. It has a sand box of truly remarkable construction and performance. No moving parts come in contact with the sand. The sand feeds simply by the rocking of the box, and yet the shape of the box is such that the sand never feeds, except when desired, although the opening is large and unobstructed, and consequently not clogged by sticks and stones, nor can such obstructions break the feeding mechanism. Besides the box the company has a valuable plan of supporting the spiral sand pipe so that it will feed onto the rail on curves on double-truck cars. Charles V. Rote, vice-president, and Park E. Shee, secretary, had the apparatus on exhibition.

EXHIBIT OF THE TAYLOR ELECTRIC TRUCK COMPANY

EXHIBIT OF THE FRANKLIN ROLLING MILL & FOUNDRY COMPANY

THE UNIVERSAL CAR BRAKE COMPANY, of Lancaster, Pa., made an exhibit of its combination track and wheel brake. This brake is operated by a solenoid magnet, taking power from the trolley. This company also has a sand box which is extremely simple in construction, which feeds the sand from a wheel somewhat similar to an undershot water wheel. The feed wheel forms the bottom of the hopper. Joseph Cullman, John F. Brimmer, I. Levi, William M. Deal and Richard Brimmer composed this company's representation.

JOHN A. ROEBLING'S SONS COMPANY, of Trenton, N. J., had Ulysses G. Tingley in attendance.

EXHIBIT OF THE ROBINS CONVEYING BELT COMPANY

EXHIBIT OF THE LORAIN STEEL COMPANY

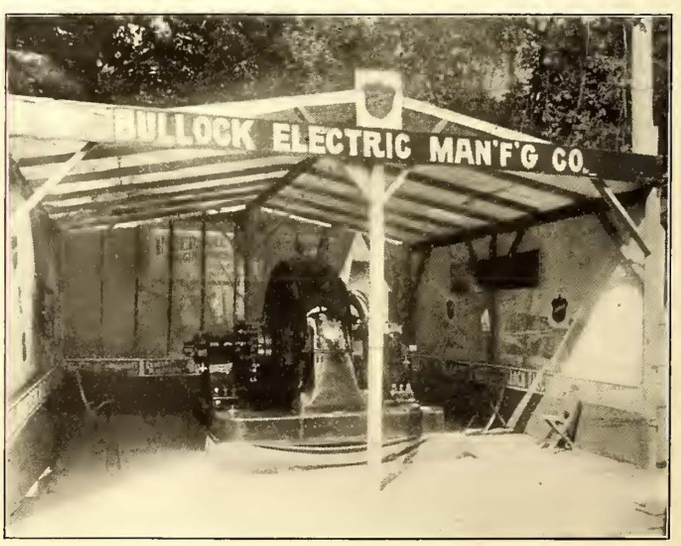


EXHIBIT OF THE BULLOCK ELECTRIC MANUFACTURING COMPANY

THE BALTIMORE RAILWAY SPECIALTY COMPANY, of Baltimore, which makes ball-bearing center and side bearings for supporting car bodies on swivel trucks, and which does an extensive business on steam roads, showed its Norwood center and side bearings, and also a combination center and side bearing to be used under the center of the car, which practically does away with the necessity of extreme tilts. In the center bearing made for electric cars, the draft of the motors, as well as the load, comes upon the balls. Great saving in track wear at switches and curves is claimed when ball-bearing supports are used for the car body. In a test made by the M. C. B. Association committee in 1903 this was the only center bearing to turn under a load of 37 tons without cutting, the flange pressure in this case being only 58 lbs. It is used on 100 steam roads. John E. Norwood, the inventor, was in attendance.

R. W. CONANT, of Cambridge, Mass., exhibited his bond-testing and motor armature and field coil testing apparatus, and some samples of defects found by the use of his testing instruments. The Conant apparatus for locating weak motor fields is used by a number of companies, and was very well spoken of in some of the discussions that took place in the mechanical and electrical convention.

THE O. M. EDWARDS COMPANY, of Syracuse, N. Y., represented by O. M. Edwards, J. E. Simons and G. G. Norris, exhibited a disappearing window for street car service. The sill of the window is pulled horizontally outward, then the window is let down and the sill goes back to its original position, covering up the top of the window below the sill. When the window is to be closed the sill is again pulled outward and the window, operated by a Hartshorn roller, comes up of itself until it is closed. The tension of the spring on the roller can be regulated from the inside of the car by a small socket wrench.

HEYWOOD BROTHERS & WAKEFIELD COMPANY, of Wakefield, Mass., and New York city, showed their well-known

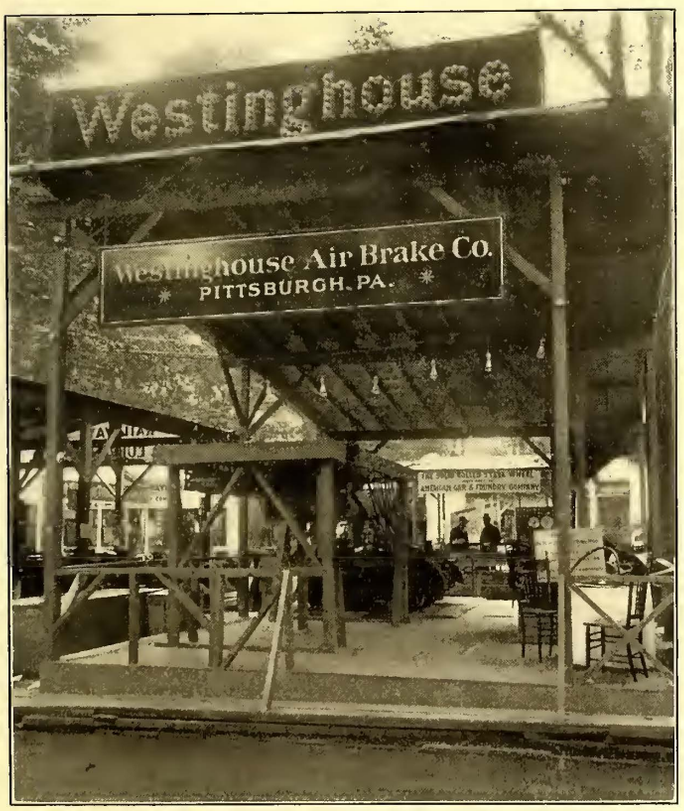
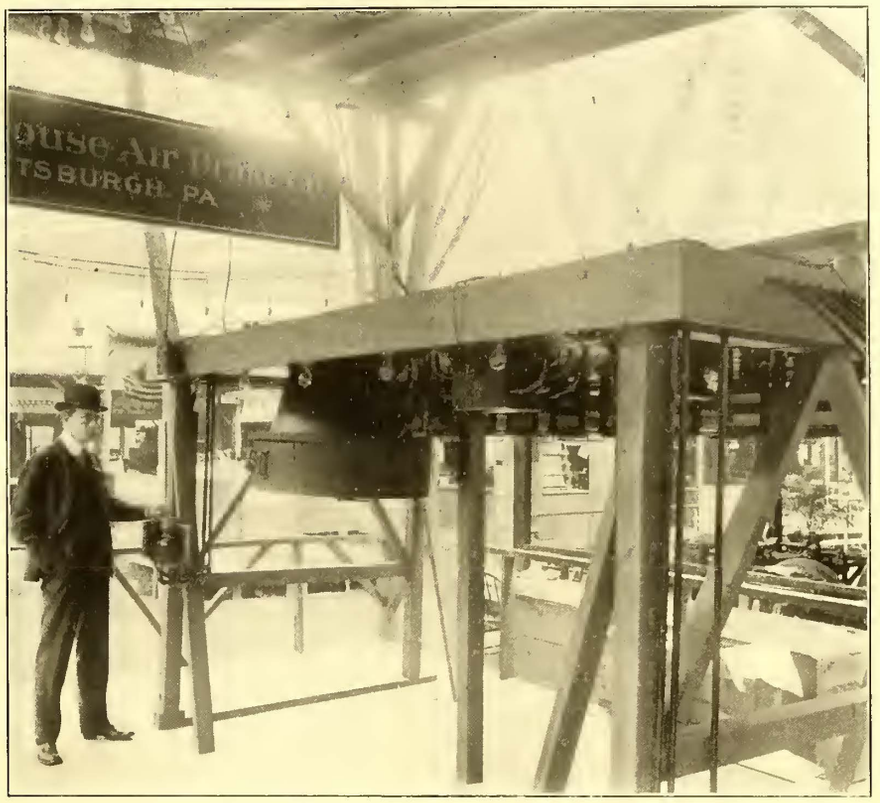


EXHIBIT OF THE WESTINGHOUSE AIR BRAKE COMPANY

Wheeler reversible seats, upholstered in rattan, plush and artificial leather. Their No. 4 S. F. has a high three-part back with head rest, and the seat cushion has spring edge, making a luxurious seat for interurban cars. It also has a mahogany arm rest, and a brass grab handle on the corner of back for use of standing passengers. They also show the shifting foot rest and pedestal base giving room



ELECTRO-PNEUMATIC TURRET CONTROLLER IN EXHIBIT OF THE WESTINGHOUSE AIR BRAKE COMPANY

under seat for small baggage. One of the seats that was shown had slat seat and back, similar to those furnished by this company for 120 Brooklyn semi-convertible cars. They were represented by Bertram Berry, of New York; F. H. Henry, of Wakefield, Mass.

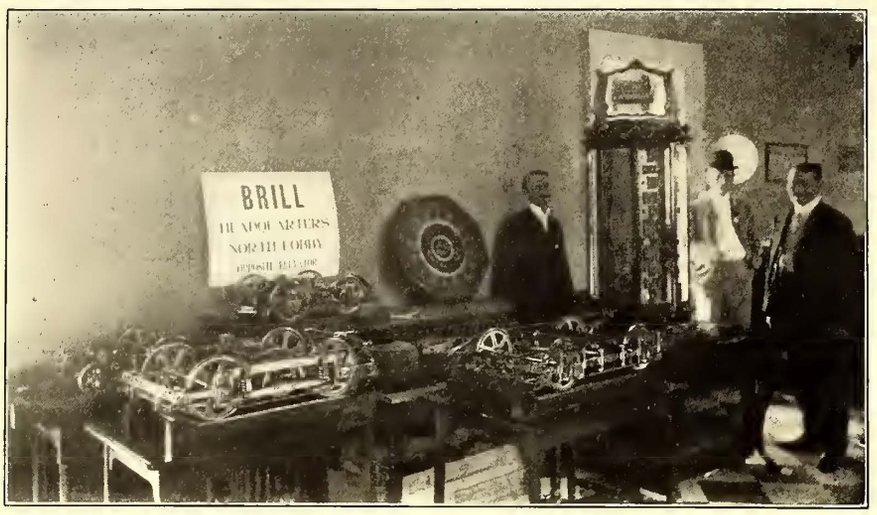
THE STUART-HOWLAND COMPANY, of Boston, Mass., in parlors of the Grand Union Hotel, made an elaborate exhibit of its specialties, featuring its varied lines of overhead material. Six types of bracket arms were shown, together with thirty-six types of trolley ears, several of which were hammered and bent to an extreme right angle, thereby demonstrating their wonderful plasticity, which in no wise injured their tensile strength. A constant flow of visitors were entertained by H. W. Smith, from headquarters in Boston, and H. De Steese, from the New York branch office. In addition there was shown the standard "III rib" wheel, Ham sand boxes, trolley catches and retriever, swivel trolley harp, bayonet trolley harp, signal bells, and S-H spiral brand trolley rope. It is interesting to note that this exhibit was the most elaborate ever made by this company, and the wonderful growth of its business during the past three years speaks volumes for the progressive policy and spirit which has been displayed.

THE HAM SAND-BOX COMPANY, of Troy, N. Y., represented by President A. W. Ham, exhibited its trolley catchers, and the well-known Ham sand box in the parlors of the Stuart-Howland Company on the second floor of the Grand Union. Mr. Ham had also on exhibition a new swivel trolley harp, which is a genuine novelty. The harp has a horizontal swivel adjustment through a radius of about 3 degs., thus enabling the wheel to follow curves with extreme ease. The wire at all times is in the center of the wheel, reducing the liability that the trolley will jump the wire. this point alone is one greatly appreciated by all who have had trouble with the wire cutting through the edges of the wheel.

THE CELLULOID COMPANY, New York, exhibited various styles of curtain material for open and closed cars. This curtain material is waterproof on both sides. The advantages of this fact can readily be appreciated in the use of this cloth for open car service. On rainy days, when the curtain is wet on the outside, it can be rolled up without affecting in the least the inside, or dry side, of the curtain. The company also had on exhibition several car seats, upholstered with "Texoderm," a form of artificial leather manufactured by the Celluloid Company. W. S. Sillcocks and W. C. Crosby were the company's representatives.

HAROLD P. BROWN, of New York, of course exhibited his various types of rail-bonds and track drill appliances, and also

his motorman's mirror, which has been recently adopted by a number of large roads in different parts of the country. Mr. Brown is also putting on the market a new fuel mixture, called "Brillium," which facilitates the burning of poor coal to such an



THE BRILL HEADQUARTERS

extent that much better evaporation per pound of coal is obtained. In fact, the results said to be obtained would savor of Arabian Nights tales were not an engineer of Mr. Brown's reputation not behind the statements. Brillium fuel was being used under some of the boilers of the Grand Union Hotel during the convention. It is a powder which is mixed with coal and cinders, and gives most surprising evaporation results. Mr. Brown distributed an interesting circular showing the great saving effected by using "Brillium" at the Grand Union Hotel, Saratoga.

THE STANDARD POLE AND TIE COMPANY, New York, exhibited the round Southern cedar poles, octagon and

EXHIBIT OF WILLIAM WHARTON, JR., & COMPANY

square, and yellow pine; Florida heart pine cross-arms, and insulator pins. The exhibit was neatly and attractively arranged around the platform and exhibit booth of the Consolidated Car Fender Company. F. L. Merritt and E. G. Chamberlain were the representatives.

THE GLOBE TICKET COMPANY, of Philadelphia, exhibited samples of its transfers and tickets. A feature was made of the Ham patent transfer, which has stubs for morning and afternoon. W. C. Pope, vice-president; P. C. Snow, Eastern representative; D. C. Griffith and Western representative were present. H. N. Brown, of the Duplicate Transfer & Rebate Company, of Norfolk, Va., held forth at this stand.

THE OHMER FARE REGISTER COMPANY, of Dayton, Ohio, featured its new No. 4 register, which is designed for interurban use, and has twelve classes of fare and transfer records. It registers and prints the date, the trip number and a record of cash and ticket fares, including mileage. A section of a car was shown, demonstrating the use of the device on summer cars, where it is desirable to enable the conductor to register fares from either running board. Samples of the other well-known types of registers were shown under operating conditions. These people are meeting with unusual success in introducing their goods on Western roads, and have recently sold the following equipments to coast systems: Oakland Transit Company, fifty; Los Angeles & Pacific Railway, seventy-seven; Los Angeles Street Railway, 350; Pacific Electric Railway, 140; Portland Railway, 200. The demand from all other sections of the country is also showing remarkable gains, and the company is preparing to enlarge its factory to twice the present capacity. John F. Ohmer, vice-president and general manager; J. H. Stedman, secretary; H. Tyler, Western representative; W. E. Hinman, Eastern representative; C. W. Kitteman, Southern representative, and H. A. Eckert, general representative, were present.

THE SPEER CARBON COMPANY, of St. Marys, Pa., displayed a large case containing samples of its large line of carbon brushes. An attractive paper knife was distributed to friends of the company. J. S. Speer and G. P. Tryling were present.

THE CONTINUOUS RAIL-JOINT COMPANY OF AMERICA, of Newark, N. J., exhibited samples of several styles of its well-known rail-joint. W. A. Chapman, of Boston; S. P. McGough, of Chicago; W. E. Clark, of Newark; B. M. Barr, of New York; L. F. Braine, of Newark, and W. J. Bradley, of Troy, were on hand.

THE LUDLOW SUPPLY COMPANY, of Cleveland, attracted considerable attention with its very efficient Cleveland track drill, which was arranged for electric motor drive. The device was shown in operation, and on numerous tests holes were drilled by one man in twenty-nine to thirty-five seconds. The device was fully described and illustrated in the Souvenir edition of Street Railway Journal. Col. W. E. Ludlow and James Ludlow were present. They also explained the features of the

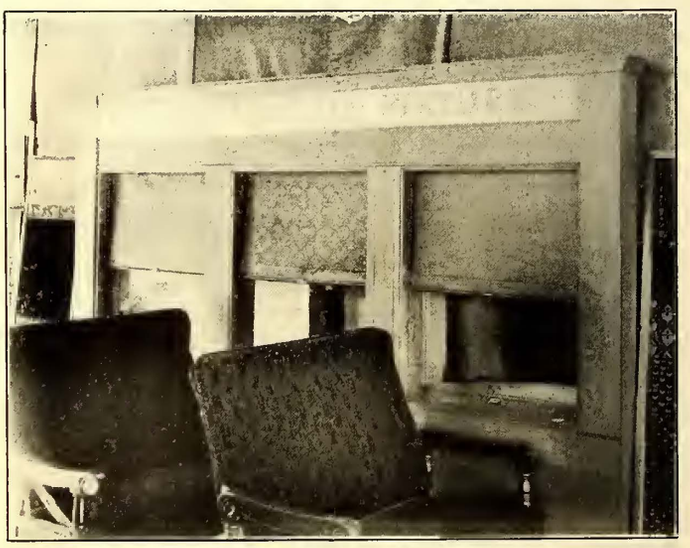


EXHIBIT OF L. C. CHASE & COMPANY

Garry pneumatic pit jack, and the Keeler curtain fixtures for which the company is agent. The Federal Manufacturing Company, of Cleveland, which manufactures the last-mentioned device, was represented by E. L. Ludlow and H. E. Keeler. The Keeler fixture has an eccentric fastener, by the use of which the two edges of the curtain remain constantly in parallel, no matter at what position the curtain may be gripped for raising or lowering. The company has recently taken a very nice order from the Metropolitan Street Railway, and another from the Rochester Railway.

THE AMERICAN STEEL & WIRE COMPANY made no exhibit, but it was well represented by H. G. Greenberg and C. S. Knight, Jr., of Chicago, and F. A. Keys, of New York.

THE WHEEL TRUING BRAKE-SHOE COMPANY, of Detroit, displayed its "tried and true" brake-shoe, which is used by about 500 roads in this country. It is so well known that a detailed description is not necessary at this time. The company is

pleased at this time to announce that Judge Hazel, of the Western district of New York, has handed down a decision affirming the validity of its patent, and adjudging that a certain defendant has infringed the same, and ordering a decree for perpetual injunction, and accounting for damages. James M. Griffin and Mrs. Griffin were present. The latter had a fine souvenir deck of playing cards for the ladies.

JOHN C. DUNER, of Chicago, showed the Duner sand box. The former is well known through its use by all the Chicago elevated roads. The movement of the door is controlled by one pin projecting upward into a guiding track. Double wire gates for summer use can be operated by the same attachments. The Duner sand box is made in two types for either constant or intermittent discharge. A wire agitator moves up and down through the sand each time the hopper is tilted.

THE W. T. VAN DORN COMPANY, of Chicago, showed its well-known Van Dorn automatic couplers for elevated and surface cars. They are made in eleven sizes, and the company is bringing out a heavier draw-bar than heretofore made. W. T. Van Dorn was present.

THE ALLEN & MORRISON BRAKE-SHOE & MANUFACTURING COMPANY displayed its new steel back brake-shoe, the well-known Detroit insulating machine, and a new insulating compound known as "Thebest." This preparation is said to be free from acid, it dries quickly and the higher the temperature the greater the resistance. Donald Rawson, superintendent, was present.

THE FEDERAL SUPPLY COMPANY, of Chicago, manufacturer of steel wool journal packing, the Miller car box receptacle, the Robertson ash and cinder conveyor and the Toltz automatic ash pan, was represented by W. B. Walker. The company is meeting with phenomenal success in introducing its steel wool packing, particularly in the foreign field, due, the company states, to the foreign circulation of the STREET RAILWAY JOURNAL. Recently the company shipped eight tons of packing to China, and has had orders from South Africa, France, Belgium and other foreign countries.

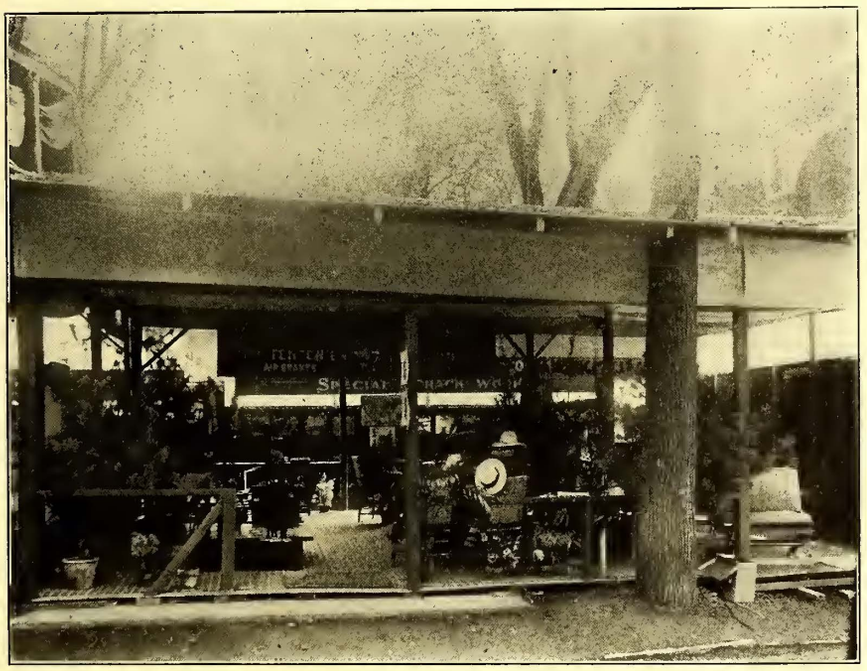
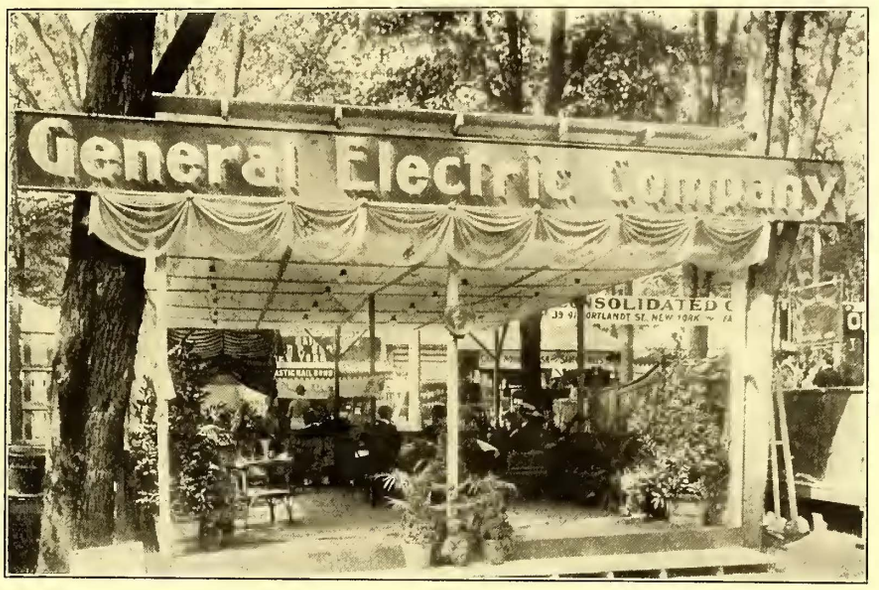


EXHIBIT OF THE NATIONAL ELECTRIC COMPANY

THE DETROIT TROLLEY & MANUFACTURING COMPANY, LTD., of Detroit, represented by W. S. McDonald, showed the Detroit ball-bearing trolley base, which was introduced at the Detroit convention last year, and which has since been adopted by a number of roads. Undoubtedly the plan of having a flexible trolley base goes a long way towards overcoming trolley difficulties.

THE STAR BRASS WORKS, of Kalamazoo, Mich., displayed numerous samples of its trolley wheels and harps. The company makes the statement that its wheels have been adopted as standard by a large majority of the leading roads in the country. The Star wheel is made of pure copper, especially treated, which gives it a softness combined with a high degree of toughness, making an extremely durable wheel. It is claimed that as high as 35,000 miles have been made with 6-in. wheels, and 23,000 miles with 4-in. wheels. O. P. Johnson was present, and distributed a neat paper cutter to friends.



HEADQUARTERS OF THE GENERAL ELECTRIC COMPANY

THE NATIONAL TICKET COMPANY, of Cleveland, showed numerous styles of tickets, transfers and punches, and featured the National cash fare receipt, which has been adopted by a large number of interurban systems. H. C. Bates was present.

THE COLUMBUS STEEL ROLLING SHUTTER COMPANY, of Columbus, showed a steel rolling door as used in actual practice. The company has recently brought out a new form of slatting, which has a hinge, tubular in form, designed to produce great stiffness and reducing friction to a minimum. The shape is such that there are no pockets or recesses for the accumulation of water or dirt, which prevents rusting or clogging of joints. The doors are entirely fire proof, and take up a minimum amount of space, as they roll into a hood. Ray Lovell, manager, was present.

THE JOHNSON WRECKING FROG COMPANY, of Cleveland, showed the Johnson car replacer. Dr. X. Y. Scott was present.

THE ELECTRIC RAILWAY EQUIPMENT COMPANY, of Cincinnati, featured an hydraulic grooving press for placing recesses in wire for attaching ears. The strength of this method of attaching ears was shown by a test of 2500 lbs. on a single ear. The new Form M. ear, designed for all sizes and shapes of wire, was also featured. Various kinds of strain insulators made from a new composition were shown. Insulators of this composition have been tested to 16,000 volts and 360 deg. F. The company's well-known line of poles, brackets and other overhead material were displayed. P. F. Harten, of Cincinnati, and Elmer P. Morris, of New York, were in attendance.

THE TROLLEY SUPPLY COMPANY, of Canton, Ohio, showed its Knutson trolley retriever, designed for use on high-speed lines. The device is positive and quick of action, and has been adopted on such high-speed roads as the Stark Electric Railway, Western Ohio Railway, Cincinnati, Dayton & Toledo Traction Company, Columbus, London & Springfield Railway, Columbus, Buckeye Lake & Newark Railway and the Canton & Akron Railway, of Ohio; the Indiana Union Traction Company, the Indianapolis, Shelbyville & Southeastern Railway, and the Indianapolis & Martinsville Rapid Transit Company and the Lehigh Traction Company, of Pennsylvania. Equipments have

recently been shipped to Berlin, Paris, South America and Belgium. Robert K. Fast, secretary and treasurer, was present.

THE CLIMAX SUPPLY COMPANY, of Chicago, which has recently been formed to handle the lines of the Climax Stock Guard Company, of Canton, Ohio; the Climax Fence Post Company, of Chicago; the Union Drop Forge Company, of Chicago, and the Edgar Car Lock & Seal Company, of Iola, Kan., was represented by H. E. Overstreet, general manager, and J. H. Downs, Eastern representative. A crossing fitted with the Climax stock guard and fence post was shown. The company is going into the business of fencing railroads, utilizing its patent fence post in connection with plain or barbed wire. The new track tools furnished by the Union Drop Forge Company include tamping bars, claw hammers, driving hammers, picks, etc.

THE NATIONAL LEAD COMPANY, of Chicago,, showed babbitt metal journal bearings, and Phœnix metal armature bearings. Prominently displayed was a journal bearing which had seen continuous service for thirteen months under a car on the Detroit United Railway. It is claimed that this metal is used exclusively on bearings in all Detroit United cars. Arthur Benzel, St. Louis; J. R. Weithas, New York, and R. B. Pierson, Detroit, were present.

THE BENJAMIN EECTRIC MANUFACTURING COMPANY, of Chicago, had an attractive display of clusters of lamps arranged with the Benjamin wireless cluster. This cluster has an insulating base of porcelain, with two-piece contact plates attached thereto, each serving like terminals of all lamps in the cluster, and each provided with a binding screw, and a removable

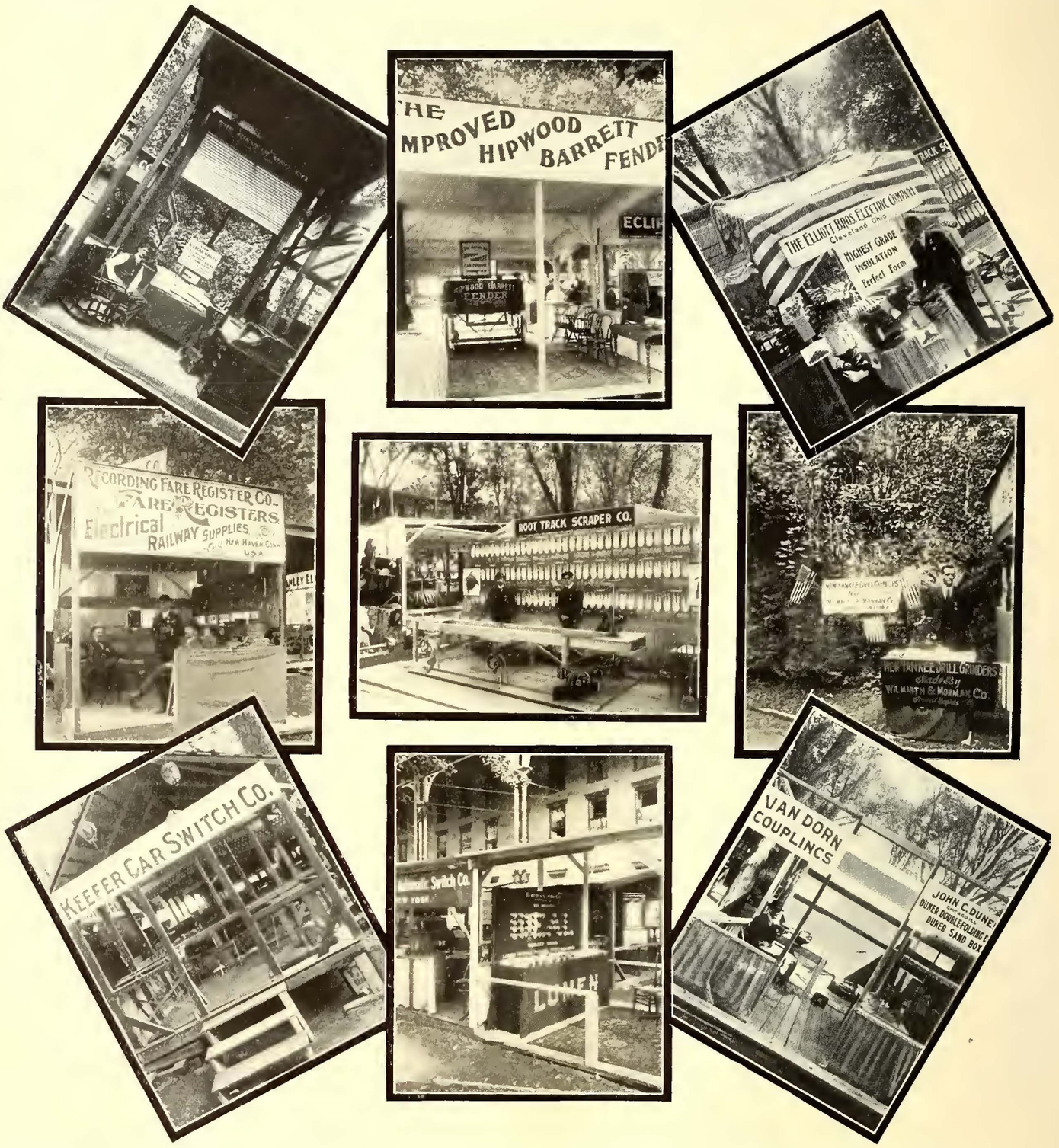


EXHIBIT OF THE KINNEAR MANUFACTURING COMPANY

EXHIBIT OF THE RECORDING FARE REGISTER COMPANY

EXHIBIT OF THE KEEFER CAR SWITCH COMPANY

EXHIBIT OF THE HIPWOOD-BARRETT CAR & VEHICLE FENDER COMPANY

EXHIBIT OF THE ROOT TRACK-SCRAPER COMPANY

EXHIBIT OF THE LUMEN BEARING COMPANY

EXHIBIT OF THE ELLIOTT BROS. ELECTRIC COMPANY

EXHIBIT OF THE WILMARTH & MORMAN COMPANY

EXHIBIT OF THE W. T. VAN DORN COMPANY AND JOHN C. DUNER

casing of brass or aluminum, protected by porcelain rings or bushings. In series clusters the contact plates are made in sections, each section serving two adjacent lamps, the inner and outer plates overlapping each other, thus connecting the lamps in series without wiring. The company states that these clusters have been adopted by the Interborough Rapid Transit Company, of New York, for the illumination of all underground cars. Basil G. Kodjbanoff, manager of the Eastern Department, was in charge.

THE AMERICAN CAR & FOUNDRY COMPANY, of Chicago, showed samples and sections of its new solid rolled steel wheel. The wheel is made from a cast-steel blank, which is heated and rolled by driven rolls, thereby compressing the steel of the tread and flange, and reducing the area of its cross section 20 per cent. The hub and ribbed plate remain as cast. The tire can be turned down as much as ordinary steel tire that is 2½ ins. thick, and, of course, the tire cannot work loose, as it is an integral part of the wheel. The low cost of this wheel forms one of its attractive features. The Fowler truck side bearing, a newly patented device, was also shown. The bearing consists of a gear wheel revolving between the body transom and the truck bolster. The bearing has but three parts. It cannot fail to revolve, as the truck bolster turns, and as the bearing surface in any position is from 3 ins. to 6 ins., the roller cannot flatten. The device can be supplied to any size or style of truck. William H. Fowler, of Chicago, was in charge of the booth.

THE PETER SMITH HEATER COMPANY, of Detroit,

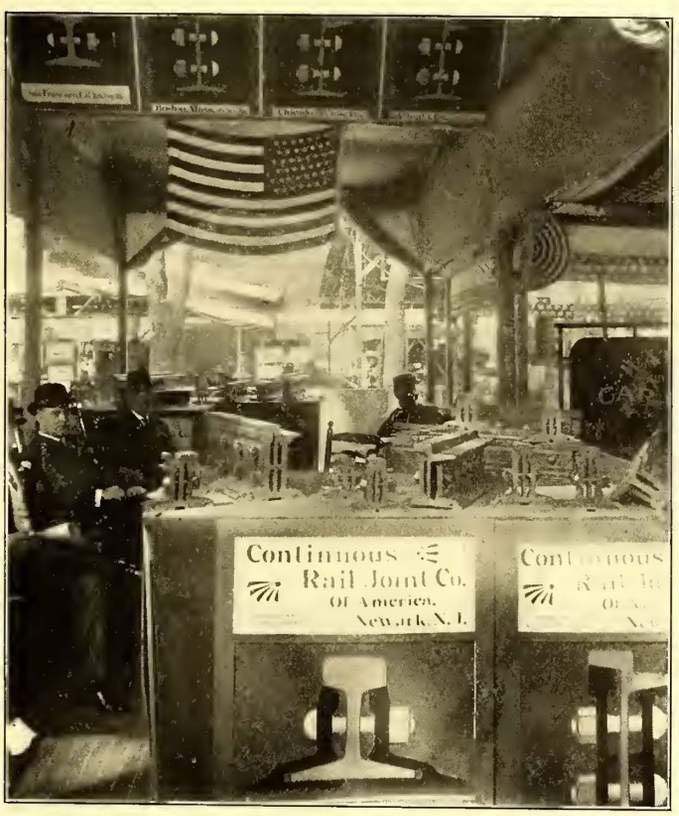


EXHIBIT OF THE CONTINUOUS RAIL JOINT COMPANY

displayed three sizes of its widely used hot water heater for closed cars. The company is meeting with marked success in placing its device with leading city and interurban roads, and the advantages of this system of heating are rapidly becoming universally recognized. Peter Smith and E. J. Smith were in charge. George S. Hastings, general sales agent, was also present.

THE KINNEAR MANUFACTURING COMPANY, of Columbus, manufacturer of the Kinnear rolling door, displayed a section of car house, with trolley wire and Kinnear door installed. The numerous self-evident advantages possessed by a rolling door which passes out of the way into a hood, are daily becoming more widely appreciated by electric railway people, and a very large proportion of the more modern car houses are being equipped with the Kinnear door. This fact is particularly true in the case of the roads in the vicinity of Albany and Saratoga. An important contract recently closed by the company was that of the Georgia Railway & Electric Company, of Atlanta, which calls for sixteen doors. F. H. Billheimer was in charge.

EXHIBIT OF ROSSITER, MACGOVERN & COMPANY

THE ECLIPSE CAR FENDER COMPANY, of Cleveland, had several methods of calling the attention of the public to the merits of its new life guard, and it is safe to say that no one who attended the Convention missed seeing the operation of the Eclipse fender in some manner or other. At the stand was displayed a fender attached to the dash of a car as in actual practice, and many hundreds of times the attendants allowed themselves to be pushed into the fender. Each morning and evening the company gave actual demonstrations of the fender on Hamilton Street, at the rear of

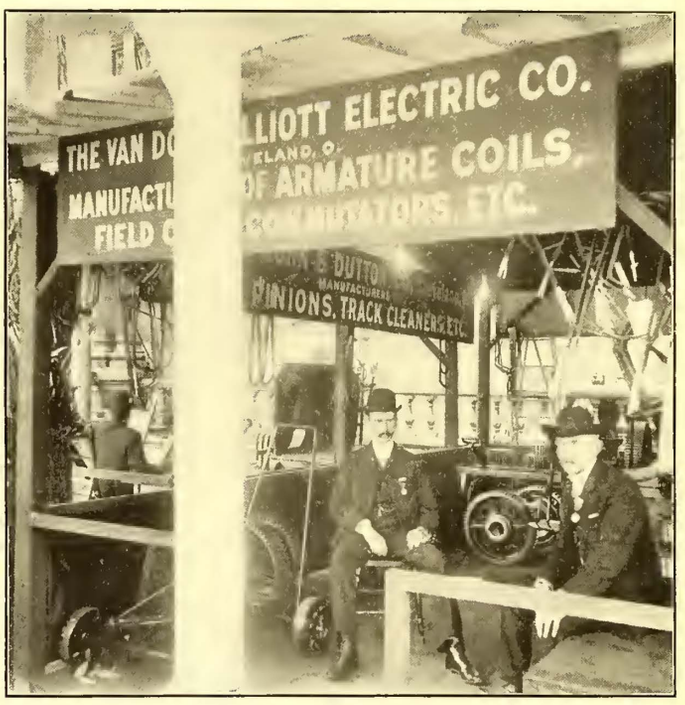


EXHIBIT OF THE VAN DORN & DUTTON COMPANY AND THE VAN DORN-ELLIOTT ELECTRIC COMPANY

the Grand Union Hotel. On no less than thirty occasions, not only employees of the company, but motormen and conductors of the Hudson Valley Railway, were picked up uninjured at speeds ranging from 5 miles to 15 miles an hour. On the last test two men were picked up at once. At one of the tests on Tuesday there was a "pick-up" which was not down on the programme. George Groman, a conductor on the Hudson Valley line, who had been instructed to keep back the crowd, failed to get out of the way of the car, and was picked up. He claimed it was a genuine accident, and that he had had no intention of getting in the way. These trials proved one of the greatest attractions of the week, and many thousand people witnessed them. Each evening the company gave a biograph exhibition of a trial made in Brooklyn

at 22 miles an hour, while at the stand there was in constant operation a mutoscope showing the same tests. Each day thousands of small and attractive cards, calling attention to the various trials, were distributed throughout the grounds. On the whole, the new fender attracted widespread attention and comment, and its success seems assured. During the week many orders were taken for trial equipments. Those in attendance were Dr. C. B. Forward, Benjamin Lev, J. W. Range, Harry Brakeman, Charles F. Merseburg, S. M. White and S. C. Warr. Nearly all of the the above took part in the tests, and were picked up by fenders.

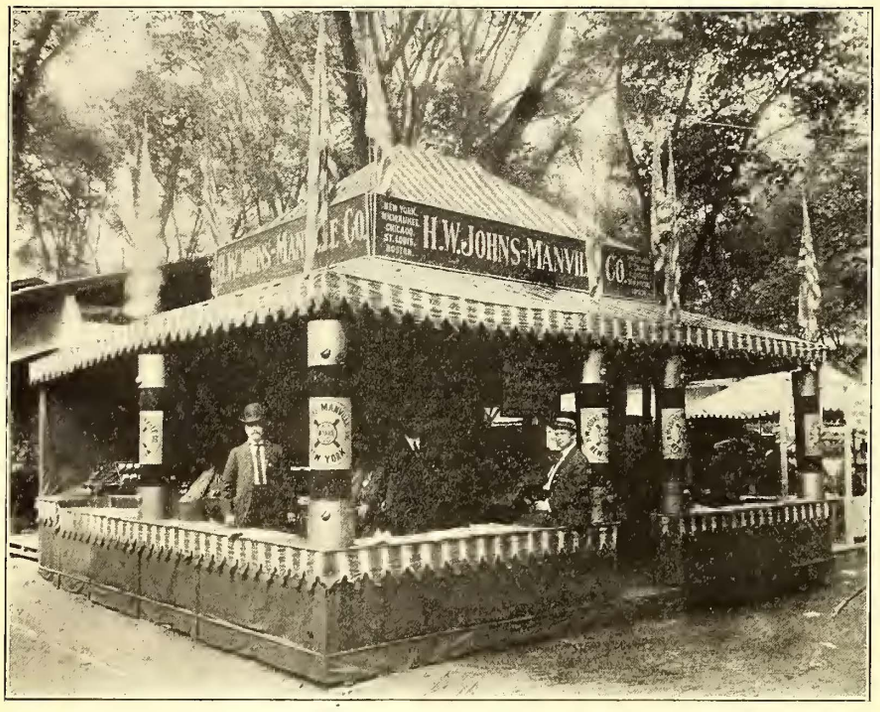


EXHIBIT OF THE H. W. JOHNS-MANVILLE COMPANY

THE CURTAIN SUPPLY COMPANY, of Chicago, had an artistically arranged booth on the veranda, half of which was fitted up as a Turkish cosy corner for entertainment. Three very fine revolving frames contained the various styles of the company's line of curtains in the various fabrics used in these goods. The leading feature to which attention was called was the Forsyth No. 86 roller tip fixture. The new device is self-aligning; it will not come out of grooves; it has a wide range of adjustment; it has a locking adjustment which can be operated only by barn men or others familiar with the device, these locks being capable of adjustment without removing from the window frame; there are no small parts; it is impossible to loose the tips or handles; the curtain will not creep up; and the device is made with or without handles. The fixture can be instantly removed from groove if desired, for cleaning, it will not disfigure the groove in removing, and it is reversible, so that an ignorant man cannot make an error in putting it in. Another feature was the Forsyth open car cable fixture. This device does not depend upon the cable for friction, and the cable is used simply to prevent the curtain from coming out of the groove. A simple pin and slot lock prevents the possibility of losing the cable tip. The fixture is designed for either open or convertible cars. W. H. Forsyth, general manager; A. L. Whipple, Eastern representative, and B. S. McClellan, Western representative, entertained.

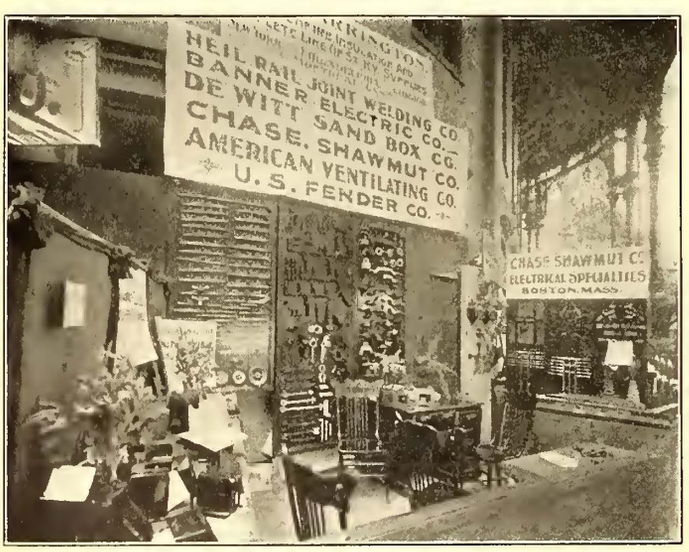


EXHIBIT OF C. J. HARRINGTON

THE CREAGHEAD ENGINEERING COMPANY, of Cincinnati, manufacturer of line material, flexible brackets, pole fittings, etc., was represented by Thomas J. Creaghead, president.

THE RAILWAY APPLIANCES COMPANY, of Chicago and New York, had a pagoda-shaped booth, in which it showed several of the appliances it is manufacturing. These included the Q. & C. portable rail drill, the Sampson rail bender, the Stanwood step, the Bryant portable rail saw, and the Fewing car replacer. The new drill is a very light and simple device, which sells at a very low price. It has clamps which hook on the rail above and below, and may be applied instantly. The drill proper is hinged so that it may be dropped back away from a passing car. There is a double handle, and the drill may be operated by either one or two men. The feed is automatic, and by means of a split gear in the driving mechanism, two speeds are available. Anthony T. Kalas, of Chicago, and Fred Brotherhood, of New York, were present.

THE GLOBE ELECTRIC MANUFACTURING COMPANY, of Cleveland, made a decided hit with its combination arc and incandescent headlight, designed to obviate the common objections to the arc headlight while on city tracks. A two-point switch, placed in the motorman's cab, does the trick, the same circuit being used. The company offers a thirty-day trial free of charge, and a number of sample orders were booked. William C. Egert, sales manager, was in charge, and a sample of the lamp was shown in operation.

THE NATIONAL CARBON COMPANY, of Cleveland, exhibited a line which is almost too well known to require detailing. It included carbons, brushes, dry cells, etc. R. K. Mickey, of the carbon brush department, was much in evidence. James Partridge, of the Partridge Carbon Works, Sandusky, was also present.

EXHIBIT OF THE STERLING-MEAKER COMPANY

F. H. NEWCOMB, of New York, known to the trade as the "Cap man," exhibited his usual line of uniform caps. A souvenir pocketbook was much sought for.

EUGENE MUNSELL & COMPANY and the Mica Insulator Company, of New York and Chicago, were represented by Charles E. Coleman, manager of the Chicago house. Their exhibit, which consisted of micanite rings, segments and empire cloth, and their other lines of insulation, was located at the left of the main cross

aisle in the booth with the National Carbon Company. Samples of their material were freely distributed among the visiting delegates, and at all the writing desks of the hotels very attractive blotters were very much in evidence.

GEORGE F. ROOKE, the inventor of the Rooke fare register, interviewed a good many railway managers who were interested in his device. The machine will not be placed on the market before the coming winter.

M. A. BERG, of Porter & Berg, electric railway supplies, represented the firm at the convention.

JOHN E. ELDRED, JR., represented N. A. Christensen, builder of air compressors at Milwaukee, Wis.

THE JEWETT CAR COMPANY, Newark, Ohio, had A. H. Sisson, general manager, and Mr. Gardner, treasurer, at the convention.

THE J. M. ATKINSON COMPANY, electric railway supplies, Chicago, was represented by J. M. Atkinson.

CHARLES K. KNICKERBOCKER, of the Griffin Wheel Company Chicago, was present.

THE W. R. GARTON COMPANY, electrical supplies, Chicago, was represented by the president, W. R. Garton.

L. E. MYERS, of the L. E. Myers Company, Chicago, was present.

E. F. KIRKPATRICK, of the McRoy Clay Works, Brazil, Ind., arrived with the "Wabash Special."

GEORGE S. BIGELOW, of the Railway Department, Chicago Varnish Company, was at the convention.

GEORGE WESTON, accompanied by Mrs. Weston, represented the Chicago Engineering & Constructing Company, of Chicago.

THE PAIGE IRON WORKS AND THE BUDA FOUNDRY COMPANY, Chicago, were well represented by E. S. Nethercut, who was accompanied by his wife.

THE HALE & KILBURN MANUFACTURING COMPANY, of Philadelphia, New York, Chicago and London, attracted universal attention with a novel and extensive display of car seats. The space, measuring 25 ft. front, was covered by a canopy, projecting about 6 ft. and supported by front columns. The entire rear wall of the exhibit, together with the inside of the canopy, was covered with canvas-lined woven rattan. The face of the canopy, as well as the columns supporting the same, were likewise covered with this material, which, taken as a whole, had a decidedly unique effect. Rolls of this material arranged in columns

EXHIBIT OF THE OHIO BRASS COMPANY

likewise added to the impressive effect. The entire space was surrounded by a solid brass railing. A uniformed colored attendant was present to act as a messenger and otherwise to provide for the comfort of the numerouse friends of this popular concern. The display of car seats included the famous walkover patterns, some ten or twelve in number, some of which never had been heretofore presented. The long experience of this concern in railroad car seating has led it to introduce numerous desirable features in electric car seats, which hitherto have only been used in steam car seating. This feature has been much appreciated by some of the foremost interurban electric lines of the country, including the Aurora, Elgin & Chicago line. Numerous other lines have likewise been fitted with the Hale & Kilburn interurban seats, and others now under construction will be equipped in the same manner, with high headroll backs, polished hardwood aisle ends, automatic foot rails, etc. The Hale & Kilburn Company was the first to introduce pressed steel car seats for first-

EXHIBIT OF THE CONSOLIDATED CAR FENDER COMPANY

class passenger coaches, and to-day this seat has become the exclusive standard of numerous leading railroads throughout the United States. The company has introduced this valuable feature into electric car seats, and showed the first samples in the Saratoga display. The absolute indestructibility, simplicity and lightness secured by this invention meets with unqualified approval on the part of all examiners. Among the samples shown were the high-back cross seats now being manufactured by this concern for the New York Interborough Rapid Transit, to be placed in 500 subway cars. The entire number of seats in this order is 26,000, the contract for which was awarded the Hale & Kilburn Company for the patented steel band construction after a close examination of every other seat manufactured in the country. The Hale & Kilburn Company is now rapidly finishing an immense new plant along the line of the Pennsylvania Railroad in Philadelphia, to enable it to meet the constantly increasing calls from home and foreign trade. The company will soon issue a catalogue of the leading styles of seating, which it will be pleased to forward to all inquirers. H. T. Bigelow, of Chicago, and Messrs. Walker and Old represented New York and Philadelphia interests.

THE LORAIN STEEL COMPANY had a handsomely decorated stand, and its exhibit included three large sample cases containing nickel-plated sections of all the types of rails built for city and interurban work. The staff present included: P. M. Boyd, secretary; D. J. Evans, Chicago office; Major H. C. Evans, and F. J. Drake, New York office; William W. Kingston, Atlanta office; Rudolph Clitz, Lorain; H. T. A. Kleinschmide, Johnstown, Pa., and L. P. S. Ellis, Pittsburg.

THE M'GUIRE MANUFACTURING COMPANY, of Chicago, had the only exhibit on the Delaware & Hudson tracks, at the rear of the hotel, which were supposed to have been the location of the rolling stock exhibits. The company showed a heavy vestibule rotary snow sweeper, one of a type which is used by many of the leading roads of the country. On the Hudson Valley tracks the company displayed in operation, a 4000-gal. sprinkler. The car was provided with a sprinkling head at each end, and sprayed water 45 ft. on each side of track. The width of the spray was regulated by

air pressure supplied the water compartment, controlled by a reducing regulating valve, and the variation in the spread of the water was governed by a lever, readily controlled for any distance from maximum to quick shut-off. The company states that many street railway systems are taking contracts for city sprinkling, and with a sprinkler of this kind, such a contract is likely to prove a most profitable arrangement. The sprinkler was equipped with the new 39-A truck, for heavy high-speed service. At Cottage P, W. J. Cooke, vice-president, and B. F. Stewart, sales manager, displayed a line of models of McGuire trucks. A new feature was the solid steel Columbian truck, 100 of which have just been supplied the Pittsburg Railways Company, making a total of 1000 McGuire trucks in use in the "Smoky City."

HEADQUARTERS OF THE "STREET RAILWAY JOURNAL"

THE STERLING VARNISH COMPANY, and the Pittsburg Insulating Company, of Pittsburg, were represented by H. Lee Bragg, general sales manager, Pittsburg, and S. C. Schenck, New York. They showed samples of varnish, armature coils, coated in varnish, insulating varnish and a new black plastic varnish for coil work. This is claimed to be absolutely oil proof and weather repellant, thus preventing the absorption of oils and moisture, and consequent lowering of insulation.

THE ELECTRIC STORAGE BATTERY COMPANY, of Philadelphia, had a very plain, yet effective exhibit, consisting of two Chloride type G-51 cells, having a capacity of 2000 amps., and two type F-11 cells of 200-amp. capacity. The stand was decorated with a number of photographs of Chloride installations in railway central station and isolated lighting plants, and there was a large map of the United States, showing the cities in which Chloride installations are located. All but two States were represented, the total including 286 railway batteries, 92 central station batteries, and 517 isolated plants, a total of 382,000 kw-hours. Business was reported to be increasing faster than ever before, and recent contracts include large batteries for the Northwestern Elevated Railway, Chicago; the Chicago Edison Company, Chicago; the Los Angeles Edison Company, Los Angeles, Cal., and the New York Edison Company, New York. This makes a total of 22 batteries in use by the latter company. The representatives present were: Charles Blizard, Philadelphia; J. L. Woodbridge, Pittsburg; Albert Taylor, New York; G. H. Atkins, Chicago; F. J. Stone, Boston, and H. B. Gay, Cleveland.

EXHIBIT OF THE OHMER FARE REGISTER COMPANY

THE DEARBORN DRUG & CHEMICAL COMPANY, of Chicago, was represented by William McVicker and J. Johnson, of New York, and G. W. Spier, of Chicago. They presented the merits of the various compounds manufactured by the company for obviating boiler flue troubles. Some remarkable samples of boiler scale were shown. As in previous years, this stand was constantly the Mecca of the souvenir-hunters, and fortunate ones were presented with tasty and valuable reminders of the company's products.

THE HEIL RAIL JOINT WELDING COMPANY, of Milwaukee, showed samples of its cast-welding in connection with the exhibit of C. J. Harrington.

ARTHUR S. PARTRIDGE, the St. Louis railway supply man, was a visitor to the convention. He made no exhibit.

THE PITTSBURG REDUCTION COMPANY, of Pittsburg, had a unique display. The booth was a large one, and one-half was occupied by an aluminum wire drawing machine in operation, reducing wire from No. 2 gage to No. 9 gage. The reception section was handsomely furnished with heavy antique and leather chairs and couches, and displayed on tables were aluminum splices, cables, insulated and bare wire. The railings were aluminum, and potted plants and handsome rugs were included in the decorations. The entertainment committee of the company was a large one, including: Arthur B. Davis, general manager; A. K. Laurie, general sales agent; J. A. Rutherford and Cyrus Harris, Cleveland; S. K. Colby and W. R. Darby, New York; E. H. Noyse, Chicago; William Hoopes, Pittsburg, and J. H. Finney, Washington, D. C.

EXHIBIT OF THE WATSON AUTOMATIC CAR FENDER

THE ADAMS & WESTLAKE COMPANY, of Chicago, was represented by J. A. Foster and W. H. Piersen. The exhibit consisted of headlights, lanterns, semaphores, and the gravity brake-handle. The arc headlight displayed included the Mosher, Wagenhals and Eureka. One of the signal lamps shown was of the non-sweating type, while another was of the long-time burning variety. It was claimed that with a good grade of oil this lamp would burn a week without refilling or touching wick.

EUGENE H. FARR, of the Farr & Foster Company, Chicago, manufacturers of railway tickets, ticket cases and supplies, was at the convention.

THE BALDWIN LOCOMOTIVE WORKS, of Philadelphia,

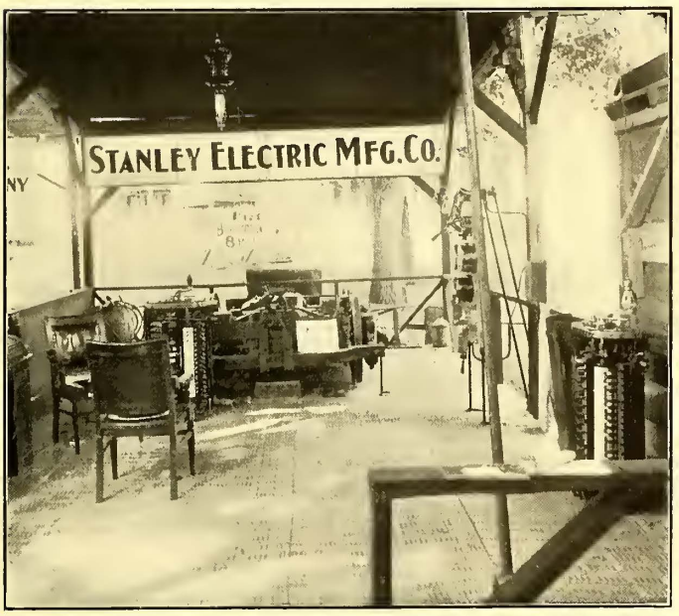


EXHIBIT OF THE STANLEY ELECTRIC MANUFACTURING COMPANY

exhibited one of the motor trucks it is building for the Interborough Rapid Transit Company, of New York, for the new subway lines. This truck is, of course, very massive in construction. It has been described in a recent issue of the STREET RAILWAY JOURNAL.

THE SHERWIN-WILLIAMS COMPANY, of Cleveland,

EXHIBIT OF THE ST. LOUIS CAR COMPANY

made a decided hit by placing its large "Covers the Earth" signs all over the rotunda. The booth was artistically arranged, and the exhibit included a line of paints and varnishes and insulating material. Two large panels demonstrated the various steps taken in finishing cars, both in light and dark colors. The company is meeting with excellent success in introducing its Ajax insulating varnish, a preparation for which many good qualities have been demonstrated. A brilliantly finished cast-iron chameleon, representing the company's trade mark, was a souvenir which was much sought after. E. M. Williams was in charge, assisted by F. A. Elmquist and L. W. Barney.

THE ALLIS-CHALMERS COMPANY, of Chicago and Milwaukee, had no exhibit, but was represented by John B. Allan, engine sales manager, Chicago; Jesse Vail, New York representative; James Lyons, Chicago; Edw. J. Meisenheimer, advertiser, Chicago.

THE MASSACHUSETTS CHEMICAL COMPANY, of Boston, distributed a unique souvenir, a rubber cuspidor mat, a useful article which was much in demand.

BERRY BROTHERS, of Detroit, showed highly varnished panels in light and dark finishes. The booth was tastefully fitted up for reception purposes, and the railway men who called were given a leather-covered memorandum book as a reminder of the company's line. Harry Frost was in charge of the exhibit.

THE ROOT TRACK SCRAPER COMPANY, of Kalamazoo, Mich., was late in completing its exhibits, as the goods were lost

EXHIBIT OF THE SECURITY REGISTER COMPANY AND GILES S. ALLISON

in transit. The line included several varieties of track scrapers. A new type, known as No. 5, is designed to clean all the snow from between the rails, and 9 ins. outside, throwing it away from the center, and at the same time cleans the top of the rail and the groove, being in fact a practical and inexpensive snow-plow, designed to clean the tracks of several inches of snow. The springs and plates are made of open hearth steel of the best quality, and will stand a great deal of heavy work and hard usage. The operation is by lever, giving a greater variation than the old plan of wheel operation. The double device is handled by one man as easily as the single machine. The arrangement and tension of the springs is such that it will operate satisfactorily on rough roads, as well as smooth pavement. Another new device was a third-rail ice cutter, which is claimed to be the best device yet brought out for removing ice and sleet from the contact rail. It first breaks the ice and then scrapes it off. Any desired pressure may be placed upon the springs, and no matter what the speed the ice is broken and removed uniformly. F. N. Root, general manger of the company, was in charge, assisted by Newton Root.

THE HOWE MANUFACTURING COMPANY, of Scranton, Pa., exhibited the Howe steam sand dryer. The device is a radical departure from the old hopper and stove combination. The chief feature comprises layers of steam pipes, so laid that all condensa-

tion immediately runs off. The device will handle a car load of sand at a time, and the entire operation of drying and screening is entirely automatic. The company makes a 10-ton machine of electric railway use. A. D. Blackinton, president of the company, explained the features of the device.

H. W. COVERT, of Waterford, N. Y., manufacturer of a new type of convertible car, was unable to exhibit, but delegates were extended an invitation to visit the factory and inspect a full-sized section.

EXHIBIT OF SHERWIN-WILLIAMS COMPANY
EXHIBIT OF THE STANDARD AUTOMATIC LUBRICATOR COMPANY
EXHIBIT OF R. W. CONANT

EXHIBIT OF THE STERLING VARNISH COMPANY
EXHIBIT OF MERRITT & CO.
EXHIBIT OF THE AMERICAN CAR & FOUNDRY COMPANY
EXHIBIT OF THE AMERICAN DIESEL ENGINE COMPANY

EXHIBIT OF THE INGERSOLL CONSTRUCTION COMPANY
EXHIBIT OF THE UNIVERSAL BRAKE COMPANY
EXHIBIT OF THE SEAVY AUTOMATIC CAR FENDER COMPANY

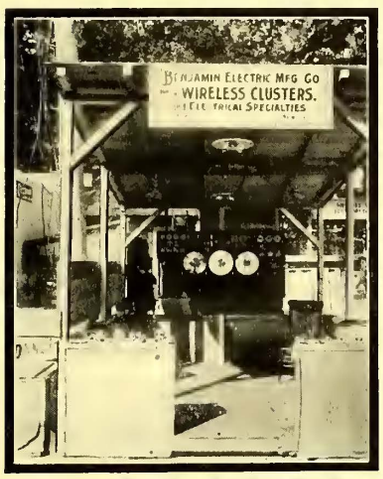
THE BANNER ELECTRIC COMPANY, of Youngstown, Ohio, exhibited a line of lamps and featured its special series burning lamp for electric railway service.

JOHN F. OHMER, of the Ohmer Fare Register Company, of Dayton, has accepted an invitation to deliver before the convention of the Pennsylvania Street Railway Association, at Park Hotel, Williamsport, Pa., Sept. 23, a paper on the subject, "Fare Collection and Proper Protection of Same." This is the first time on record that a member of the trade has been asked to deliver a paper before this association, and the compliment was very gratifying to Mr. Ohmer.

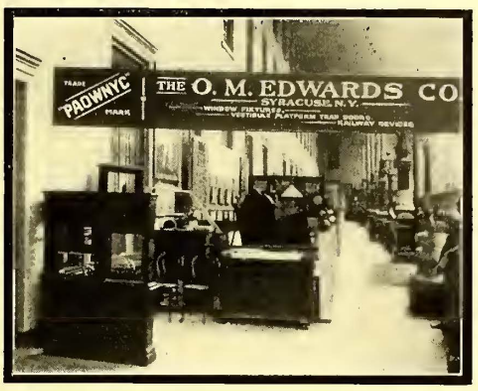
THE HIPWOOD-BARRETT CAR & VEHICLE COMPANY, of Boston, exhibited an improved type of their well-known fender, which is much lighter in construction than the old type. Mr. George Hipwood, Henry S. Jenkins, J. W. Barrett, A. B. Dalby, were present.

C. O. OBERG & COMPANY, of Boston, had an exhibit of their register handles. This concern states that its detachable register handles have been adopted as standard by the largest street

railways in the United States and Canada, and that every practical railway man who uses them finds that they will save his company both time and money. They are specified for new cars, and many order them for stock to replace old handles. The company believes it impossible to construct a more powerful and reliable gripping handle.



THE CHASE-SHAWMUT COMPANY exhibited in space 12, with C. J. Harrington, of New York, showing a full line of Shawmut soldered rail bonds attached to all makes of rail joints. In addition to exhibiting in the booth, a practical demonstration of the application was given on the tracks of the Hudson Valley Traction Company. They were represented by Harry P.



EXHIBITS OF THE BENJAMIN ELECTRIC MANUFACTURING COMPANY AND THE O. M. EDWARDS COMPANY

Moore, Frank D. Masterson and E. P. Howe. C. S. Knowles, Boston, Mass.; W. J. Walther, J. S. Lapp, and C. H. Clark exhibited various specialties sold by this company.

THE F. H. SEAVEY AUTOMATIC FENDER COMPANY, Boston, Mass., exhibited the Seavey automatic fender. This is a new device recently patented and placed on the market by F. H. Seavey. Considerable interest was manifested in this life-saving device by all those who examined it.

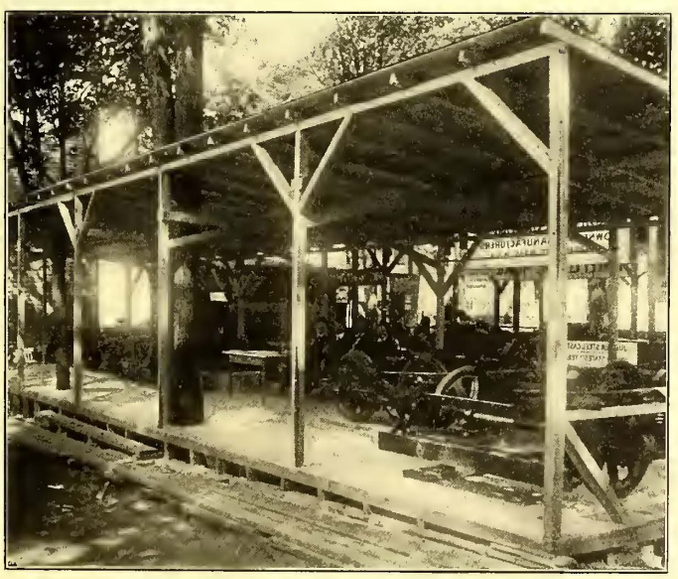


EXHIBIT OF THE BEMIS CAR TRUCK COMPANY

C. J. HARRINGTON, of New York, exhibited a complete line of Empire overhead material, cast-welded rail joints, lamps, rail bonds, car ventilators and various other street railway appliances which Mr. Harrington handles.

THE STANDARD VARNISH COMPANY, of New York, was represented by J. C. Dolph.

THE CONSOLIDATED CAR-HEATING COMPANY, of Albany, exhibited its new type of cross-seat heater, with lead wires coming out of the case at one end. This heater is shown under a cross seat, and other types are also shown in position under seats. A truss plank heater is shown under one end of a cross seat. This heater is very popular for interurban cars, as it is placed on the truss plank, near the floor, making it impossible to overheat the seats. Sufficient heaters are usually used to extend the full length of the car on both sides. The connecting wires are carried in a moulding underneath the heaters. These wires are connected to the heater coils inside of the heater case.

EXHIBIT OF THE UNITED STATES ELECTRIC SIGNAL COMPANY

There are, therefore, no exposed wires, and no joints outside of heater cases. The manner of bringing lead wires out at one end of heaters overcomes the objection to some heaters, where it is necessary to staple wires across the seat frame. The panel heater for New York Subway cars, for which an order for 12,680 heaters has been placed with this company, was also shown. The company was represented by Mr. Green, general manager, of Albany; Mr. Hawley and Mr. Keys from the New York office, and Mr. Hequembourg, of the Chicago office.

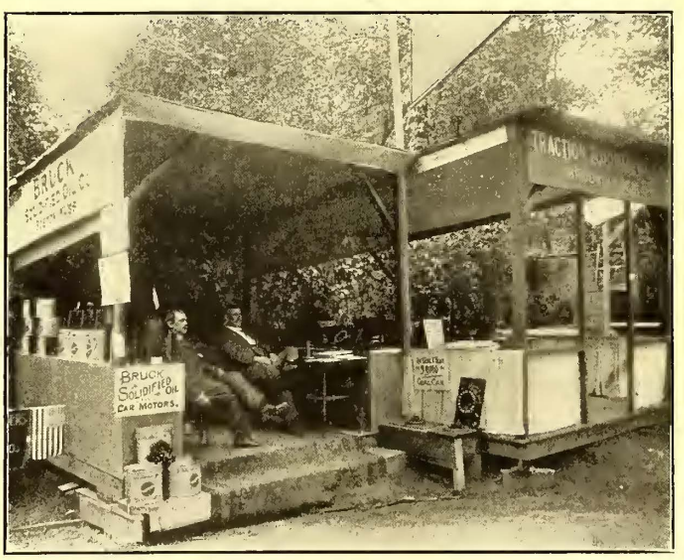


EXHIBIT OF THE BRUCK SOLIDIFIED OIL COMPANY AND THE TRACTION EQUIPMENT COMPANY

THE M'ROY CLAY WORKS, Brazil, Ind., had signs everywhere about the grounds, and Manager E. F. Kirkpatrick, of Chicago, was there.

GEORGE C. EWING, of Boston, was present at the convention in the interests of the McGuire Manufacturing Company, the Electric Railway Equipment Company, Nernst Lamp Company, and Cooper-Hewitt Electric Company, for which companies he is agent. He has recently been appointed New England agent for the Cooper-Hewitt mercury vapor lamp.

THE FRANK RIDLON COMPANY, of Boston, was, as usual,

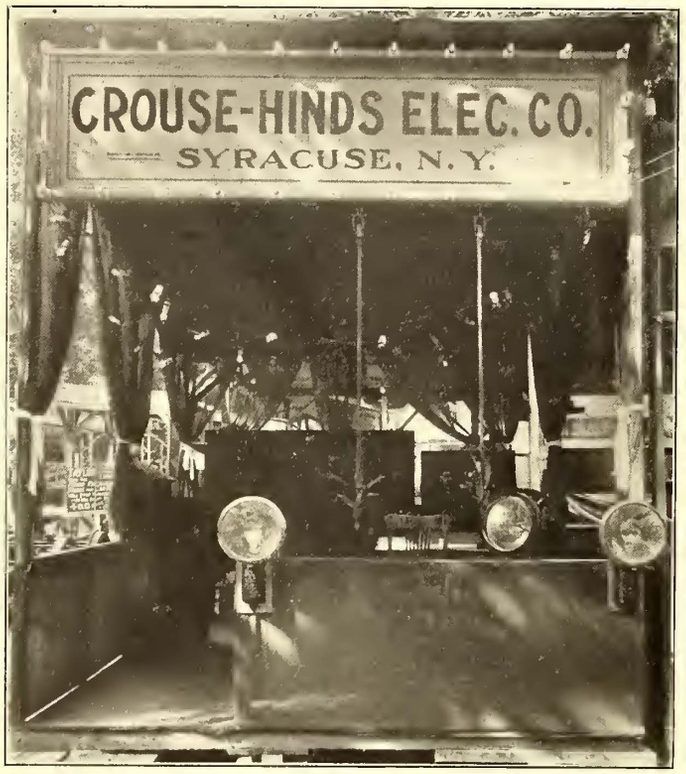


EXHIBIT OF THE CROUSE-HINDS ELECTRIC COMPANY

represented by Charles N. Wood, and by Robert Mathias and David Stimon. The "Ridlon Representative" was very much in evidence at the convention. This house organ is now an estab-

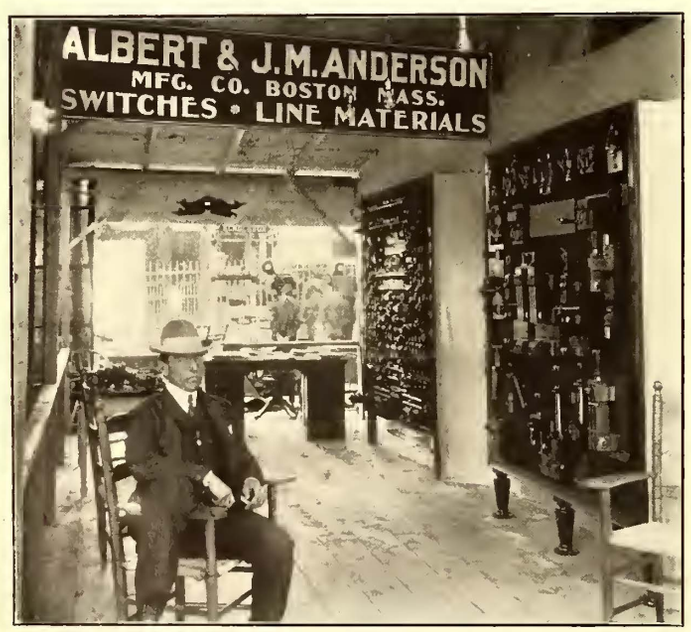


EXHIBIT OF THE ALBERT & J. M. ANDERSON MANUFACTURING COMPANY

lished and regular feature of the advertising department of the Frank Ridlon Company, and is a welcome guest to all street railway managers that it reaches. Newsy, epigrammatic, short and to the point is all the matter in it. It illustrates the progressive nature of the house it represents.

THE WEBER RAILWAY JOINT MANUFACTURING COMPANY, of New York, represented by Percy Holbrook, general manager; James C. Barr, general sales agent; Fred A. Poor, H. C. Holloway, Frederick P. Thompson, and James A. Greer, exhibited all types of its joints, including the one adopted as standard on the New York Subway.

THE CROUSE-HINDS ELECTRIC COMPANY, Syracuse, New York, exhibited the Crouse-Hinds arc headlight junction boxes, switchboards and switches, and Nesbitt specialties. Those present were A. F. Hills, Nathan Shute and H. B. Crouse, president. One of the best and most notable exhibits at the convention was the decoration of the pagoda of the Grand Union Hotel with miniature electric lamps, strung on Norbitt porcelain socket attachments. The lamps were surrounded by red decorative paper and strung in a very artistic way, making a brilliant and attractive effect. The Norbitt specialties are finding a ready sale for decora-

EXHIBIT OF THE ELECTRIC STORAGE BATTERY COMPANY

tive work in the hundreds of summer street railway parks now in operation all over the United States. They are also splendidly adapted for conduit construction work where temporary light is needed for working at night. The arc headlight manufactured by this company, and recently placed on the market, has also many excellent advantages over those now in use, and should be adopted by all street railway companies having interurban and suburban service.

THE SECURITY REGISTER COMPANY, St. Louis, Mo., regretted the absence, through serious illness, of its president, Giles

EXHIBIT OF ARCHBOLD-BRADY COMPANY AND LOCKE INSULATOR MANUFACTURING COMPANY

S. Allison, who, however, is expected to be out again shortly. The company was represented by H. C. Donecker, secretary, and D. J. Fitch, who report great interest in the self-recording registers. Six different types of registers were shown in the exhibit of this company, forming a most attractive and handsome display.

DICK HAM, Stockport, N. Y., was present at the convention in the interest of his trolley catcher attachment for retrieving the trolley pole when it jumps the wire.

THE R. D. NUTTALL COMPANY, of Pittsburg, was represented by President F. A. Estep.

THE T. H. SYMINGTON COMPANY, of Baltimore, Md., which has made a specialty of perfecting the steam railroad journal box in its various details, showed its boxes, both apart and assembled, and also two boxes with glass sides with a revolving journal inside them, to show the lubrication attained. The points of excellence of this box are, first, the placing of the metal where it is most needed to withstand the strains which most frequently break it in service; second, a dust proof lid, with a machined fit; third, a dust guard that protects the rear of the journal on all sides; fourth, arrangements to prevent the waste packing from becoming caked in the bottom of the box or from climbing up one side of the journal; fifth, a metal suited to the conditions. In other words, the company has simply applied good, conservative engineering to the regular journal box, with beneficial results. John F. Symington was present.

EXHIBIT OF THE CURTAIN SUPPLY COMPANY

THE MAYER & ENGLUND COMPANY, Philadelphia, had a tastefully arranged booth, containing all types of Protected rail-

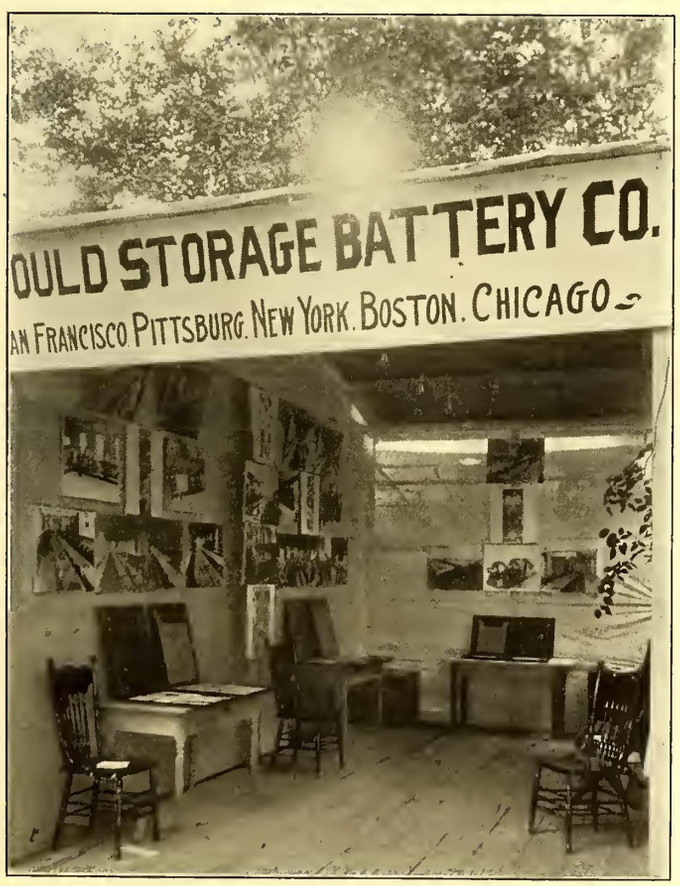


EXHIBIT OF THE GOULD STORAGE BATTERY COMPANY

bonds. The Gonzenbach third-rail insulator used on the Aurora, Elgin & Chicago Railway and the Gonzenbach cable terminal for connecting the ends of third rails with lead covered cables at

A SNAP SHOT ON THE PIAZZA OF THE GRAND UNION HOTEL

crossings and feeding in points was also shown. Charles J. Mayer, A. H. Englund, H. G. Lewis, William Armstrong, Jr., J. F. McCarthy, W. A. Cockley, J. M. Gallagher, Ed. Hammett and D. L. Crawford were in attendance.

THE AMERICAN AUTOMATIC SWITCH & SIGNAL COMPANY, of Chicago, is a new company, just starting in the manufacture of automatic block signals for electric roads. Its signal was on exhibition. It is not an untried device, as signals on the same principles have been in operation for several years in East St. Louis. Robert Skeen, the inventor, was formerly connected with the East St. Louis interurban lines. Besides Mr. Skeen, those connected with this company who were present at the Convention were M. B. Madden, of Chicago, who is president, and V. W. Bergenthal. Mr. Bergenthal was, until Sept. 1, assistant manager of the Stanley Electric Manufacturing Company's Chicago office. He will be in charge of the sales of the company.

THE GOLD CAR HEATING & LIGHTING COMPANY, of New York, had a full line of electric car heaters on exhibition, and a set of heaters arranged to show method of regulation. Those representing this company at the Convention were E. E. Gold, J. E. Ward, W. H. Stocks and Chief Engineer Frank Cahill.

THE GENERAL RAILWAY SUPPLY COMPANY, of Pittsburg, was represented by George W. Provost, manager, and John P. Provost, treasurer.

THE KEEFER CAR SWITCH COMPANY, of Albany, N. Y., exhibited its automatic track switch, operated mechanically from an attachment on the car. This switch was fully described in the STREET RAILWAY JOURNAL, Aug. 29, 1903. D. H. Keefer, J. W. Keefer and Frank Bloomingdale were on hand explaining the device.

H. K. DOOLITTLE, Watertown, N. Y., showed his patented improved windows, which can be removed without removing stops or screws. The sashes are grooved, and slide up and down on a metallic rod.

CHARLES F. LUTHER, of Pawtucket, R. I., exhibited the "Rubaner" automatic switch for street railways. This is a track switch, operated mechanically by a car attachment. He also distributed samples of the new adjustable passenger strap, described elsewhere in this issue.

THE H. W. JOHNS-MANVILLE COMPANY, of New York, had on exhibition the most recently developed devices per-

taining to the Sachs "Noark" enclosed fuse apparatus. There were several fuse boxes of large capacity, a service box, and also some new designs of fuses. A complete line of the latest overhead line material, cars, clips, trolley wheels, insulated and metallic crossings and section insulators was on display, as well as a complete line of electric car heaters. Several new designs of heat-

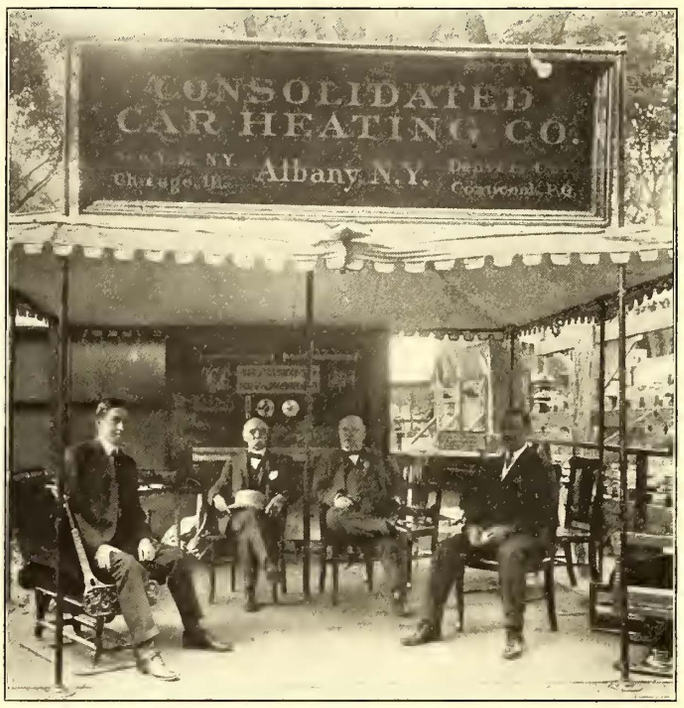


EXHIBIT OF THE CONSOLIDATED CAR HEATING COMPANY

ers have been recently brought out. Those representing the Johns-Manville Company were J. W. Perry, manager electrical department, New York; J. E. Meek, New York; H. M. Voorhis, Philadelphia, and James Humphreys, of Boston. The Johns-

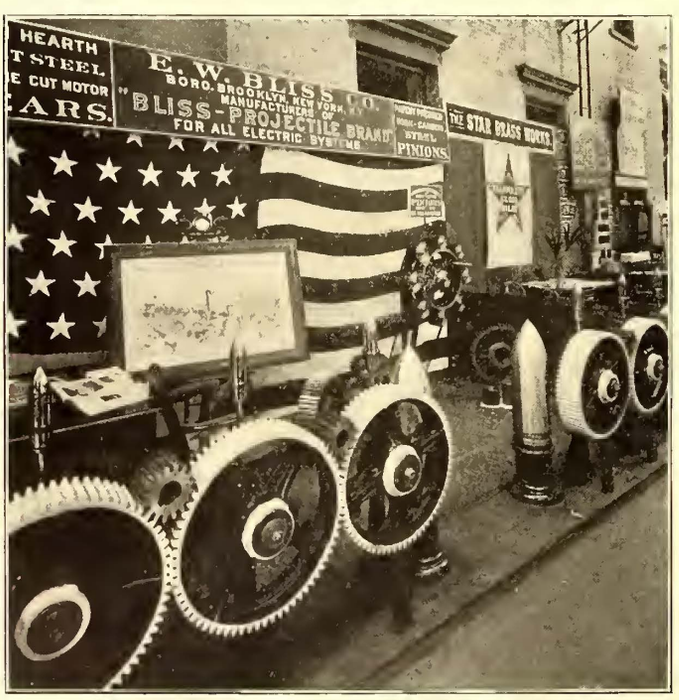


EXHIBIT OF E. W. BLISS COMPANY

Pratt Company, which manufactures the overhead line material and "Noark" fuses, of which the Johns-Manville Company is the sole selling agent, was represented by E. B. Hatch, president; Joseph Sachs, electrical engineer.

WILLIAM WHARTON, JR., & COMPANY, of Philadelphia, had, among other novelties, in their well-arranged exhibit, a 9-in. girder guard rail, made entirely of manganese steel. This was 20 ft. long, and curved to a sharp radius. Curves made entirely of these rails for places where the traffic is very heavy are new being used, where curves made of ordinary Bessemer steel rails wear out quickly. These manganese steel curves outlast the ordinary rails many times. A curved T-rail, also made of manganese steel, was shown. This was a sample of what this company has furnished for a number of places on the Boston Elevated Railway, where the curve wear has been most excessive. The remarkable wearing qualities of manganese steel were shown by a large photograph of a manganese steel frog, which was

EXHIBIT OF THE HALE & KILBURN MANUFACTURING COMPANY

placed in the Philadelphia terminal of the Pennsylvania Railroad. This frog was the first of its kind put down by the Pennsylvania Railroad. It was induced to try this because of the fact that in this particular location frogs made of ordinary rails did not last more than three months. This manganese steel frog has now been in the tracks over three years, outlasting twelve ordinary frogs, and being still in good condition. Since this first frog was sold to the Pennsylvania Railroad, William Wharton, Jr., &

EXHIBIT OF THE CLIMAX FENCE POST COMPANY AND THE CLIMAX STOCK GUARD COMPANY

Company have sold over 2000 to the same company. In the exhibit a sample of this style of frog as usually supplied to steam or elevated roads was shown. A photograph of a manganese steel frog in one solid cast, as furnished to some of the crossings on the Boston Elevated Railway, was shown. Solid cast-steel manganese steel frogs and mates for surface railways laid with T-rail were exhibited. These are furnished regularly to such roads on calls for first-class work. The company is also prepared to furnish regular girder rail, switchboards, mates and frogs, cast

solidly of manganese steel, where the increased expense would warrant it; but no samples of this were shown, as the regular manganese steel center work has given such satisfaction. This was illustrated by a wornout frog, on which the entire head of the rail part had been worn away, while the manganese steel center was still in serviceable condition. Of course, the regular girder rail manganese steel center special work was exhibited. Unbroken main line work has undergone considerable improvement within the last year. All the parts subjected to the strain of wagon traffic are made of cast steel instead of cast iron, as heretofore. The movable tongue has a detachable device to hold the pivot and take up its wear. Attached to the girder rail-tongue switch is a novel spring-throwing device for the tongue, called the Dunham spring throw. By it the tongue can be turned, by means of an ordinary switching iron, and in either position it will act as a spring tongue. The spring at the same time keeps the tongue in position, so that it can be thrown between wheels.

EXHIBIT OF THE LE VALLEY VITÆ CARBON BRUSH COMPANY

EXHIBIT OF THE AMERICAN BRAKE SHOE & FOUNDRY COMPANY

THE AMERICAN DIESEL ENGINE COMPANY, of New York, which manufactures the Diesel gas engine, giving such fuel economy, and which has introduced its engines extensively in isolated plants in the East, is now preparing to enter the electric railway field. Norman McCarty represented the company at the convention, and a prominent sign was also displayed, containing a list of representative plants now using Diesel engines.

ALBERT B. HERRICK, consulting engineer, of New York, was at the convention, as usual, this year, and was able to give some of the details of his new autographic test car upon which he has been working for some time, and which has now reached a high state of perfection. With this car Mr. Herrick can go over a road and obtain a continuous graphic record of the condition of the ground return. The resistance of every joint is recorded by Weston instruments, in connection with a static spark recording device. The moving record sheet is on a scale of 1 in. to 100 ft. of track. The resistance of both rails and every joint is given in this record. A rotary converter is used to give a current of 200 amps., which is passed through the rails immediately under the car as the car passes along, and so gives an appreciable drop across each bonded joint. On interurban work paint is squirted on the defective joints, which is accomplished automatically, as the car moves at a rate of about 10 miles per hour. He also has his test car fitted up with appliances to make all line equipment and elec-

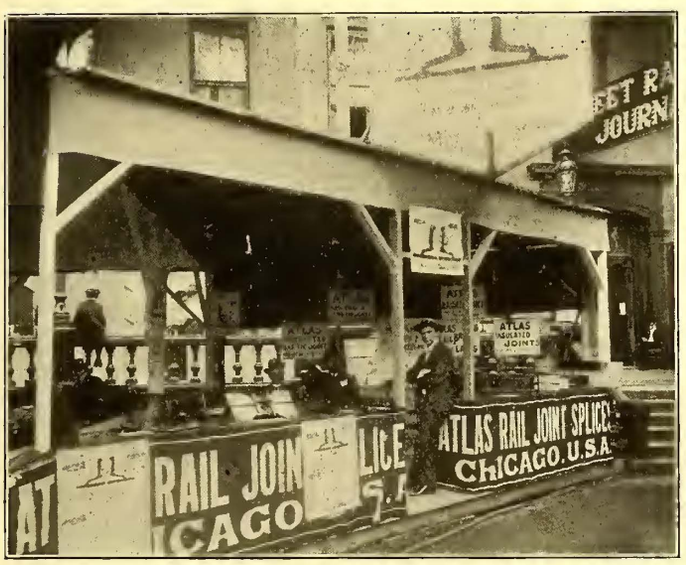


EXHIBIT OF THE ATLAS RAILWAY SUPPLY COMPANY

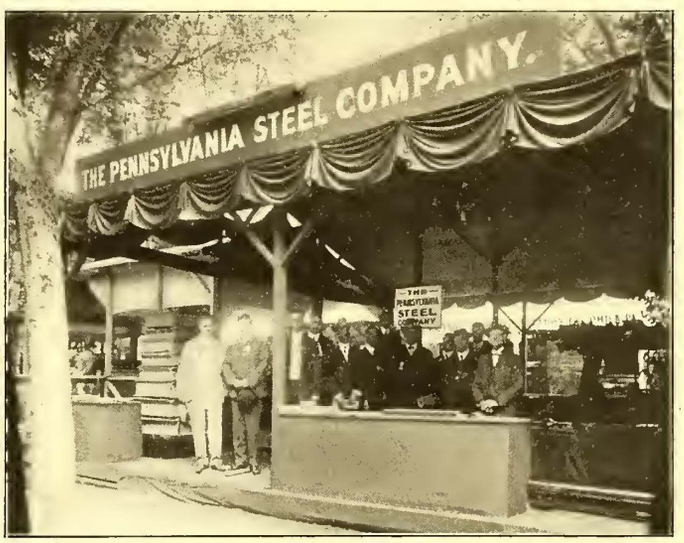


EXHIBIT OF THE PENNSYLVANIA STEEL COMPANY

The Nichols protected heel-tongue switch was another feature of the exhibit.

C. J. FIELD, of New York, made a small exhibit of his single and multiple-duct vitrified glazed clay conduits.

MERRITT & COMPANY, of Philadelphia, makers of the expanded metal lockers that are becoming so popular for use by street railway companies in shops and employees' rooms, made an exhibit of these lockers, in charge of George E. Morgan.

THE INDIANAPOLIS SWITCH & FROG COMPANY, of Springfield, Ohio, was represented by W. H. Thomas, the chief engineer.

THE MAGNETO ELECTRIC COMPANY, of Amsterdam, N. Y., exhibited a new form of graphite resistance box, which it is just putting on the market. This resistance is in the form of hollow graphite tubes, clamped between aluminum terminals. This company also makes variable-speed motors after the design of I. E. Story, assistant manager, who is so well known through his extended work in the way of the Storey variable-speed motors for machine tools. W. F. Dana and I. E. Storey were present.

trolysis tests, and apparatus for making station tests. Since Jan. 1 of this year he has gone over with his car and reported upon the systems of the following companies: Twin City Rapid Transit Company, the Milwaukee Electric Railway & Light Company, including the interurban lines; Toledo Railways & Light Company; Maumee Valley Railway & Light Company; Lake Shore Electric Railway Company; Lorain & Cleveland Railway Company; Sandusky, Norwalk & Southern Railway, and the New Haven roads operated by the Fair Haven & Westville Railroad Company. This includes over a thousand miles of track, forty-two power stations and 600 equipments. He has orders ahead of him for 1300 miles of track. With this car Mr. Herrick is, of course, able to make thorough tests much more cheaply than they could be done by the companies in any other way.

EXHIBIT OF THE AMERICAN CAR SEAT COMPANY

THE CHICAGO PNEUMATIC TOOL COMPANY had a large space, in which an air compressor supplied compressed air to various kinds of pneumatic tools useful in the shop or along the track. The tools shown included hydro-pneumatic punches and presses, using oil worked by compressed air for heavy punching and for pressing off pinions, compressed air jacks, drills, hammers, chisels and riveters. T. Alderson, of New York, together with W. P. Pressinger, Joe Parr and J. Caskey, made demonstrations of the work of the tools.

EXHIBIT OF HAROLD P. BROWN

THE STANDARD STEEL WORKS, of Philadelphia, had H. W. Sheldon as representative.

THE AMERICAN CAR SEAT COMPANY, of Brooklyn, exhibited various types of its push-over and stationary back cross seats, with rattan and plush upholstering. The stationary-back seat is creating interest among railroad officers now, as so many roads operate cars from one end only, that this type of seat is becoming more and more general. The push-over cross seats that were exhibited included several designs. One was a plush-covered seat, with high roll head rest and automatic movable foot rest with side arm. This style of seat is being adopted on high-speed interurban cars. Another type was the rattan upholstered seat, with corrugated back for ordinary street railway service. The principal aim in the construction of the reversible seat is to simplify the mechanical push-over action, and to have as few parts as possible. This seems to have been accomplished, as the action comprises simply a small tilting link or plate of malleable iron, on which the two levers connect, which are used to reverse the seat back. Consequently, the full mechanism consists of three metal parts, including a simple cam movement which locks the seat cushion forward and backward to give it slant. The maintenance cost of these few parts should be very small. This company makes its own canvas-lined rattan webbing for seat covering, which is carefully selected as to strength and color. It imports direct, sweeper rattan, which is furnished both in natural and cut lengths. President Joseph Salomon, who was in attendance, has just returned from a trip to Europe, where he has been looking after this company's export business, which has increased very much during the past year.

EXHIBIT OF THE DUFF MANUFACTURING COMPANY

EXHIBIT OF THE GOLD CAR HEATING & LIGHTING COMPANY

THE TAYLOR ELECTRIC TRUCK COMPANY, of Troy, N. Y., made one of the most extensive truck exhibits to be found on the grounds. The trucks shown were a swing bolster double truck, with 4½-ft. wheel base for outside-hung motors, an extra heavy swing bolster, swivel truck of M. C. B. type, on extra heavy 8-ft. wheel base single truck, a regular 7-ft. wheel base single truck, and an Empire State radial swivel truck. John Taylor, F. M. Nicholl and G. A. Tupper received the numerous delegates who visited this company's space.

THE U. S. CURTAIN COMPANY, of Newark, N. J., exhibited its curtains in the space of H. F. Sanville, of Philadelphia.

WILLIAM HALL & COMPANY, of Boston, manufacturers of brass car fixtures, were represented by J. F. Stout.

FRANCIS GRANGER, of New York, representing the Sterling Electrical Manufacturing Company, and other specialties which he handles, was very much in evidence at the convention. Mr. Granger's long experience in the street railway supply business and his many friends, make his attendance at the conventions a feature pleasant to all those acquainted with his genial and hospitable spirit.

THE WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, of Pittsburg, very sensibly confined its exhibit this year to the two things of most interest to electric railway men, namely, the new turret train control and the single-phase alternating-current railway motor. The turret controller, with two motors connected therewith, was here shown for the first time, and was described in a preliminary way in the issue of last week. The single-phase railway motor, it was stated, had been in service several months without sandpapering or turning down the commutator, as it was excellent. If this is a sample of what may be expected in service with this new motor there would seem to be nothing to fear from this heretofore most dreaded trouble with motors of this class. This motor was one built for the Washington, Baltimore & Annapolis Railway. A small army of Westinghouse representatives were present. Those connected with the Westinghouse Electric & Manufacturing Company were: L. M. Aspinwall, N. S. Braden, Paul T. Brady, J. L. Crouse, E. Dryer, H. P. Davis, D. E. Drake, A. F. Elers, T. C. Frenyear, J. R. Gordon, T. P. Gaylord, E. W. T. Gray, E. M. Herr, Arthur Hartwell, J. B. Ingersoll, W. W. Lovell, D. E. Manson, M. M. Murrill, E. D. Mills, W. M. McFarland, C. F. Nudbury, F. B. H. Paine, W. M. Probasco, George W. Pulver, W. S. Rugg, C. W. Register, S. B. Storer, N. W. Storer and Calvert Townley.

WILMARTH & MORMAN COMPANY, of Grand Rapids, Mich., manufacturers of the "New Yankee" twist drill grinder, had a model of one of these grinders on exhibition for the benefit of those master mechanics who have shops large enough to warrant the purchase of a twist drill grinder. Charles E. Meech, secretary of the company, was in charge of the exhibit.

THE PARMENTER FENDER & WHEEL GUARD COMPANY, Boston. George A. Parmenter was on hand at the convention to meet his many customers and friends, and incidentally talk the Parmenter fenders and wheel guards. Mr. Parmenter distributed a neat and handsome pocketbook as a souvenir of the convention.

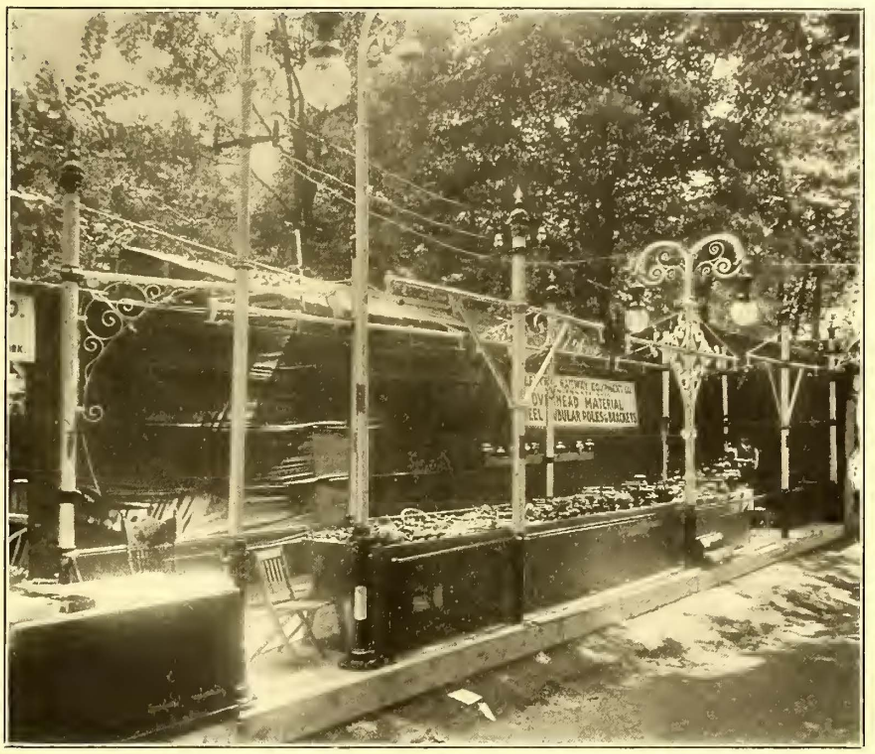


EXHIBIT OF THE ELECTRIC RAILWAY EQUIPMENT COMPANY AND THE ELMER P. MORRIS COMPANY

THE INGERSOLL CONSTRUCTION COMPANY, of Pittsburg, had undoubtedly the exhibit which attracted the most popular attention of any on the grounds. In fact it was the only one intended to attract the general public outside of street railway men, and the way this laughing gallery drew the people was the best recommendation it could have had in the eyes of delegates. The laughing gallery which this company set up had some of the funniest distortion mirrors that human eye ever gazed into. The laughing gallery is only one of the park attractions which this company makes. The figure 8 coaster, a model of which was on exhibition, is one of its most profitable products. The company keeps its amusements of all kinds fresh and up to date, so that the public has something new to look for from month to

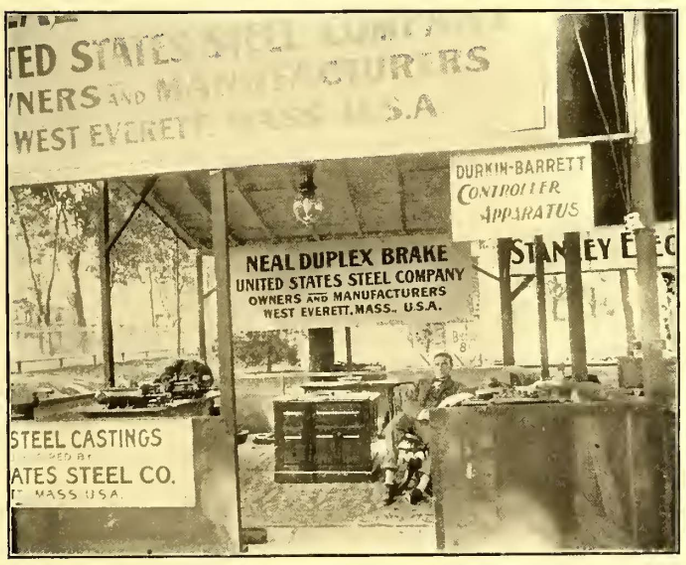


EXHIBIT OF THE UNITED STATES STEEL COMPANY

EXHIBIT OF THE DEARBORN DRUG & CHEMICAL WORKS

month. Its attractions are found in parks all over the country, and it is almost as President Ingersoll says: "Time was when street railways made parks; now parks make street railways." The confidence that the Ingersoll Construction Company has in its amusement business is shown by the fact that it both builds and operates coasters, laughing galleries, etc., and is not simply a selling company. The way this exhibit accomplished the desired end of getting favorable attention from street railway presidents and managers is a matter on which the company is to be congratulated. Fred Ingersoll, president; E. E. Gregg, secretary; L. W. Hyde and J. T. Williams were present.

CHARLES F. JOHNSON, of Buffalo, was present in the interest of his large second-hand business.

J. M. JONES' SONS, Troy, N. Y.—This company was represented by J. H. Jones. Being one of the oldest car builders in the country, Mr. Jones naturally met many customers and friends of long standing.

THE MAGNET WIRE COMPANY, of New York, was represented by G. F. Valentine, who was also at the convention in the interest of the New York & Stamford Railway, in which he is largely interested.

THE BRADY BRASS COMPANY, of New York, exhibited a complete line of motor and journal bearings, babbitt metals, solder and trolley wheels. The company was represented by Daniel N. Brady, president; C. P. King and George C. Morse.

THE ROBINS CONVEYING BELT COMPANY, of New York, had in operation on the grounds a complete model outfit of the Robins conveyors, as they would be in a large power house, including Richardson automatic scales. This model used rice instead of coal, which was made feasible by the fact that bridal parties were not common at Saratoga this time of year. Some photographs of recent installations of Robins conveyors were shown by A. B. Proal, Jr., and John Fuller.

N. A. CHRISTENSEN, of Milwaukee, manufacturer of air compressors, was represented by J. E. Eldred, formerly one of the Christensen air-brake salesmen.

THE FALK COMPANY, of Milwaukee, made no exhibit this year, but Otto Falk was in attendance.

THE PENNSYLVANIA STEEL COMPANY showed several pieces of special work with hardened steel centers having cast joints. A frog, with hardened center, for steam railroad and interurban work, was an interesting feature. One decided novelty was the crossing with hardwood centers, which is the invention of C. A. Moreno, chief engineer of the St. Louis Transit Company. This crossing is to be tried at St. Louis, as mentioned in a previous issue of the Street Railway Journal. The "new century" adjustable switch stand, by which the switch point can be adjusted without the use of adjusting nuts by simply adding shims, is also arranged so that the motion of the handle and target to danger does not affect the switch point until the target has moved sufficiently to show red to an approaching car. The company was amply represented by George W. Parsons, superintendent of frog and switch department; Mason D. Pratt, C. W. Reinoehl, Charles A. Alden, R. E. Belknap, C. E. Irwin, Charles S. Clark, Joseph A. Fitzpatrick and W. C. Cuntz.

THE NATIONAL ELECTRIC COMPANY, successor to the Christensen Engineering Company, was represented by a large corps of salesmen and engineers. It showed an air brake equipment on the exhibit grounds, and entertained in a nearby suite of rooms in the Grand Union. F. C. Randall, general manager of sales, headed the list of this company's entertaining force, assisted by the following salesmen and engineers: J. H. Denton, J. T. Cunningham, J. F. Dixon, Jr., and J. D. Maguire, of New York; W. W. Power and W. H. Goble, of Philadelphia; H. N. Ransom and C. N. Leet, of Cleveland; J. J. Nef, of Chicago; S. I. Wales, of Cincinnati, and J. S. Hamlin, of St. Louis territory; C. G. Burton, of Chicago; W. L. Waters, W. J. Richards and C. D. Knight represented the electrical end of the business.

THE DUFF MANUFACTURING COMPANY, of Allegheny, Pa., as usual, had a fairly representative line of Barrett jacks. Perhaps the most notable was the small, strong emergency jack, with which all the cars of the Pittsburg railways are equipped. A motor armature lift, mounted on wheels, for pit work, was the most prominent feature of the exhibit. A "traversing base," upon which any car jack could be mounted, was shown. By putting this under a jack considerable movement can be had in a horizontal direction. T. A. McGinley and G. A. Edgin formed this company's representation.

THE BEMIS CAR TRUCK COMPANY, of New York, had an extensive truck exhibit, consisting of a No. 51-M. C. B. extra heavy truck; No. 47 heavy interurban truck, No. 45 city and interurban truck and the standard single truck. Those present in this company's interests were D. Gallagher, president; W. S. De Hart, secretary and treasurer; S. A. Bemis, Charles Mead, Thomas F. Carey and George M. Hoadley.

THE G. P. MAGANN AIR BRAKE COMPANY, of Detroit, entertained visitors at its space. Manager E. C. Rutherford, W. K. Omick, superintendent, and J. C. Grace, vice-president, were in attendance.

THE AMERICAN RAILWAY SUPPLY COMPANY, of New York. Mr. Walter Chur was present entertaining the many friends of this company.

E. W. BLISS & COMPANY, Brooklyn, represented by Charles E. Porter and B. W. Stone, exhibited its Projectile-Bliss brand of high carbon steel gears and pinions.

THE STANDARD VITRIFIED CONDUIT COMPANY exhibited single and multiple-duct vitrified clay conduit and third-rail insulators, in charge of W. H. Barnard. B. S. Barnard, president of the company, was also in attendance.

THE PANTASOTE COMPANY, of New York, had an exhibit in the shape of a drawing-room car, equipped with Pantasote curtains, and two revolving seats and two cross seats, upholstered with Pantasote leather. The ceiling of the car was also made of embossed Pantasote, presenting a very handsome appearance.

THE E. P. MORRIS COMPANY made an exhibit of the goods for which it is agent. Mr. Morris himself was, of course, in attendance.

THE RECORDING FARE REGISTER COMPANY, of New Haven, exhibited its new recording fare register, which records on a strip of paper the number of fares collected on each trip. These trip sheets can be made in duplicate or triplicate if carbon copies are desired, and might be substituted for the usual reports entered on a conductor's trip sheet. The company also manufactures trolley wheels, conductors' punches, trolley catchers and cord. M. de Forest Yates, J. M. Hayes, Charles N. Yates and F. B. Kennedy were this company's delegation.

THE IMPERIAL MACHINE COMPANY, of Pittsburg, had a representative in the person of S. B. Whinery.

THE ALBERT & J. M. ANDERSON MANUFACTURING COMPANY, of Boston, exhibited its overhead material, and as a matter of historical interest, to show the progress that has been made since the early days of the electric railway, had some of the earliest overhead appliances used. Besides overhead appliances, several types of third-rail insulators, including one of reconstructed granite, were shown. E. Woltmann, J. R. Eckman and H. F. Sanville represented this company.

L. C. CHASE & COMPANY, of Boston, had a curtain novelty this year in the way of a curtain fixture which releases by pushing instead of pinching. Thus a person taking hold of the bottom of the shade in the most natural way would release the curtain so that it could be shoved up and down. This curtain fixture is very neat, and does not project far from the bottom rod of the curtain. The exhibit included also Chase leather for car seats and curtains. Frank P. Hopewell and William Walden had charge of the exhibit.

C. H. WHALL, of Boston, exhibited his metallic window-casing, which is dust and rattle proof, and reduces the tendency of window sashes to stick.

THE VOSE SPRING COMPANY, of New York, had General Manager Gus Suckow in attendance.

THE STANDARD PAINT COMPANY, of New York, which makes the P. & B. products, which are almost too well known to need comment, made an exhibit of its insulating paints, tape and varnish. P. & B. paint and tape are in use the world over, in all climates, and have a reputation for durability, elasticity and good insulating qualities. One secret of the success of this paint is that it retains its flexibility and does not dry out to the extent that many insulating paints do. One suggestion for master mechanics that this company is making is to insulate motor leads and car wires by wrapping with "Rubberoid" motor cloth and then wind with P. & B. insulating tape. F. F. Van de Water, Charles Ernshaw and N. D. King represented this company.

H. F. SANVILLE, of Philadelphia, dealer in street railway supplies and the agent of a number of prominent manufacturers, made an exhibit.

THE D. & W. FUSE COMPANY, of Providence, R. I., had Secretary W. S. Sisson on hand to meet the trade and agents of this company from various parts of the country.

THE AMERICAN BRAKE-SHOE & FOUNDRY COMPANY, of New York, exhibited its many types of brake-shoes, but gave special prominence to the cast-iron marginal protecting

strip for paving next to the rails in asphalt streets, and thereby cutting down the cost of paving maintenance. This marginal protecting strip has been laid in several cities with gratifying results. The brake-shoes exhibited were the Diamond S, Corning, Lappin, Streeter, and the steel back U shoe.

THE TRACTION EQUIPMENT COMPANY, of Brooklyn, has a new form of car resistance which it exhibited, in charge of George Best and C. V. Rapelje.

THE WESTINGHOUSE TRACTION BRAKE COMPANY exhibited an equipment on the porch of the Grand Union. A large number of its representatives were in attendance, including J. Brooks Clarke, A. J. Brislin, George E. Baker, J. B. Clark, E. H. Dewson, J. R. Ellicott, C. R. Ellicott, F. V. Green, E. M. Herr, G. A. Hagar, P. J. Miller, J. F. Miller, George H. Martin, William D. Ray and H. H. Westinghouse.

THE STANDARD AUTOMATIC LUBRICATOR COMPANY, of Philadelphia, makers of a lubricator which was very favorably spoken of in the discussions at the Mechanical Association conventions, showed its lubricators for motors and car journals. These lubricators feed oil to the bearing by virtue of the vibration of the car and stop feeding when the car stops. They can be applied so as to give oil lubrication on motors built originally for grease, as many companies now use oil instead of grease. G. B. Kirkbride, president, and J. P. Dirkin were in attendance.

THE BRYAN MARSH COMPANY, of New York, had J. P. Williams, special representative, and Guy V. Williams, of Minneapolis, looking after its interests.

THE STANDARD UNDERGROUND CABLE COMPANY made its usual parlor display of cable samples, and was well represented by C. J. Marsh, manager New York office, and Mr. Kimball, of that office; T. E. Hughes, Philadelphia manager; J. E. Pietzeker, of the Chicago office; F. C. Cosby, Boston manager, and T. J. McBride.

THE KEYSTONE CAR WHEEL COMPANY, of Pittsburg, was represented by John Howard Yardley, sales agent of the Philadelphia office.

BALDWIN & ROWLAND SWITCH COMPANY, of South Norwalk, Conn., exhibited their track switches.

W. T. WATSON, of Newark, N. J., had a very attractive exhibit, showing his 1903 type of fender and automatic wheel guard. Both of these devices attracted much favorable comment. As is now generally known, the Watson fender is furnished with two automatic releases and a foot-drop. An important feature of the Watson automatic wheel guard is that it is free from the spring movement or oscillating motion of the car, as it is fitted directly to the truck, being bolted to the pilot-board with four ½-in. bolts, and can be run closer to the rails or street surface than is possible when a gate type of drop or trip is used.

J. G. BRILL COMPANY exhibited several models of its latest trucks. The company was represented by W. H. Heulings, Jr., S. M. Curwen, George M. Haskell, George H. Tontrup, C. K. Pickles and J. E. Brill.

CROCKER-WHEELER COMPANY, Ampere, N. J., was represented by Charles W. Startsman, sales department, Ampere, N. J.; F. B. De Gress, manager New York office; S. Russell, manager Philadelphia office; R. N. C. Barnes, manager Boston office. The company distributed a special bulletin on street railway generators and gave away handsome souvenir match safes.

THE RAILWAY STEEL SPRING COMPANY, of New York, exhibited all classes of its springs. In the center of the booth was displayed a nickel-plated, full-size elliptical spring, which attracted a great deal of attention. There were also displayed nickel-plated spiral springs in small sizes and heavy spiral springs for truck construction. A. S. Henry, F. C. McLewee and D. S. Roche represented the company.

THE HAM SAND-BOX COMPANY, of Troy, N. Y., was represented by the Stuart-Howland Company, of Boston, the Sterling-Meaker Company, of Newark, N. J., and the Recording Fare Register Company. Its exhibits consisted of trolley-catchers, trolley retrievers and an adjustable trolley harp to prevent wear of trolley wheels and overhead wires on curves. This harp attracted much attention.

W. A. WOOD & COMPANY, of Boston, manufacturers of oil specialties, were represented by George W. Brown. This company is preparing to place on the market a new journal box, which will soon be heard from.

THE REVOLVING RAILWAY SANDER COMPANY, of Toronto, exhibited a sand box possessing novel and interesting features. The company was represented by B. B. Jenkins and G. Stevenson, who explained the merits of the device to many electric railway managers and master mechanics. The sander has been given a thorough trial in Toronto and other cities, and the success of the company seems assured.

THE FOREST CITY ELECTRIC COMPANY, of Manchester, England, was represented by W. A. Neff, whose many American friends were glad to welcome him. Mr. Neff is spending a few weeks in the United States and Canada, and reports the continued success of the Protected rail-bonds in Europe.

THE POWELL & TURNER TRUCK COMPANY, of Troy, N. Y., was present in the person of A. Fairweather, secretary. In addition to the Powell electric car truck, the company is putting on the market an emergency brake, and also a roller bearing possessing interesting features.

THE AMERICAN WOOD FIRE-PROOFING COMPANY, of New York, was a newcomer at the convention, being represented by Samuel A. Clark, treasurer. The obvious need of better protection against fire in the construction of car bodies should make an excellent market for the fire-proof wood which this company is now prepared to furnish.

PRATT & LAMBERT, the well-known varnish house, was represented by Joseph Maycock, of the Railroad Department. Through the excellent quality of its varnishes, and the enterprise of its officers in New York, Buffalo, Chicago, London, Paris and Hamburg, the name of Pratt & Lambert has attained an enviable international reputation.

THE UNI SIGNAL COMPANY, of Cambridge, Mass., exhibited its signal system. It had in actual operation a complete block, illustrating the workings in every detail. There are improvements in certain respects on this system over those of a like nature on the market, which ought to appeal to the progressive railway manager. The company was represented by C. F. Hopewell, general manager, and Professor Charles H. Morse, consulting engineer.

THE BARBOUR & STOCKWELL COMPANY, Boston, Mass., was represented at the convention by F. F. Stockwell. Mr. Stockwell entertained his many customers and friends with liberal hospitality. A neat souvenir in the shape of a measuring tape was distributed by Mr. Stockwell.

THE NATIONAL LOCK WASHER COMPANY, of Newark, N. J., exhibited its lock washers and the curtain fixtures manufactured by it.

THE WESTERN ELECTRIC COMPANY was represented by R. M. Campbell, of New York, and R. H. Harper, of Philadelphia, in the interest of Electrose overhead material. The Western Electric Company is exclusive selling agent of this well-known line of overhead material. It also handles in the East Stornbaugh guy anchors, manufactured by W. N. Matthews & Bro., St. Louis, Mo.

THE STANLEY ELECTRICAL MANUFACTURING COMPANY, of Pittsfield, Mass., showed a large interurban truck equipped with two S. K. C. 402 motors. One S. K. C. 401 motor was also exhibited, showing the careful and thorough construction in every detail employed by the Stanley Company. One improvement of great value is the thorough ventilation of the motor. Under the severest ordinary service this motor cannot get overheated. This fact has been thoroughly established by suburban roads in Pittsfield and vicinity which have used the Stanley motor for the past two years. The company also had on exhibition two S. K. C. 2 controllers, which are described in detail elsewhere in this issue, trolley stands, switchboards and car circuit breakers. S. T. Dodd, M. C. Canfield, H. R. Wilson, R. H. Hamlin and George C. Robb were present at the convention.

JOHN STEPHENSON COMPANY, of Elizabeth, N. J., was represented at the convention by E. J. Lawless, David Moffett, Thomas F. Carey and J. A. Hanna. The company made no exhibit.

THE WM. HALL COMPANY, of Boston, Mass., was represented at the convention by J. F. Stout.

NORMAN McCARTY attended the convention in the interest of the American Diesel Engine Company. This company is now prepared to bid for contracts in the street railway field for engines up to 500-hp. Considering the enormous economy and small cost of operating the Diesel engine, it ought to appeal to every railway manager who has the interest of his stockholders at heart.

THE force of habit brought to the convention John S. Bradley, F. C. Boyd and Willis Anthony, of the old New Haven Car Register Company, which recently sold out its business to the International Register Company, of Chicago, Ill.

THE ELECTRIC MOTOR & EQUIPMENT COMPANY, of Newark, N. J., furnished several electric signs, including the large STREET RAILWAY JOURNAL sign which was placed over the door leading into the convention hall, and adjoining the STREET RAILWAY JOURNAL booth. The Electric Motor & Equipment Company is to be congratulated on the artistic character of its work at the convention.

M. A. SINGER, of New York city, was the designer and builder of many of the booths in the court, and on the veranda of the Grand Union Hotel. Mr. Singer's long experience in work of this kind enabled him to handle this work in a manner which gave general satisfaction.

THE SAFETY CAR STRAP COMPANY, of New York, had on exhibition its recently patented Y-shaped safety strap. Judging from the interest displayed by the delegates at the convention this strap ought to find a ready sale on all progressive roads. The company was represented by Mr. Myers.

S. B. CONDIT, JR., & COMPANY, Boston, Mass, were represented by S. B. Condit, Jr., in the interest of his switches and oil circuit breakers and general heavy current switchboard work. Mr. Condit distributed a very handsome souvenir in the shape of a neat pocket knife.

THE LUMEN BEARING COMPANY, of Buffalo, N. Y., exhibited its motor, truck and journal bearings, ideal trolley wheels, and alpha bronze check plates. Considerable interest was manifest among the delegates in examining the goods displayed by this company, especially its special composition motor bearings, as well as the neatness and general appearance of the devices on exhibition. The company was represented by E. P. Sharp, manager of sales.

THE ELECTRIC CABLE JOINT & APPLIANCE COMPANY, New York, distributed neat folders describing its electric cable joint. The company was represented by W. M. Murphy.

EUGENE MUNSELL & COMPANY AND THE MICA INSULATOR COMPANY, of New York and Chicago, were represented by Charles E. Coleman, the energetic and enterprising manager of the Chicago house. The exhibit, which consisted of micanite rings, segments and empire cloth, and their other lines of installation was located at the left of the main cross aisle in the booth with the National Carbon Company. Samples of their material was freely distributed among the visiting delegates, and at all the writing desks of the hotels very attractive blotters were very much in evidence.

THE UNITED STATES ELECTRIC SIGNAL COMPANY, of West Newton, Mass., exhibited its signal system, which has been in use for several years. A complete block of the system was shown illustrating the workings of the system in detail. It is interesting to note that a great many street railway systems are equipped with this system, and that it has so far done most of the block-signal business in the street railway field. J. H. Nickerson, H. G. Root and J. J. Ruddick represented the company at the convention.

THE CLEVELAND FROG & CROSSING COMPANY, of Cleveland, Ohio, was in evidence through G. C. Lucas, general manager.

THE AMERICAN ELECTRICAL WORKS, of Providence, R. I., was represented by W. J. Watson, the New York sales agent of the company. The general hospitality of Mr. Watson was much enjoyed by his many friends.

THE GOULD STORAGE BATTERY COMPANY, New York, had on exhibition plates of the Gould storage battery. The booth was attractively decorated with large, clear photographs of some of the many large installations for street railways which it has recently made in various parts of the United States. Some of the largest and most important street railway installations in this country have recently been furnished by the Gould Storage Battery Company. The photographs displayed by this company were carefully examined by railway men at the convention, and judging from expressions made by some of them who are not users of storage batteries, they evidently gave them food for thought. The company was represented at the convention by W. W. Donaldson, sales manager, and E. L. Draffen.

THE AMERICAN AUTOMATIC SWITCH COMPANY, of New York, exhibited an automatic switch.

THOMAS F. CAREY, of Boston, Mass., was present at the convention in the interest of his varied business. Mr. Carey represents the John Stephenson Company, Bemis Car Truck Company, and the snow plow department of the Wason Manufacturing Company, in Boston and the East. Mr. Carey also deals in all classes of heavy second-hand equipments for street railways.

GILES S. ALLISON, 57 Broadway, N. Y., unfortunately, was not able to be present at the convention, owing to serious illness. He was, however, well represented by H. C. Donecker, of St. Louis, and D. J. Fitch, of New York. A street railway convention without the presence of Colonel Allison is an unusual occurrence, and the absence of the "genial Colonel" was widely commented upon.

THE GEORGE W. KNOWLTON RUBBER COMPANY, of Boston, had an interesting display of its rubber specialties. The company was ably represented by D. B. Wakelee.

BULLOCK ELECTRIC MANUFACTURING COMPANY, of Cincinnati, had the largest single electrical exhibit at the convention, this being one of five rotaries for the Scioto Valley Railway Company's power plant at Columbus, Ohio. It is a handsome machine, receiving three-phase current and delivering 400-kw direct current at 600 volts. It is six-pole, about 9 ft. high, and slightly over 10 ft. square at base. The order for these includes three 1000-kw, three-phase generators, as well as step-up and step-down transformers. The exhibit was in charge of R. T. Lozier, general sales agent; G. B. Foster, W. S. Arnold, A. E. Foote and C. Van Deventer.

ROSSITER, MACGOVERN & COMPANY had a large space on the lawn fitted up with a booth and replete with electrical apparatus, and occupied also one of the cottages in the annex, where a hospitable welcome was extended to all comers. A number of motors were shown, open for inspection, as well as armature and field coils, and commutators, including one of 750 kw, just finished for the Brooklyn Rapid Transit Company. The exhibit was directed by Frank MacGovern, vice-president and general manager, whose staff comprised Messrs. R. J. Randolph, J. A. Peirce, C. J. Macdonald, J. W. Archer and several other efficient men. A neat pamphlet of Rossiter-MacGovern plants was distributed and was in great demand.

THE COLUMBIA MACHINE WORKS & MALLEABLE IRON COMPANY, of Brooklyn, was represented at the convention by its president, J. G. Buehler. Mr. Buehler, with his original and genial ways, is always a welcome guest among his hosts of friends from all parts of the country. W. R. Kerschner, second vice-president, from Allentown, Pa., was also present at the convention.

THE PECKHAM MANUFACTURING COMPANY, of Kingston and New York, had one of the largest and most tasteful booths at the Saratoga Convention. As its exhibit was located on the main walk from the hotel to the convention hall, and as the apparatus shown was of great interest, the exhibit attracted wide attention. Mr. Peckham this year devoted his exhibit principally to his new line of M. C. B. trucks, of which three types were shown. The first of these was the No. 36B, which is intended for high-speed service with medium weight of cars. The second type of M. C. B. trucks in the Peckham exhibit was the No. 40, called by Mr. Peckham his "standard" high-speed truck, while the third type was the No. 46, or "extra strong." All three of these trucks are equipped with the patent combination side frames, double roller side bearings, flexible motor suspension, Taylor's patent non-chattering brake hangers, and other features which made these trucks popular in interurban railway work. Mr. Peckham also showed his No. 14 B 3 X short-wheel base truck, which has been adopted on a large number of city and suburban roads, and which is well known to railway managers and delegates to the conventions. The Peckham Company had a large number of representatives present, who were kept busy explaining the special merits of the different trucks to those in attendance. They included Mr. Peckham, president of the company; E. G. Long, G. H. Bowers and Wm. M. Wampler, of the New York office; Messrs. Hanna and Richards, of the Cleveland office; Arthur W. Field, of the Boston office, and Messrs. Wilkinson and Riley, from the works at Kingston. The company also had at the convention its new catalogue, which describes the full line of Peckham trucks, and which was one of the most complete as well as tasteful catalogues at the convention. All of the typographical work issued by this company is of a superior grade, and the catalogue this year forms no exception to the rule.

E. P. ROBERTS & COMPANY, of Cleveland, Ohio, were represented by William C. Andrews, of New York, their Eastern representative. This well-known firm of consulting engineers has recently completed work on the Northern Texas Traction Company now operating between Fort Worth and Dallas, and is now building the Dayton & Muncie and Muncie, Hartford & Fort Wayne roads, and is acting as engineers for a number of other properties. Mr. Andrews states that the company has a number of prospective enterprises in its office for which it will do the entire electrical, mechanical and civil engineering.

THE ELLIOTT BROTHERS ELECTRIC COMPANY, of Cleveland, made an attractive exhibit, and was represented by W H. Elliott, manager, who explained his company's facilities for handling dynamo and motor repairs, including armature and field rewinding, commutator building, etc.

MR. E. F. DE WITT was on deck as usual, making new converts to the De Witt sand box.

MESSRS. GEORGE S. HASTINGS & COMPANY, of Cleveland, who are doing such an enviable business in electric railway supplies, were represented by Mr. Hastings himself.

THE many friends of W. R. Kerschner, of Allentown, were glad to welcome him on his return from a sojourn in Europe. They were also glad to learn that Mr. Kerschner's trip abroad has resulted in a considerable improvement in his health.

THE ELECTRIC RAILWAY EQUIPMENT COMPANY, of Philadelphia, was represented by A. S. Vane, president; M. Herman Brill, vice-president, and W. H. Heulings, Jr., secretary and treasurer.

MESSRS. WENDELL & MacDUFFIE were present in the persons of Jacob Wendell, R. L. MacDuffie and C. A. Hayden.

THE UNITED STATES STEEL COMPANY, of Everett, Mass., exhibited the Neal duplex brake and Jupiter steel castings. The advantages of the brake and castings were explained by William E. Reid, mechanical engineer, and L. H. Miller, of the steel department.

THE ST. LOUIS CAR WHEEL COMPANY was ably represented by J. L. Butterfield, general sales agent, and John Jay Morse, treasurer.

WARREN M. POORMAN, of Boston, through whose efforts the varnishes manufactured by McCaskill, Dougall & Company, of Montreal, are being so extensively introduced on street railway systems in the United States, was present in person, and distributed cards setting forth the merits of his goods.

MESSRS. J. G. WHITE & COMPANY, of New York and London, were represented by J. G. White himself.

THE CHICAGO CAR WHEEL & FOUNDRY COMPANY was represented by A. A. Hilton, vice-president and manager.

THE GENERAL ELECTRIC COMPANY, of Schenectady, made no regular exhibit, as its works at Schenectady were so near, and were made particularly available through the special excursion to the works which the company tendered to the Associations on Thursday afternoon. The company had, however, headquarters on the grounds in a spacious booth, which was attractively decorated by palms and other plants, and illuminated at night.

T. G. SEIXAS, of the Philadelphia Electric Company, Philadelphia, Pa., was a guest at the convention of the American Street Railway Association. Mr. Seixas greatly enjoyed a visit to the works of the General Electric Company, at which place he had the pleasure of seeing many of his old friends and associates, he having been with the original Edison Machine Works at Schenectady in the early days.

H. A. NEALLY, of the paint department of the Joseph Dixon Crucible Company, looked after the interests of his company at the Saratoga Convention. Mr. Nealley was sought after by a great many people, who desired to secure one of the very unique pencils given away by him as a souvenir. The pencil contained lead at one end, and rubber at the other, which was a perfect imitation of a pencil, and fooled every one who tried it. Mr. Nealley also distributed among the railway men a circular descriptive of the colored paints made by his company. It is needless to say that if Mr. Nealley attends future street railway conventions, and gives away souvenirs that will be appreciated as much as the above-mentioned pencil, he will always be a center of attraction.

THE STANLEY NO. 2 CONTROLLER

The Stanley No. 2 controller, which was shown for the first time at the Saratoga Convention, differs radically from the other controllers on the market both in details of construction and in the combinations which it effects with the motors.

The interlocking arrangement between the main cylinder and the reverser cylinder does not depend upon the usual cam movement. Instead each cylinder carries a flanged disc with slots cut in its flanges. These flanges intermesh so that the main cylinder can be revolved only when the reversing cylinder is in the proper position, and vice versa. The arrangement of the magnetic blow-out is also novel. The magnet for the blow-out is provided with long pole pieces which are within the stationary horizontal partitions separating the controller contacts. These pole pieces produce a perpendicular magnetic field at each contact piece, with the result that the arc is always blown out horizontally. The separating partitions are removable and, in fact, are supported on the pole pieces of the magnetic blow-outs and are also held by spring clips.

An ingenious attachment to the controller prevents the necessity of opening the casing in order to cut out one motor. The motors are cut out by means of a switch connected with a short horizontal shaft projecting through the side of the controller casing. This shaft is turned by the reverser handle, which has to be removed for this purpose. As it can be taken off the reverser cylinder only when the latter is in the right position and the main controller is off, there is no danger of throwing either motor cut-out switch with the current on.

The connections of the motors effected by the controller are not the same as those of the ordinary series parallel controller, and instead of two, as in the latter, the new controller has five running points. This is secured by running a lead to the middle of each motor field and thus securing combinations between half fields on each motor. The actual combinations used are as follows: In the first position, the current is led first through a resistance, then through armature No. 1, field No. 1, field No. 2 and armature No. 2 to ground. In the second and third positions the resistance is cut out until at the fourth position the motors are running in series with the fields connected directly to each other, in the order stated above. In position 5 the end terminals of each field farthest away from its armature are connected to the mid-lead of the other field, so that each motor runs on a three-quarter field. In position 6 there is only one connection between the motors, that between the middles of the two fields, so that each motor runs on a half field. In position 7 the mid-field lead of each motor is connected to the outside brush of the armature of the other motor so that the two armatures are in parallel together with half of their respective fields, while the other halves of the fields are in series with this combination. This gives a three-quarter field strength for each motor, with armatures in parallel. In position 8 the two motors are in straight parallel.

The special feature of the connections is that the motors are very easy in acceleration, as there is no cutting out of blocks of resistance, but rather a shifting of the motor equipment from one characteristic curve to another until the required speed is attained. Although, as described, the combinations seem somewhat complicated, a small amount of wiring only is required, consisting of five wires to each motor, viz., two armature wires, two field wires and one mid-wire. The controller was shown at Saratoga applied to two S. K. C. 402 48-hp motors mounted on a truck, and the motors were started and run on the different position points and different motors were cut out to illustrate the combinations possible.

PROPOSED ASSOCIATION OF SUPPLY MEN

A meeting of the street railway supply men exhibiting at the Saratoga Convention was held on Friday, Sept. 4, in the meeting room of the Street Railway Accountants' Association at the Grand Union Hotel. The meeting was called to order at about 1 o'clock by O. W. Johnson, general manager of the Johnson Wrecking Frog Company, who explained that the object was to form an organization of the manufacturers of and dealers in street railway equipment and supplies who attend the annual meetings of the American Street Railway Association and its allied associations. Daniel M. Brady, president of the Brady Brass Company, then made a short speech, in which he described the organization and methods of a similar association which conducts entertainments and arranges for exhibits in connection with the conventions of the American Railway Master Mechanics' Association and the Master Car Builders' Association. After discussion as to the best method of proceeding, W. J. Cooke, vice-president and general manager of the McGuire Manufacturing Company, of Chicago, was by motion appointed temporary chairman, and Cornell S. Hawley, of the Consolidated Car Heating Company, of New York, temporary secretary.

J. G. White, of J. G. White & Co., then moved that an organization of electric railway supply men be formed and that W. J. Cooke, vice-president and general manager of the McGuire Manufacturing Company, Chicago, chairman; Daniel M. Brady, president of the Brady Brass Company, New York; Scott Blewett, of the American Car & Foundry Company, St. Louis, Mo.; James H. McGraw, president of the STREET RAILWAY JOURNAL, New York, and F. S. Kenfield, president of the Street Railway

Review, Chicago, be constituted an executive committee, to which they shall add four other representative supply men; that the full committee of nine as thus appointed confer with the executive committee of the American Street Railway Association and other committees representing those who may have interest in this question, and that the executive committee have full power to establish a permanent organization, to decide upon the name of the association and to arrange for all such matters affecting the interest of the association as may seem desirable. The motion was carried unanimously. There was some discussion on the name of the association, but decision on this point was left to the discretion of the executive committee.

TWENTY-FIRST ANNUAL MEETING OF THE NEW YORK STATE STREET RAILWAY ASSOCIATION

The twenty-first annual meeting of the New York State Street Railway Association will be held at the Yates Hotel, Syracuse, Tuesday and Wednesday, Oct. 6 and 7, 1903. This meeting has been called a month later than usual because the American Street Railway Association held its convention this year during the early part of September, which is the time when the New York Association usually convenes. In view of the change of date and the large attendance and great interest manifested in the American Street Railway Association, the executive committee of the State Association appreciates the necessity of an even more determined effort than it has put forth heretofore to secure the desired large and representative attendance of both street railway and supply men.

An unusually interesting meeting is anticipated. Numerous papers upon important street railway subjects will be presented and topics of general interest and profit to street railway men will be thoroughly discussed. In addition to the interesting and profitable features of the meeting a splendid programme of entertainment (including the annual dinner on Tuesday evening, Oct. 6), has been arranged by the local committee.

The Association is very desirous to have a large attendance, and wishes to have it plainly understood that supply men are particularly invited and will be tendered a cordial welcome.

The following list of topics for papers and discussion speaks well for the activity of the committee, and should help to make the coming meeting very successful:

"Care of Dynamos."
"Street Railway Taxation."
"Electrically Welded Joints."
"Street Railroads vs. State."
"Receipts from Other Sources."
"Transfers—Their Use and Abuse."
"Points on Overhead Construction."
"Long Distance Power Transmission."
"The Care and Maintenance of Fenders."
"Suggestions on Financial Organization."
"The Inspection and Care of Brakes."
"Reading and Club Rooms for Employees."
"Care and Inspection of Wheels and Axles."
"Signal Systems for Single Track Roads."
"Maintenance and Repair of Car Bodies."
"Pleasure Resorts as Traffic Stimulators."
"Suggestions for Report Blanks and Forms."
"The Selection and Management of Employees."
"Effect of Interurban Service on Small Towns."
"Track Bonding."
"Car Mileage Record."
"Rotary Transformers."
"The Modern Power-House."
"Power Brakes for Electric Cars."
"Employees' Benefit Associations."
"Low Joints—How to Prevent Them."
"Prevention of Accidents."
"Electrolysis."
"Care and Inspection of Motors."
"Municipalities vs. Street Railroads."
"Economical Maintenance of Boiler Room."
"How Can We Increase the Efficiency of Employees?"
"Hints on Making Small Electric Railroads Profitable."
"Store-Room Accounting and the Distribution of Supplies."
"How Can We Enlarge the Field and Scope of the Association?"
"Practical Experience with Double-Deck and Semi-convertible Cars."
"Economical Production of Steam."
"Electric Lighting by Street Railways."
"Steam Railroad Crossings or Right Angle Crossings of Electric Lines" (Allotted).
"Repair Shop Methods" (Allotted).
"Hydraulics in Connection with Street Railway Operation" (Allotted).
"Track Construction and Maintenance" (Allotted).
"Accounting and Way-billing on Trolley Express Lines" (Allotted).
"Despatchers' Duties and Electric Signals" (Allotted).
"Methods of Discovering Fraudulent Claims for Injury" (Allotted).
"Physical Examinations in Accident Cases" (Allotted).
"Track Drainage—Interurban Roads."
"Steam Turbines."
"Single and Double Trucks—Their Advantages and Disadvantages."
"The Sub-station."
"Physical Examinations as Aid for Trial Counsel" (Allotted).

In addition to the papers allotted and selected from above list of topics, there will be an allotment of sub-topics and ensuing general discussion upon the following practical subjects suggested by H. H. Vreeland:

"Interurban Service" (divided into three heads), (a) Standard Equipment, (b) Car Despatching, (c) Standard Methods of Fare Collection and Ticket Taking.

"Extra Freight and Baggage Service on Interurban Lines" (divided into three heads), (a) Traffic Arrangements with Steam Roads and Boats, (b) Traffic Arrangements with Other Interurban Lines, (c) Development of Freight and Express Service.

In pursuance of the suggestion of the Board of Railroad Commissioners of the State of New York, there will be a general discussion of the following timely topics:

"The Advantages and Disadvantages of Oil Tail Lights for Interurban Cars."

"Street Car Controllers—Their Proper and Improper Operation."

All street railway representatives are earnestly urged to come prepared to participate in the discussion of the above important subjects as outlined.

DEVELOPMENT OF ENCLOSED FUSE PROTECTIVE DEVICES

Probably no recent development in electrical construction devices has met with more rapid advancement and success than the so-called enclosed fuse, which is to-day supplanting nearly all forms of open fuse protective devices. Actual commercial exploitation was begun but five years ago; yet to-day the enclosed fuse has been accepted almost universally and is to-day being demanded by the Underwriters,—and in fact it finds a place in almost every new plant. At first it was thought that the increased cost of the necessarily more expensively constructed enclosed fuse device would to a great extent prohibit the universal application of this meritorious protective device, yet it was soon found that the many advantages accruing from the use of enclosed fuses warranted the additional expenditure.

The development of enclosed fuse protective devices is somewhat noteworthy, as their application has been almost universal, not only to ordinary interior work, but for street railway motor protection, transformer protection, switchboard work, and a multitude of other service. The Sachs "Noark" enclosed fuse, marketed by the H. W. Johns-Manville Company, sole agents, was one of the pioneers in the enclosed fuse field. The basis for the development of this now well known protective device began more than a dozen years ago. The original Sachs patent of 1894 is claimed to be the first showing the modern form of constructing enclosed fuses.

The variety of styles and types of enclosed fuse protective devices marketed by the above-mentioned concern is exceedingly extensive and covers almost every branch of electrical service. It is also of interest to note the large ampere sizes to which these fuses have been developed on the various voltages in common use. Recent tests made of Sachs "Noark" fuses on a 4000 amp. hour storage battery at 250 volts have demonstrated the entire efficacy of fuses whose normal carrying capacity was 400 amps. at 250 volts (100,000 watts). These fuses were short-circuited dead on the terminals of the battery and operated absolutely without smoke, flash or any demonstration whatever, yet indicating upon the exterior of the tube their interior condition. Larger sizes are also being developed, and it is expected that they will be furnished up to 1000 amps. in the near future. As a circuit-rupturing performance, the opening of an enclosed fuse capable of carrying 500 or 600 amps. at 250 volts absolutely without any external demonstration or explosion whatever, and without in any way affecting the integrity of the tube or external structure, is certainly noteworthy.

FINANCIAL INTELLIGENCE

WALL STREET, Sept. 9, 1903.

The Money Market

The recent incident of the greatest interest for the money market was the official announcement from Washington that Secretary Shaw would use, in case of need this autumn, the surplus treasury moneys, amounting to about $40,000,000, to add to the bank deposit fund. Various interpretations have been placed upon this proposal, but in banking circles only one opinion is expressed. The Secretary clearly means to come to the relief of the market only in case there is no other way to prevent a serious money stringency. He does not propose to make the treasury surplus available for a fresh Wall Street speculation, but, on the contrary, Wall Street liquidation on a more or less extensive scale would probably have to be tried before the treasury funds would be placed at the market's disposal. What the Washington authorities particularly want to be sure of is that there will be plenty of money this autumn for all legitimate needs. The present bank surplus reserve—$17,000,000—may be adequate, but if it is not, and if gold cannot be imported readily from abroad then the treasury proposes to stand by and help out the mercantile community. That this action is felt to have a practical significance is made clear by the quick decline in rates for time money, which followed the first news of the treasury offer two weeks ago. Previous to then it was difficult to obtain five and six months' loans at 6 per cent; now 5½ per cent is the ruling figure on this class of business, and loans are comparatively easy to negotiate. Rates for call money and for the short-time options continue rather low, the same as they have been for some time past. The average call rate is 2 per cent, and for sixty-day money 4½ per cent. Regarding the likelihood of gold imports this season the chances have been diminished somewhat by recent developments. A heavy and protracted drain from Egypt, Germany and other parts of Continental Europe has caused the holdings of the leading foreign banks to fall below what is considered a prudent average at this period of the year. Partly under this pressure and partly with a view to future demands from America the London market has taken some sharp measures to protect itself, and to make the process of withdrawing gold a difficult one. The price of the metal has been forced up by successive stages, thereby raising the premiums which the foreigner must pay for it. More to the point still, the Bank of England last Thursday took the unusual course of jumping its discount rate from 3 per cent to 4 per cent, a month at least ahead of similar moves in former autumns. The Bank is following up this step by borrowing heavily, with a view to diminishing the outside supply of lendable capital, and thereby bringing the market within its control. All this means, so far as our money situation is concerned, that drawing gold from Europe this fall will be a much more difficult operation than seemed probable a month ago. The exchange market has already reflected the altered condition rather notably by advancing 1¼ cents in the pound above the August low level. To sum up the most obvious facts of our money market in one conclusion, the Treasury tender of relief and the foreign exchange position promise either separately or combined to prevent any real stringency during the next few months. But neither of these palliatives would come into operation soon enough to prevent a fairly considerable rise in interest rates from the present level.

The Stock Market

The course of the general stock market from day to day confirms the opinion expressed some time ago that the larger financial interests are content that Wall Street speculation should be left to take a good rest. The market is intensely dull, with prices moving in a narrow range, and with nine-tenths of the business supplied by the professional operations on the floor of the Stock Exchange. Indeed, what has been witnessed for the past two weeks has been simply a succession of petty movements, first in one direction, then in another, with the advantage possibly in favor of a rise, but with certainly no settled upward tendency. Speculative circles are simply enjoying a breathing space. Liquidation is over, many people believe for good, but investment buyers are so extremely cautious, what between the unsettled crop outlook and the money market uncertainties, that there is no substantial support for any operations designed to effect a higher price level. The best news that has come to hand recently was the Government report, issued last week on cotton. It showed that not only is the area under cultivation the largest on record, but that the condition of the crop is far above the average for the season. These circumstances have suggested so forcibly the probability of a record-breaking cotton harvest this autumn that it is small wonder that they have completely knocked out the underpinnings of the recent bull speculation in the staple, causing a severe reaction in prices. These events have a large meaning for the general financial situation. But, like other favorable factors, such as the excellent statements of railway traffic, their influence seems likely to be postponed until the corn crop is out of danger, and until a better measure can be taken of the season's requirements in the money market. Continuation of the present dullness and narrow price fluctuations for a while longer at least seem to be the most logical course of things.

The transfer of the Kuhn-Loeb holdings in the Metropolitan Securities Company to what is known as the Ryan-Whitney syndicate caused quite a stir in the local traction share market when the news was first published, ten days ago. Various opinions have been expressed as to the motive beneath this transaction, but the latest statement issued by Mr. Ryan seems to make it clear that the exchange of holdings was purely voluntary, and that there is no basis for the sinister talk that Kuhn-Loeb & Company forced the sale by claiming that the situation in the Metropolitan Street Railway Company had been misrepresented to them. On the Stock Exchange both Metropolitan Street Railway and Metropolitan Securities shares advanced rapidly when the operation was first announced. A sympathetic rise also took place in Brooklyn Rapid Transit and Manhattan on the idea that the Metropolitan stock transfer might be one of the parts in a grand scheme of traction consolidation. The several movements, however, proved to be entirely speculative, and when the trouble became known the stocks concerned quickly receded to their former level.

Philadelphia

Prices have altered very little in the Philadelphia market for some time past. The undertone continues strong in all classes of securities, but in the absence of developments affecting individual properties and in the apathetic state of the general market, there is little business doing. Philadelphia Company common has been the most active stock on the list, but for a fortnight past it has not swung beyond a one point range, from 40 to 41. The preferred stock is unchanged, at 43¾. Union Traction sold down from 44⅛ as low as 43½ at one time, then recovered to 44. Philadelphia Traction was strong, at an advance from 95¾ to 96. Rapid Transit on a renewal of pool operations rose as high as 14½, then fell back to 14. Other recent sales of note include Consolidated Traction, of New Jersey, at 60, Railways General at 3, American Railways at 46, Reading Traction at 30, Chicago Union Traction at 5½, and Union Passenger Railway, of Philadelphia, from 235 to 238.

Chicago

This is a very stupid time in the market for Chicago traction stocks. Announcement has already been made of the fact that the so-called minority committee of Lake Street Elevated appointed by the stockholders last June, now has an actual majority of the stock in hand. It is expected that a reorganization plan will be drawn up some time this month, with a fair chance that all the various interests in the property will come together on a harmonious basis. In this hope the stock has held well in the market, but with few trades between 6 and 6¾. The only other transactions reported during the last two weeks include Northwestern Elevated common at 22, City Railway at 170, West Chicago 5 per cent bonds at 97, Metropolitan Elevated common at 21, the preferred from 61½ to 59½, and South Side at 96. All lines are making good traffic returns. The Metropolitan has about completed its new coaling station on the Belt Line and Forty-Sixth Street, and the only remaining construction work is the downtown terminal, which, owing to the difficulty in obtaining structural material promptly, will probably not be completed during the present calendar year.

Other Traction Securities

Trading is practically at a standstill in Boston, so far as traction securities are concerned. As an instance of the prevailing dullness less than a thousand shares of Massachusetts Electric

common—ordinarily a very active stock—have changed hands during the past week. Prices are barely changed at all from what they were a fortnight ago. Massachusetts Electric common has sold between 22 and 21½, the preferred from 81 to 79¾, Elevated from 137½ to 138, West End common from 89½ to 89, and the preferred at 110. In Baltimore only one or two transactions have occurred in the traction department, outside of United Railways issues, which have held their prices well, but which have shown no tendency to advance. Recent sales of the stock are recorded between 10¾ and 11, the income bonds at 63½, and general 4s "ex" semi-annual interest of 2 per cent at 90¾. Sales are also reported in Lexington Street Railway 5s at 100 and Atlanta Street Railway 5s at 104¾. On the New York curb the traction sales during the last ten days might be enumerated on the fingers of both hands. Interborough Rapid Transit, after selling at 98⅛, fell to 96½. New Orleans common sold at 11⅛ for 200 shares. Three hundred St. Louis Transit went at 18¼ to 18. Washington Traction & Electric common sold at 11 for 100 shares, while the general 4s changed hands at 73.

Security Quotations

The following table shows the present bid quotations for the leading traction stock, and the active bonds, as compared with last week:

	Closing Bid	
	Aug. 18	Sept. 8
American Railways	46½	45
Aurora, Elgin & Chicago	b17½	a20
Boston Elevated	137	137
Brooklyn Rapid Transit	47¾	43¾
Chicago City	160	170
Chicago Union Traction (common)	5	4½
Chicago Union Traction (preferred)	25	30
Cleveland Electric	b72	a73
Columbus (preferred)	—	100
Consolidated Traction of New Jersey	61	58
Consolidated Traction of New Jersey 5s	103	104¾
Detroit United	69¾	68¾
Elgin, Aurora & Southern	b52	a42
Lake Shore Electric	b10½	—
Lake Street Elevated	5¾	6
Manhattan Railway	135	134¾
Massachusetts Electric Cos. (common)	24	21½
Massachusetts Electric Cos. (preferred)	80	79
Metropolitan Elevated, Chicago (common)	22	21
Metropolitan Elevated, Chicago (preferred)	60	59
Metropolitan Street	116	112½
New Orleans (common)	11⅛	10⅝
New Orleans Railways (preferred)	35	31
North American	79⅜	77⅜
Northern Ohio Traction & Light	18	18
Philadelphia Rapid Transit	12¾	13¾
Philadelphia Traction	95½	96
St. Louis Transit (common)	19	18⅜
South Side Elevated (Chicago)	96	96¼
Syracuse Rapid Transit	25	—
Syracuse Rapid Transit (preferred)	73	—
Third Avenue	114	110
Toledo Railway & Light	22	20
Twin City, Minneapolis (common)	95	93¼
Union Traction (Philadelphia)	43⅝	43⅝
United Railways, St. Louis (preferred)	68⅝	67

a Asked. b Last sale. * Ex-dividend. † $10 paid.

Iron and Steel

A more hopeful feeling prevails in the iron trade than has appeared in some time past. It is generally felt that the decline in prices for pig iron, which began six months ago, and has continued without interruption up to the present, has now about run its course, and that with the usual autumn requirements close at hand, the market is in a better position to raise prices and increase business than it has been at all since the culmination of the boom last autumn. Already the lower prices have compelled a number of the less profitable mills to shut down, and this, of course, has benefited the technical situation. Along with the improvement in the lower branches of the industry a better demand is reported for the manufactured iron and steel products generally. This is in part due to the belief that a great deal of the business hitherto deferred on account of labor troubles will shortly come upon the market. Quotations are as follows: Bessemer pig iron, $17.35; Bessemer steel, $27, and steel rails, $28.

Metals

Quotations for the leading metals are as follows: Copper, 13¾ to 13⅞ cents; tin, 27¼ cents; lead, 4¼ cents, and spelter, 6 cents.

AFFAIRS IN CHICAGO

The proposed modifications of the leases from the West Chicago and North Chicago companies and of the tripartite agreement have been approved by over 70 per cent of the stock of each company. The leases and agreement therefore take effect Sept. 1, 1903. The position of North Chicago stock as to dividends under the amended lease is that on Oct. 15 (the next dividend day) the Traction Company shall pay to the Railroad Company $88,800 which shall be taken as a payment generally on account of rent to accrue and be credited against any deficit of the cumulative rental should there be such deficit. The rent for the quarter beginning Sept. 1 is payable Jan. 15, and, for successive quarters, on the 15th days of April, July and October. This rental shall consist of the entire net earnings of the lines up to $237,600 per quarter (at the rate of 12 per cent a year), but if the net earnings so paid as rental fall below $118,400 per quarter (or at the rate of 8 per cent a year on the outstanding stock, extending that owned by the Traction Company), then the deficit shall be cumulative and be a charge against the future net earnings of the Traction Company and be paid without interest out of such future earnings before any dividend is paid on Traction stock. Beginning Oct. 15, 1908, the minimum 8 per cent rental becomes an absolute guaranteed charge, failure to pay which constitutes default. The position of West Chicago stock is the same except that the cumulative rental, guaranteed after five years, is 4 per cent.

Receiver Sampsell, of the Union Traction Company, recently made a statement indicating a consolidation of all the companies. The central idea is that a concrete organization, offering universal transfers, could obtain better concessions from the municipality in the matter of franchises than could Union Traction, West Chicago and North Chicago acting individually. It is pointed out that a company in position to offer a service first-class in every respect, with universal transfers, might be able to obtain such favorable conditions in the matter of renewal of franchises as would make it desirable for all interests to accept the scheme. From an operating standpoint it is urged that, with the companies consolidated, by a rearrangement of routes, passenger traffic could be diverted into new channels. This would get rid of the congestion and enable the company to operate cars according to the natural avenues of travel, rather than within the limits of separate franchises.

FLOOR FRAMING FOR MILWAUKEE CARS—A CORRECTION

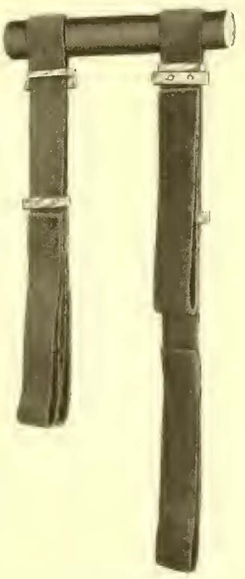
In the article on "Improvements in Interurban Cars and Motors by the Milwaukee Electric Railway & Light Company," which appeared in the Street Railway Journal of Sept. 5, 1903, an engraving entitled "Floor Framing" was, by mistake, inserted in the article. The engraving referred to is the channel bottom construction supplied by the same builders to the Chicago City Railway, and a number of other companies, for city cars. The Milwaukee cars do not have this channel bottom type of construction, as can be seen from the engraving of the exterior of the car, which appeared in the article.

AMERICANS TO BUILD ELECTRIC RAILROAD ACROSS NICARAGUA

An American syndicate has been formed for the purpose of building an electric railway system across Nicaragua, Central America. Pittsburgers are primarily interested in the project. T. M. Latimer, president of the Lindmore Land Company and the Anglo-American Potteries Company, of Pittsburg, is the chief party concerned in the enterprise. Others largely interested are Isham Sedgwick, of the United Coffee Company, and C. T. Manning, who is the Nicaraguan representative of R. G. Dun & Company. The Nicaraguan steam railroad, which was built about a year ago by British capitalists and is now owned and operated by the Nicaraguan government, will be acquired by the syndicate. The line runs from Port of Corinto, on the Pacific Ocean, to Granada, on the Lake of Nicaragua, via Chinandega. Its length is 161 miles. The road will be electrically converted, and is to be operated in connection with the new electric road which will join the existing one at Managua and extend to the Atlantic Ocean, having terminals at Monkey Point and Perlas. The third-rail system will be employed. The present Nicaragua road is narrow gage. It will be standardized as well as the new line. The length of the system will be about 500 miles. The power house will be constructed at Matagalpa, where water power is available. It will take about five years to complete the work.

AN ADJUSTABLE CAR STRAP

The Adjustable Passenger Strap Company, of Pawtucket, R. I., is putting on the market the new type of car strap illustrated herewith. This strap possesses several points of superiority over the ordinary leather strap which is in general use. A unique and advantageous feature is that the new strap is instantly adjustable to two lengths, differing from 2 ins. to 5 ins. or 6 ins., as the company purchasing the strap may desire. This arrangement thus provides for the comfort of standing passengers, whether they are tall or short. Another great advantage possessed by this style is that in replacing a strap it is not necessary to remove the strap-rod, as is the case with the ordinary strap, but the strap may be removed and a new one substituted by a simple fold in the strap through one of the buckles. The strap is made of strongly webbed material and is very durable. As the strap is very easily removed and replaced, it can be easily cleaned and kept free from disease germs. The manufacturer is prepared to fit one or more cars of any street railway company with these straps for a thirty or sixty-day trial, with the understanding that the straps shall be paid for only if entirely satisfactory.



ADJUSTABLE CAR STRAP

ANNUAL MEETING OF THE PENNSYLVANIA STREET RAILWAY ASSOCIATION

At a meeting of the executive committee of the Pennsylvania Street Railway Association, held in Harrisburg, on Aug. 24, it was unanimously resolved that the twelfth annual meeting of the association be held in Williamsport, Sept. 23 and 24. The convention will be called on Wednesday, Sept. 23, at 11 a. m., at the Park Hotel, and continued during the day. Papers on subjects of general interest will be read and discussed. On Thursday, Sept. 24, there will be an excursion to Eagles Mere, to be followed by a banquet at the Crestmont Inn. The association is anxious to have the attendance at the coming convention exceed any heretofore held, and all persons interested in street railways in Pennsylvania, whether members of the association or not, are invited and urged to be present, and participate in the deliberations.

THE WORCESTER SUBURBAN COMPANIES' TROUBLE

The Worcester & Southbridge Street Railway Company and the Worcester, Rochdale & Charlton Depot Street Railway Company, of Worcester, Mass., two companies which were closely allied, have gone into the hands of receivers. The properties at Pinehurst Park, Auburn, and Hotel Overlook, Charlton, which were built up by the Worcester & Southbridge Development Company, have been put in the hands of another receiver. Wilford A. Bailey has retired from the general management of these properties, a position he has occupied since they began to be built.

Charles M. Thayer, of Worcester, and John A. Hall, of Southbridge, were appointed receivers of the two street railway properties Aug. 29 by Chief Justice Albert Mason, of the Superior Court. The appointment of receivers was on the petition of Arthur P. Rugg, of Worcester, representing the Trust Company of the Republic, of New York, the city of Worcester and Horace S. Pike, of Worcester. Other creditors were represented by Rufus B. Dodge, of Worcester, and L. R. Eastman, of Boston. Charles M. Thayer appeared for the two street railway companies. The Trust Company of the Republic had a demand note of $25,000 which it has tried to collect, and the failure to secure payment on this led to the appointment of receivers. On the allegation that money of the street railway companies had been used for the development of the properties at Pinehurst and Overlook, Rufus B. Dodge, of Worcester, was appointed receiver of these properties.

Since the appointment the receivers have been going over the books of the various companies to learn their exact standing. There is some uncertainty as to the relations between the two street railway corporations and the development company. Both were under Mr. Bailey's personal management.

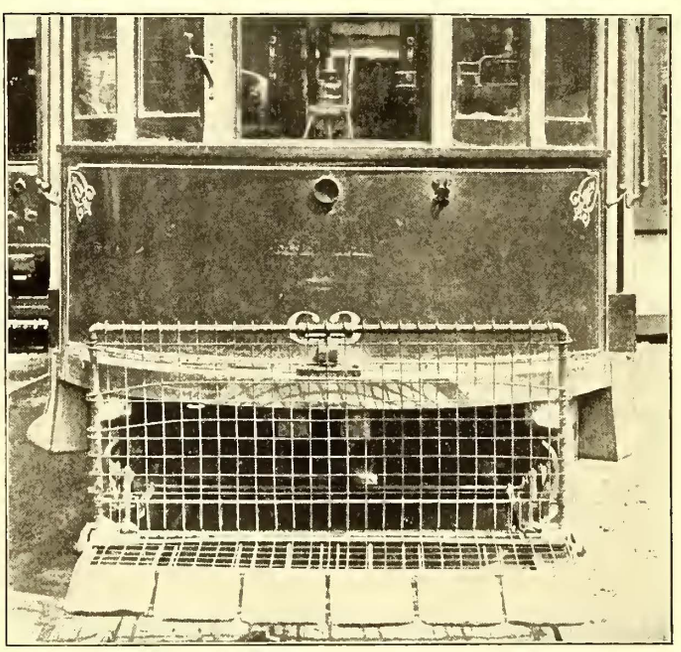
The failure of the roads is ascribed to the large expenditures that were made for construction. Large amounts of money were spent in building up the development company's property, but how far this has affected the finances of the roads is to be determined. From the start the expenditures on the construction of the properties, both of the street railway companies and the development company, have been lavish. The stock of the Worcester & Southbridge Street Railway Company and of the Worcester, Rochdale & Charlton Depot Street Railway Company is held by the same people. The latter company owns tracks and rights, but all cars are operated over its property by the Worcester & Southbridge road. Because of the great expenditures the companies have been unable for some time to raise the money for necessary current expenses.

The failure of the street railway company has involved Frank D. Perry, of the American Car Sprinkler Company, who underwrote some of the Worcester & Southbridge paper, in financial difficulties. Contractors who worked for the companies have been unable for some time to make collections. The failure of the Worcester & Southbridge has attracted a great deal of attention in financial as well as street railway circles because of the amount of money involved, said to reach between $2,000,000 and $3,000,000. Steps were being taken to consolidate the companies which are now in receivers' hands.

A NON-RIGID CAR FENDER

For several years inventors have endeavored to design a fender that would obviate the great force of impact exerted by a moving car when colliding. Efficient safe-guarding by fenders can be accomplished only when this shock is eliminated. A rigid fender imparts the velocity of the car, producing a blow, and favors an object passing under.

The Hipwood-Barrett Car & Vehicle Fender Company, of Lakeport, N. H., has embodied in the fender shown herewith the principle of receding action, which gradually imparts momentum, easing and lifting an object from the roadbed, and which has for the moment the effect of a car coming to a stop. This fender is designed to conform to uneven surfaces and to offset the effects of car oscillation.



NON-RIGID FENDER

By the simple receding and conforming principles, combined with a receptacle sufficient to contain a person, and a resilient bunter guard to prevent forceful contact and rebounding, the required fender protection is attained.

A blow that seriously distorts a rigid fender causes little or no damage to the receding front sections of this fender, each of which may, if necessary, be replaced at slight cost.

The fender may be quickly adjusted and instantly controlled in emergencies. Its simple construction enables the quick removal of fenders when repairing cars. The projection of the fender is very moderate when in use, but when not in use it can be instantly placed beneath the car, thus giving full space in car houses without interference by fenders.

A DARING CAR-HOUSE ROBBERY IN CHICAGO

There was a most daring car-house robbery in Chicago Sunday morning, Aug. 30. Protected by darkness, masked thugs secured entrance to the Sixty-First Street car-house of the Chicago City Railway Company, and deliberately shot down the three men working in the brilliantly lighted office. When all had fallen, one of the robbers forced an entrance to the office, seized the cash at hand, and vanished with his pals. One of the employees shot was killed outright, another was left dying, and the third was seriously wounded. The robbery was carried out some twenty minutes after the last conductor had made his returns, and just when the returns were all before the receiver, who was busily engaged in sorting the money. It is said that the robbers secured $4,000, but this estimate is unofficial. The company has offered a reward of $1,000 for the apprehension of the robbers, and its own detectives and a detail of Central Office men are at work on the case.

STREET RAILWAY PATENTS

[This department is conducted by W. A. Rosenbaum, patent attorney, Room No. 1203-7 Nassau-Beekman Building, New York.]

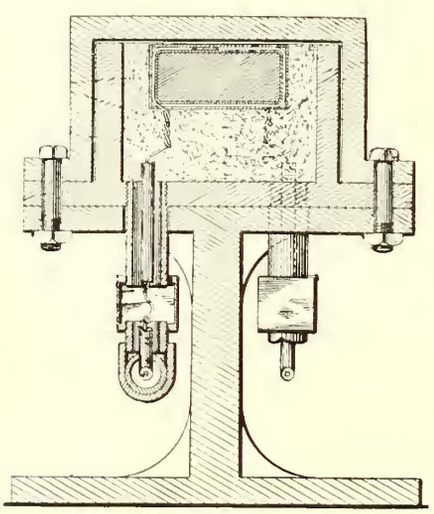
UNITED STATES PATENTS ISSUED SEPTEMBER 1, 1903.

737,582. Resilient Multiple Contact Trolley Wheel; Edward S. Cobb, Los Angeles, Cal. App. filed April 14, 1903. The trolley wheel flange and tread are made up of a series of segmental spring plates against which the wire bears.

737,596. Safety Mechanism for Motor Cars; Carrell J. Eckroad, Cleveland, Ohio. App. filed Feb. 16, 1903. Details of construction of a fender.

737,624. Emergency Car Brake; John M. Hedrick, Flourtown, Pa. App. filed Jan. 22, 1903. A brake-shoe or drag pivoted under the front platform and adapted to trail under the car is brought into contact with the roadway or ground by an operating rod, which extends through the platform, having a threaded connection therewith.

737,630. Vehicle Life Guard or Obstruction Remover; Arthur Hudson and Joseph Bowring, Manchester, England. Automatic means for causing the fender to fall to operative position when the feeler or swing gate, mounted in advance, strikes an obstruction.



PATENT NO. 737,935

737,748. Single Rail Railway Wagon; Albert Lehmann, Vienna, Austria-Hungary. App. filed May 20, 1902. An arch-shaped halter projecting laterally in the central line of the wagon-frame and adapted to pass over the back of the hauling animal, said halter being provided with means for attaching the animal thereto.

737,806. Car Fender; William J. Westgate, Glenville, and Chubb E. Herrick, Cleveland, Ohio. App. filed Sept. 23, 1902. A guard is mounted in advance of the fender which, when moved rearward or upward by contact with an obstruction, causes the fender to make a downward scoop.

737,885. Switch Operating Mechanism; Ambrose A. Tripold, New York, N. Y. App. filed June 9, 1903. Relates to that class of switch operated by the momentary interruption of the electric circuit which takes place when the car approaches a switch.

737,896. Railroad Bond; Horace M. Bellows, Huntingdon Valley, Pa. App. filed May 18, 1903. The abutting ends of the rails have aligned recesses in which is placed a coiled spring forming the bond.

737,914. Life Saving Guard for Tram Cars of the Like; William T. G. Ellis, Glasgow, Scotland. App. filed Dec. 15, 1902. Comprises a scoop, a tripping frame adapted to be suspended in advance of the scoop, and a spring catch pivoted to the base of the tripping frame and detachably connecting the tripping frame with the scoop to uphold the scoop by the tripping frame.

737,935. Third Rail for Electric Railways; Lloyd G. Johnstone, New York, N. Y. App. filed June 9, 1903. An electric heater applied to the third rail to melt ice or snow.

737,936. Contact Device for Electric Railways; Henry F. Kellogg, Wellesley, Mass. App. filed Oct. 15, 1902. Comprises a number of independent laterally movable contact pieces grooved for the reception of the wire and taking the place of a trolley wheel.

738,005. Railway Brake; David W. Davis, Detroit, Mich. App. filed March 11, 1903. A movable brake-hanger carrying an auxiliary braking wheel, a brake-shoe interposed between the auxiliary wheel and the adjacent car wheel and means for moving the auxiliary wheel against the brake-shoe and also the rail.

738,029. Abrading Shoe; Judson M. Griffin, Detroit, Mich. App. filed Jan. 15, 1903. A case adapted to hold abrading blocks, each block having one part thereof made abrasive and the other part non-abrasive.

738,056. Trolley; Moses Nicholls and Clark J. Smith, Ottumwa, Iowa. App. filed Dec. 15, 1902. Details.

PERSONAL MENTION

MR. GUY K. JEFFRIES, formerly chief despatcher of the Erie Railroad, at Huntington, Ind., has been appointed superintendent of the Indianapolis & Northwestern Electric Railway.

MR. L. F. MAHLER, formerly district manager of the De Laval Steam Turbine Company at Chicago, has taken charge of the St. Louis office of the Bullock Electric Manufacturing Company, with offices at 1505 Chemical Building, St. Louis.

MR. HOWARD S. KNOWLTON has resigned from the engineering force of Stone & Webster, of Boston. He is planning to visit Colorado and California, and will probably remain in one of those States. Mr. Knowlton has been a frequent contributor to these columns on topics of street railway and engineering interest.

MR. V. W. BERGENTHAL, formerly assistant manager of the Chicago office of the Stanley Electric Manufacturing Company, on Sept. 1 became actively connected with the American Automatic Switch & Signal Company. This is a new company, well backed by prominent Chicago men, which will make block signals for electric railways under fundamental patents granted to Mr. Robert Skeen, formerly of East St. Louis. Mr. Bergenthal will have charge of the sales business of the company, and will become vice-president, for which his previous experience as engineer and salesman make him well fitted.

MR. GEORGE M. TOMPSON, member American Society Civil Engineers, has recently opened an office in the Beacon Building, Boston, and is making a specialty of the appraisements of and reports upon the physical and commercial value of railway properties, and as consulting engineering expert in the separation of grade crossing problems. Equipped with an exceptional education, Mr. Tompson at the opening period of his career entered the office of the late Thomas Doane, C. E., of Boston, and a short time later became the division engineer of construction of the Troy & Greenfield Railroad, in which position he served two years. He left to accept the position of assistant chief engineer of the Philadelphia, Wilmington & Baltimore Railroad. Later Mr. Tompson was made locating engineer of the Texas-Mexican Railroad, and under his able supervision 250 miles of this railroad in Southwestern Texas were located. Attracted by his high qualifications the Mexican Central Railroad obtained his services, and during construction he was engineer and superintendent of the road department of that road. Owing to the failure of his health Mr. Tompson was obliged to return to New England, where he has held a number of responsible positions. One of his latest achievements was the construction of an electric railway at Portsmouth, Rye and North Hampton, N. H. Recently Mr. Tompson has been engaged in the appraisal of a number of the largest railroad properties in New England and in the Middle West and Western States also, and he is frequently consulted by the Massachusetts Railroad Commissioners. With the technical knowledge Mr. Tompson possesses is combined a practical experience that makes him peculiarly fitted in the most minute details of his profession.