

# Street Railway Journal

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No. 10.

## Proceedings of the Seventeenth Annual Convention

OF THE

# AMERICAN STREET RAILWAY ASSOCIATION

HELD AT

Boston, Mass., September 6-9, 1898.



The seventeenth annual convention of the American Street Railway Association was held at the Massachusetts Charitable Mechanic Association Hall Sept. 6-9, 1898. President Lang, of Toledo, Ohio, opened the meeting at 11 o'clock, Tuesday, and introduced Mayor Quincy, of Boston, who welcomed the members to the city in a pleasant speech, in which he referred to the rapid extension of electric railways in the country and to the early work in electric railroading in Boston.

President Lang replied in an appropriate manner to the Mayor's address:

The following companies then joined the association:

Elmira & Horseheads Railroad Company, Elmira, N. Y.  
Port Chester Traction Company, Port Chester, N. Y.  
Portland & Yarmouth Electric Railway Company, Portland, Maine.  
Portsmouth Street Railway Company, Portsmouth, Va.

Mr. Kerper, of Dayton, then offered the following resolution:

Whereas, The executive committee of this association, at its meeting held in Boston Jan. 25 and 26, 1898, owing to its inability to secure a proper hall for the annual meeting of the association at another time, issued its call for the meeting of the association to be held in Boston Sept. 6-9, 1898;

Resolved, That the action of said executive committee be and the same is hereby approved, ratified and confirmed, and this meeting is hereby declared to be the regular annual meeting of the association for the year 1898;

Resolved, That all the business of the association be proceeded with at this meeting in accordance with the by-laws of the association applicable to regular meetings called and held within the dates provided by paragraph seven of said by-laws.

The resolution was seconded by Mr. Hamilton, of Chicago, and was unanimously adopted.

The President.—The next order of business is the address of the president.

### PRESIDENT'S ADDRESS

We are to-day, for the seventeenth consecutive year, assembled in furtherance of the objects of our association, under conditions most favorable to a pleasant and profitable meeting; for we are in the house of our father, the city of our birth. As the presiding officer of the association, and in the name of the street railway men of Boston, I bid you a hearty, sincere and joyous welcome.

Amid the circumstances of this meeting our thoughts naturally turn to the time, the persons and the conditions existing when the association was formed. Some then present are with us to-day, and whether residents of Boston or not, certainly experience a

pardonable pride in the growth and achievements of the association as shown by its published proceedings and emphasized by the large number in attendance. Of the Boston people who were present at the outset, Calvin A. Richards, president of the Metropolitan Railroad Company, now a part of the Boston Elevated System, was a conspicuous and active member. In 1884 he was elected president of the association, and those who knew him best feel a deep grief that death has robbed us of a member whose welcome, if present, would know no bounds.

As I trace the history of the association from its inception, I am convinced that its founders, in the words of Emerson, "built better than they knew," for is it not remarkable that they should have chosen a name and set forth in our constitution the objects of the association so wisely and well that no material change has been required to adapt them to present conditions, which are so radically different from those then prevailing.

The constitution then, as now, says: "The object of this association shall be the acquisition of experimental, statistical and scientific knowledge relating to the construction, equipment and operation of street railways," etc.

The need for experimental knowledge in connection with a mule goes without saying, and statistical and scientific knowledge with reference to harness, cars or strap-rails sounds very ancient as compared with engines, boilers, generators, girder-rails, vestibuled cars, lightning arresters, ohms, volts, watts, amperes, etc., etc., the familiar subjects of to-day. I do not mean, however, to belittle the value of the investigation, discussion and association of the earlier days, because there are too many veterans present (and I might myself be called one), who can testify to the great benefit derived therefrom. It does seem, however, that the necessity for holding meetings in different cities was greater formerly than now, for in order to know very much about what others had done or were doing we had to go to them, whereas now we can see almost everything in connection with our business in the room below, except the mercurial portion known as the state legislator, common council or tax gatherer and ubiquitous damage lawyer, so called.

That this is a fair inference is also shown by the records, for the second meeting was held in Chicago, which then as now claimed to be the metropolis of the West, but disputed by St. Louis. While it was doubtless an enjoyable meeting, Chicago was apparently too much of a shock to the nervous systems of our Eastern members, so it was determined to return East the following year and New York was selected. Of course, New York never fails to interest, but there is one obstacle always difficult to overcome in meetings at that point, which is that one cannot remain long enough to see it all. What the delegates failed to find there, however, they looked for the year following at St. Louis, and it proved so good that they naturally looked for more near by, hence next sought out Cincinnati. Cincinnati, as was expected, proved to be ideal, but the East offered so many attractions in the contest for location that Philadelphia captured the convention following.

Dignified and made bold by the Philadelphia meeting the cry became, "On to Washington." The pleasure and profit of that

meeting cannot be doubted, but the West was evidently becoming jealous, and to secure another meeting played its trump card and Minneapolis won out. It goes without saying that this meeting was profitable to the association as well as to the good people of Minneapolis. Electricity as a motive power was at that time so far advanced that all knew it was bound to come. Its discussion consumed nearly all the time of the meeting, and we left the Minneapolis people more strongly impressed than ever before that they had made no mistake in adopting electricity as a motive power, and that they wanted still more of it.

In journeying to Buffalo the following year the association was well repaid, for much progress along electrical lines was found, and it undoubtedly stimulated the movement further in this direction, hence a dash was made for Pittsburgh the following year. No one will ever forget that great concern, the Westinghouse Electric & Manufacturing Company, which was then and is still so energetic and progressive in the electrical field, and which proved to be such an interesting feature of the meeting.

In going to Cleveland for our next meeting we did wisely for we there found roads and power houses further advanced toward the goal of perfection than could perhaps at that time have been found at any other place in the country. At the Milwaukee meeting the year following we were met with the most extensive display of electrical apparatus witnessed up to that time, presided over by scores of ever-watchful, energetic and intelligent supplymen, and our meeting proved to be unusually profitable. By this time we were all so firmly established on the electrical foundation that to see an electric road or inspect electrical appliances was no novelty; but, still searching for greater things, we turned toward Atlanta. We not only found a great exposition of the products of the country here assembled, but very much in the electrical line to interest us. The cordiality of our reception by the people was a crowning feature of this meeting.

In turning our steps toward Montreal a year later we endeavored to give of the good things we had seen and experienced at former meetings, and to acquire further knowledge from our Canadian brothers. It was the first attempt at holding a meeting beyond our borders, and for various reasons was slimly attended; still it was not void of profit, for it revitalized the association to such an extent that the meeting at St. Louis the following year was unusually interesting and valuable. Having had a foretaste of the place we, of course, were eager to return, and our reception by the people could not have been more cordial. It was left for Niagara Falls, however, to overshadow what, up to that time, had been considered great, and to reveal to us the vast in electrical units and in nature. We also found the manufacturers and supplymen present in abundance, and our meeting there was voted a success in every particular.

I have thus briefly recounted our movements and spoken of the motive which it has seemed from the best information at hand prompted the association in selecting its places of meeting, and the value of such selections and other reasons why the association has grown to its present proportions and standing. Its growth and experiences, like all such organizations, have not been without some severe trials, but unlike the prodigal son we have wasted none of our substance in riotous living, but have improved at each successive step, and now reach home; not only the birthplace of the association, but the home of the electrical industries in a larger sense, perhaps, than any other locality in the world. The people of Boston not only furnished money with a lavish hand to carry forward the work of developing the subtle power now so useful to us and all mankind, but also much of the brains and energy needed to make its use practical. Of this fact one circumstance will bear witness, and it is that C. A. Coffin, a Boston man, is still retained at the head of the largest electrical manufacturing corporation in the United States, if not in the world.

Having laid in this city the foundation of the splendid structure we have since reared, it is very proper that we should return and dwell therein for a few days. Everything gives promise of this being the largest meeting in our existence. If we do not make it one of the most valuable, the fault will be with ourselves. Let us hope to leave such an impression that the Boston people will say, "It was good to have them with us."

In the growth and development of our association and the business we represent, let us not forget the priceless and unrivaled assistance rendered by the technical press. Without a spokesman, a guardian ever faithful to our interests as they have been, our progress would have been much slower and our pathway exceeding rough. All honor to these devoted publishers and editors.

Nor must we for a moment forget (if we could) the indefatigable supplyman, for he is the noblest Roman of them all. It is his courage, foresight and energy in taking up the new and useful article, and pressing it upon our attention, that helps to effect economies. We may sometimes be prematurely persuaded, but

that is not the fault of the supplyman; it is simply one of the arts of his trade necessary for us to learn. But, seriously, without them the meetings of our association would be materially weakened and lose much of their interest and value. Let us then not fail to give them and their exhibits all the attention and examination time will permit.

The executive committee has prepared a very excellent list of papers to be read, and I trust that all will join in giving them generous discussion. Some of the writers of the papers have told me that they expected more benefit would be derived by members from discussion than from the paper itself. This should be inducement enough to keep all in constant attendance. Bear in mind that in so doing we are also promoting the best interests of the association, as well as honoring the writers of the papers, which is their due and our duty. While on this subject let me here call attention to the necessity of having at our meetings papers which will interest all the members—not only the mechanical and electrical engineers, but the general managers and even presidents of companies. We need all these officials with us at every convention, hence we must provide something of interest to them.

Each and every member must be made to feel that he has been benefitted by attending our conventions, and likewise the company represented, or our association will cease growing. As a result of our deliberations economies should follow without injury to the public service, all of which will tend toward a further realization of the objects of our association which are "the establishment and maintenance of a spirit of fraternity among the members," and in the largest degree "the encouragement of cordial and friendly relations between the road and the public."

Under the head of general business, as provided in our by-laws, or at some other appropriate time, a sort of experience meeting or informal discussion of all subjects relating to our business should take place, where each member shall feel free to ask any question that occurs to him upon which he desires information, and some one stand ready to answer.

I venture to suggest a few subjects arising almost daily where in this way very helpful information could be obtained, viz.:

"The suburban railroads; on what terms and conditions should they enter over our tracks, and how can their building be encouraged?"

"The issuing of transfer checks or tickets, and how abuses connected therewith can be limited?"

"The equipping of buildings with automatic sprinklers and the economy resulting therefrom."

"The cast or electric welding of rail joints and the saving effected in current and cars."

"The discussion or agitation of municipal ownership of franchises and the most intelligent way to treat the subject."

"To what extent companies should engage in the amusement business and the best methods of conducting the same."

"A comparison of the cost of materials and supplies and expenses of operation."

"How best to promote the interests of employees and in return secure from them the highest degree of service and loyalty."

These and many other subjects of kindred nature considered in this manner would awaken great interest.

I desire to call attention to our fellow workers and associates, the Accountants' Association, which holds its meetings simultaneously with ours each year, and is even now in session in another part of the building. The whole business of the street railway revolves around the accountants' office, and many of us can attest the value of having efficient persons in charge thereof. It with the hope of enabling them to make their services more valuable to their respective companies that the association was formed, hence they should receive every assistance it is possible for us to render. I bespeak for them your cordial co-operation.

In closing I wish to thank our efficient secretary and the executive committee for their cordial aid and support during the year, and to assure the members of the association of my great appreciation of the honor of being called a year ago to the office of president.

The President.—The next business in order will be the report of the executive committee, which will be read by the secretary.

This report consisted of the reading of the minutes of the meetings of the executive committee in Boston on Jan. 25 and 26 and Sept. 5 and 6. At the first two meetings the hall and papers for the October meeting were selected; at the second the report of the treasurer was audited and the following resolution was presented by Mr. Ely:

Pursuant to authority conferred upon this committee by the convention of 1897, an investigation of the question of municipal ownership has been instituted, and in response to inquiries sent out by the secretary much valuable data and information upon the subject has been secured. But owing to the extent of the field necessary to be covered, and also to the desirability of absolute accuracy in the evidence to be presented, and in order that the form of its presentation shall be such as to order of arrangement, conciseness of detail, etc., etc., as to render the same of the greatest value, it has been thought best to ask for further time in the matter, and your committee would therefore recommend that the subject be left in the hands of the committee until the next annual convention, and in the meanwhile any member so desiring may have access to the data in the possession of the secretary in its then existing form.

Mr. Hamilton (Chicago).—I move that the report of the executive committee be received and approved, and the recommendations presented be concurred in and that the thanks of the association be extended to the officers and executive committee for the very able manner in which they have conducted the business of the association for the past year.

The President.—We will now listen to the report of the secretary and treasurer.

REPORT OF THE SECRETARY AND TREASURER

The secretary read the report as follows:

Cash on hand Oct. 18, 1897.....	\$2,931.48
Receipts to Aug. 25, 1898.	
Annual dues .....	\$4,131.67
Membership fees .....	300.00
Space, Exhibit Hall, 1897.....	1,727.50
Space, Exhibit Hall, 1898.....	217.00
	6,376.17
	\$9,307.65
Expenses to Aug. 25, 1898.	
Printing and stationery .....	\$1,257.67
Postage .....	198.58
Salaries .....	1,500.00
Miscellaneous expenses .....	25.00
Executive committee, 1898.....	360.90
Sixteenth Annual Convention, 1897.....	1,920.74
Seventeenth Annual Convention, 1898.....	388.48
	\$5,651.37
Balance on hand.....	3,656.28
	\$9,307.65

Chicago, Aug. 25, 1898.

I hereby certify that the balance due the American Street Railway Association on the books of the Continental National Bank, of Chicago, at the close of business on the 24th day of August, 1898, was three thousand six hundred and fifty-six and 28-100 dollars (\$3,656.28).

(Signed) IRA P. BOWEN, Assistant Cashier,  
Continental National Bank, of Chicago.

MEMBERSHIP

October, 1897 .....	161
New members to Sept. 1, 1898.....	17
	178

LOSS

Withdrawn .....	9
Consolidation .....	8
	17
Membership Sept. 1, 1898.....	161

NEW MEMBERS

- Anderson, Ind., Union Traction Co.
- Atlanta, Ga., Atlanta Railway Co.
- Baltimore, Md., Baltimore Consolidated Railway Co.
- Binghamton, N. Y., Binghamton Railway Co.
- Brooklyn, N. Y., Nassau Electric Railroad Co.
- Buffalo, N. Y., Buffalo Traction Co.
- Chester, Pa., Chester Traction Co.
- Cleveland, Ohio, Akron, Bedford & Cleveland Railroad Co.
- Colorado Springs, Col., Colorado Springs Rapid Transit Co.
- Middletown, N. Y., Middletown-Goshen Traction Co.
- Pittsburgh, Pa., Union Traction Co.
- Saginaw, Mich., Union Street Railway Co.
- Sioux City, Ia., Sioux City Traction Co.

- Spokane, Wash., Spokane Street Railway Co.
- Wakefield, Mass., Mystic Valley Street Railway Co.
- Wakefield, Mass., Wakefield & Stoneham Street Railway Co.
- Webb City, Mo., Southwest Missouri Electric Railway Co.

WITHDRAWN

- The following members have withdrawn:
- Atchison, Kas., Atchison Railway Light & Power Co.
  - Buffalo, N. Y., Buffalo, Bellevue & Lancaster Railway Co.
  - Chicago, Ill., Cicero & Proviso Electric Railway Co.
  - Middletown, N. Y., Middletown, Goshen Traction Co.
  - Montreal, Can., Montreal Park & Island Railway Co.
  - New York, N. Y., Dry Dock, East Broadway & Battery Ry. Co.
  - St. Paul, Minn., Twin City Rapid Transit Co., St. Paul Division.
  - Terre Haute, Ind., Terre Haute Electric Railway Co.
  - Cincinnati, Ohio, Cincinnati Inclined Plane Railway Co.

LOSS BY CONSOLIDATION

Baltimore, Md., Baltimore Traction Co.	
" " City & Suburban Railway Co.	
Pittsburgh, Pa., Alleghany Traction Co.	
" " Central Traction Co.	
" " Duquesne Traction Co.	
" " Pittsburgh Traction Co.	
" " Pittsburgh, Alleghany & Manchester Traction Co.	
" " Second Avenue Traction Co.	

DUES UNPAID

Detroit, Mich., Wyandotte & Detroit River Railway Co....	\$25.00
Great Falls, Mont., Great Falls Street Railway Co.....	50.00
Kalamazoo, Mich., Citizens' Railway Co.....	50.00
Lock Haven, Pa., Lock Haven Traction Co.....	25.00
Newburyport, Mass., Newburyport & Amesbury Ry. Co....	50.00
Oil City, Pa., Oil City Railway Co.....	25.00
Steelton, Pa., Middletown, Highspire & Steelton Railway..	50.00
West Superior, Wis., Superior Rapid Transit Co.....	50.00
	\$325.00

SPACE, CONVENTION 1897, UNPAID

Diamond Truck & Car Gear Co., New York.....	\$60.00
Graham-Woodward Equipment Co., New York.....	10.00
D. H. Long, Buffalo.....	5.00
Skeen Electric Signal Co., St. Louis.....	20.00
	\$95.00

IN MEMORIAM

O, for the hour of rest,  
When I shall lay my weary head beneath the sod—  
My spirit to ascend to the presence of its God,  
And dwell among the bless'd!

- J. A. Stratton, secretary and treasurer, Birmingham Railway & Electric Company, Birmingham, Ala., Feb. 27, 1898.
- Reuben F. Baker, president, Columbia City Railway Company, Washington, D. C., March 23, 1898.
- Frank S. Stevens, Globe Street Railway Company, Fall River, Mass., April 25, 1898.
- Morris W. Hall, secretary, Camden & Suburban Railway Company, Camden, N. J., May 3, 1898.
- Charles B. Pratt, president, Worcester Consolidated Railway Company, Worcester, Mass., May 9, 1898.
- Julius S. Grinnell, general counsel, Chicago City Railway Company, Chicago, Ill., June 8, 1898.
- M. W. Squires, ex-superintendent, North Chicago Street Railway Company, Chicago, Ill., June 20, 1898.
- C. B. Reavis, secretary and treasurer, Augusta Railway Company, Augusta, Ga., Aug. 5, 1898.

Mr. Radel (New Brunswick).—I move that the report of the secretary and treasurer be received and adopted. Carried.

The President.—We will now take up the committee reports. The first paper is on "Comparative Earnings and Economy of Operation Between Single and Double-Truck Cars for City Use," by Richard McCulloch, electrical engineer, Cass Avenue and Citizens' Street Railway Company, St. Louis, Mo.

Mr. McCulloch read the paper, which will be found on another page.

Mr. McCormack (Brooklyn).—Mr. McCulloch states in the paper that with the use of double-truck cars it would be possible to lengthen out the headway. I wish to state that on our heavy lines we have had between three and

four hundred double-truck cars, and in not a single instance have we been able to lengthen out the headway. The double-truck cars increase the patronage to such an extent that we have had to shorten the headway. One thing more, and that is, when it comes down to standing loads and moving crowds yesterday (Labor day) I noticed on the cars seating forty passengers going to Coney Island that the average was sixty-five on the register. With a double-truck car, and a seating capacity of sixty, it is nothing unusual to see 128 and 130 on the register; so you can see when you want to move large crowds, what the difference is with the double-truck car compared with a single-truck car. There are 178 double-truck cars running in the service on one line, and you can imagine what the travel is on that line.

Mr. Dimmock (Council Bluffs).—What is the headway?

Mr. McCormack.—The headway on the Court Street line running from New York direct to Coney Island, is less than a minute. On the Third Avenue line it is three minutes nearly all day, and part of the time two minutes. The headway from Sixty-fifth Street to Coney Island where all the Coney Island cars converge is about twenty seconds.

Mr. Sloan (Chicago).—The double-truck cars are certainly coming into practice and favor, and it seems to me the main question is the question of traction. I have had no experience with double-truck cars, and I would like to know whether anyone who has had experience with them knows anything about the motors when four motors instead of two have to be used to get the maximum traction. It is a subject we should know more about, because in the use of the double-truck cars we are replacing the two motors with four.

Mr. Beggs (Milwaukee).—I think Mr. McCulloch has so thoroughly presented the case that there is very little to be said upon it, particularly in behalf of the plaintiff. I do not think that the writer of the paper evinced any partiality as between a single and double-truck car; but it is very evident in what direction the sympathies of the writer of the paper lie. In the city of Milwaukee we have for three years been experimenting practically with the advantages and disadvantages of single and double-truck cars. In 1896 there were put upon the system twenty double-truck cars with maximum traction trucks. These cars were equipped with eighteen double seats seating thirty-six persons. A year ago, the early part of 1897, in view of our experience of a year in the use of the cars, we enlarged somewhat upon them, improved the trucks to some extent, we thought, by abandoning the maximum traction truck and so building the frame of the car as to in that way obviate what had been with us a very serious difficulty, namely, the forward wheels leaving the rail. We use 30-in. wheels to accomplish it. We increase the length of the car and seat forty passengers, by placing in double seats. During the present year we have been benefitted by our experience still further, and have increased the length of the body and enlarged the seating capacity without increasing at all the overall length, which is 41 ft. over bumpers. We maintain virtually the same size of platform so far as the accommodations to passengers is concerned in crowds, by increasing the length of the body 1 ft., slightly moving the seats together and reducing the amount of the bumper in front of the dash, so that with our present car, so far as our service is concerned, there is little left to be improved. We seat forty-four passengers, having twenty-two seats.

Of course the question as to the use of the double-truck car is determined by local conditions. For the climate of Milwaukee our double-truck cars are a necessity to a great extent. Because of the large open spaces and our short

summer season, it is almost impracticable to maintain the duplicate equipment necessary for summer and winter services. I do not know anyone now in the service of the company who has not been converted to the use of the double-truck car, and we have arrived at a standard. There are many reasons existing with us for the adoption of a standard car, as the short summer season and the likelihood of chilling winds coming up and cold rains at any time in the warmest days of summer. We have now a car that suits us twelve months in the year. We have not had any difficulty with the matter of traction. We use a 33-in. wheel in our present equipment; we are having built and still maintain only a distance of 32 ins. from the rail to the bottom of the sill, and that was one of the difficulties we had to overcome. We did that by giving considerable attention to the matter of the construction and framing of the car to permit the 33-in. wheel to readily pass around our shortest curves. We are so thoroughly convinced as to the advantages of the double-truck car that we are gradually permitting all our single-truck cars to be worn out and scrapped as their life is brought to an end.

We have found that the use of double-truck cars has greatly increased the traffic; in other words, the people would wait for double-truck cars on certain lines. We are compelled to place some of the single equipment on at times, but where the two types of cars are run on the same lines the people still wait for the double-truck car, for the reason that the riding is much more comfortable. Our double-truck cars on our lines ride almost as smooth as a Pullman sleeper. That, of course, depends largely on the character of the track; but on a large portion of our lines, particularly on those lines where we are putting on the heavy equipment, we are having the connection between the rails cast-welded at the joints. We are doing away with the rocking and pitching motion of the car, and by the use of the double truck are enabled to make much higher speed, and that is the tendency of roads all over the country. We have to make higher speeds. We brought our averages up within two years certainly a mile an hour. Our average speed now is somewhat in excess of 9 miles per hour. We would not be able to do that with a single-truck car, because of the oscillating motion and liability of the pitching to displace the trolley wheel, whereas with the double-truck cars we seldom have such an experience.

As to wear and tear, we believe the weight of evidence is in favor of the double-truck car. While we have double the number of trucks and double the number of wheels to maintain, the blow on the wheel at crossings and special work is so much easier that it does not wear the trucks nearly so much, and we find that our repairs of springs is possibly 75 per cent less on the double-truck cars than on the single-truck cars. We have been able to increase our headway on most of the lines on which we have placed double-truck cars. In other words, we try to regulate the headway of the double-truck cars to meet the general conditions during the larger portion of the day; and during the rush hours of the morning and evening, particularly in the evening, we either shorten the headway one-half or throw in intermediate cars, but still maintaining the regular headway of the regular equipment of the line. So far as the city of Milwaukee is concerned, we are very strongly impressed with the very great advantages of the double-truck car, many of which have been referred to indirectly in Mr. McCulloch's able presentation of the case, and we experience other advantages, which are governed by local conditions, and would not apply, possibly, in all cities even of the same population.

A question was asked as to the four-motor equipment. I might say that during the present year we have had constructed ten interurban cars, running between Mil-

waukee and Waukesha Beach, and the city of Waukesha, a distance of 26 miles, or slightly more. These cars were carefully constructed after complete investigation and the possession of all information we could get from electrical engineers. Based on this and our own experience and judgment, we have equipped them with four G. E. 1000 motors, geared to 26 miles per hour, with 40,000 lbs. load. Our double-truck cars are possibly the heaviest in use anywhere in the United States. They weigh about 35,000 lbs. With these four-motor equipments we have no trouble whatever from lack of traction, and we are beginning to believe that in the very near future it will be advantageous for us to equip all the double cars with four motors. We have some grades which we climb with our double-truck cars, using 33-in. wheels, running up as high as 6 and 7 per cent. They do it with a little difficulty at certain times, and under certain conditions of rail and weather; but with our four-motor equipments we usually have no difficulty whatever in climbing the grades and in getting, we believe, very superior service.

I think, Mr. Chairman, that the case of the plaintiff, which Mr. McCulloch has been pleased to term the double-truck car, was so ably presented in his paper that it does not need any other advocate for it, but I should rather have denominated the double-truck car the defendant, because there have been so many attacks made upon it. I can only say, so far as we are concerned in the city of Milwaukee, that the double-truck car has come to stay. The character of the population you are serving has much to do with the discrimination that is shown in the selection of a car to ride in. Some sections of the city do not pay much attention to it, and there are other sections that discriminate, and just as we regard the pleasure and comfort of the riders, we find the traffic increases on those lines. We have what we might call a mechanic district in our city, which uses our Third Street line, which was equipped during the present year, and there is a marked increase on that line. I might say, as indicating the economy of the double truck, that on certain lines equipped two years ago with the double-truck cars we had previously maintained a headway of 4½ minutes, and by the use of the double-truck car and the greater speed obtained, together with the greater number of passengers accommodated, on this line running through the better portion of the city, we have been able to gradually lengthen out the headway to six minutes, without any complaint from our patrons. You can readily understand what that means in reduced equipment. Quite recently, within the last three months, by a further increase in the speed, on a long line—our policy is to run long lines from one extreme of the city to the other, for the comfort of the passengers and to avoid transfers—we have recently cut off another car and still maintain the headway at six minutes, by increasing the speed and making the trip in ninety minutes instead of ninety-six minutes. I might say that in the same way, on the Third Street line, the line last equipped, we hope, by the increased speed we will be able to maintain and by the use of these double truck cars, we shall be able to take off two of the sixteen cars on the line and reduce the number to fourteen. This is one of the very great economies which we are realizing throughout the system by the use of these double-truck cars. We are able to run at very high speeds on our line from Milwaukee to Waukesha with these double-truck cars, whereas with a single-truck car it would be hazardous to run the car at such speeds, and they could not be kept on the track. The experience of the city of Milwaukee is strongly in favor of the double-truck car. The latest improved truck permits us to use the 33-in. wheel with the same facility as the 30-in. wheel; that is, there is no greater height from the rail, and

I think as soon as our necessities are known the manufacturers of trucks and cars will accommodate themselves to the new conditions and many obstacles will be overcome.

The secretary read a letter from Henry M. Watson, president of the Buffalo Railway Company, regretting his inability to be present at the meeting on account of sickness.

Mr. Kelly (Columbus).—It has been suggested that all the members of the association who were present at the organization of the association in Boston in 1882 will rise.

Messrs. W. Worth Bean, St. Joseph, Mich.; George B. Kerper, Dayton, Ohio, and Julius E. Rugg, Boston, were the only members present who had attended the organization meeting.

The president announced that he had received letters from ex-Presidents Thomas Lowry, Henry C. Payne and H. H. Littell, expressing their intention of attending the convention.

The meeting then adjourned.

**WEDNESDAY'S SESSION**

President Lang called the meeting to order at 10:30 A.M., and announced that the first paper of the session would be that on "Carrying the United States Mail Matter on Street Railways" by Mr. W. S. Dimmock, general superintendent, Omaha & Council Bluffs Railway and Bridge Company, Council Bluffs, Iowa. This paper is given on another page.

Mr. Sergeant (Boston).—I heartily endorse all the writer has said.

In 1895 our company in Boston was approached by the Post Office Department to see what could be done in the establishment of a trolley mail service, but as the writer of the paper has said, there was not sufficient money available for the purpose, except some funds left over from the "wagon fund." We undertook to inaugurate the service, and take what revenue might be gotten by a transfer from this fund, as a test of the feasibility of the scheme. This was the first city in which the trolley mail cars were handled in the same manner as the steam railway mail cars, that is, with a messenger and clerks to assort the mails on the car. We began in 1895 with seven mail cars which we equipped, and for the information of the Association, I will present a memorandum which I have concerning our trolley mail cars.

Trolley mail cars inaugurated May 1, 1895.

Night service inaugurated June 3, 1895.

	Number of trips:			
	Week-day.	Sunday.	Holiday.	
Started with.....	43	18	18	12,670 trips yearly.
Same year inc. to.....	43	20	20	130,000 miles yearly.
In 1896 inc. to.....	47	20	20	14,315 trips yearly.
In 1897 inc. to.....	47	19	21	15,409 trips yearly.
In 1898 inc. to.....	47	19	21	15,517 trips yearly.

In 1898 mileage will be upward of 170,000 miles.

There were originally twelve stations, to which have been added one at Charlestown, Jan. 1, 1897, and one at Roxbury Crossing, Feb. 1, this year, on which date also a pouch service was established between Somerville and West Somerville. Connections have always been made with the Boston & Albany and Providence depots, and the Union station. Sixteen men are constantly employed, eight conductors and eight motormen. Out of about 45,000 trips run (to Jan. 1, 1898) there were 360 failures or irregularities, or about 0.8 per cent, and that was almost wholly due to the snow and the consequent blockading of teams in the narrowest streets.

Seven cars handle 100,000 pieces of mail daily. The system is under the supervision of New England Superintendent of Railway Mail. In other cities the trolley and cable service is under control of the local postmaster. The

General Superintendent of Railway Mail of the United States in his report for 1895, says:

"In Boston, by reason of the fact that the street car lines are all under one management, we are able to move mails from one suburb to another, as, for instance, from North Cambridge and Cambridgeport to Brookline, by direct transit; the mail not being compelled to pass through the main office. There is probably no city in the country where the benefits of this service will be as great as in Boston, with its densely populated suburban districts, all of which have heretofore been more or less restricted in their mail accommodations by reason of their mail having to go through the city post office. By the present system the railway post offices centering at Boston can "pouch" to the street car lines all mails for suburban points reached by them, and the street car lines in turn can gather up all the mail from suburban points and pouch it direct to the departing trains at the various depots."

The first practical illustration of a street railway post office was in Boston. Other cities had street railway mail cars first—St Louis and Brooklyn, where the mail was simply carried in bulk and delivered the same as if by teams, not being worked in transit—but Boston street railway cars were the first to be patterned after steam railway cars, with racks and all appliances for working the mails in transit; transferring, so to speak, so much working space, and clerks, from the main post office to the post office on wheels, thereby losing absolutely no time in handling matter, and enabling the business man to get his mail early in the morning rather than late in the afternoon, with nearly a whole day saved to him. One car is equipped with an electric cancelling machine, with a capacity of 2,000 cancellations an hour.

Let us follow a car to North Cambridge, and touching Park Square, Cambridgeport, and Cambridge post offices en route. Take the first trip in the morning, where the postal clerk receives from the general office all the accumulations of mail which arrive during the previous evening from all parts of the country. Upon arriving at Park Square station (the train from New York with all mail from the south and New York State arrives at 5:30), this mail is delivered direct to the postal car, and the contents opened by the clerk and assorted for the carriers. Upon the arrival of the car at Cambridgeport, a fifteen-minute run, the mail for that station is about all ready for delivery to the carrier. This also applies to Cambridge and North Cambridge. Now this car receives all mails collected at the various stations and assorts it in the car, inward, for all outgoing trains, so that when it reaches stations en route, or Boston, the mail is all ready for immediate dispatch. Each car handles nearly 5,250,000 pieces of mail, or a total of 36,561,170 pieces for the seven cars in a single year.

I thought, Mr. President, that these facts might be of interest in showing that the mail service as carried on here is not merely a transfer from a station to the post office, which method we investigated and decided could not be done to advantage, and which is virtually being done by pneumatic tube service here, but our method is practically a travelling post office, and each car is practically a branch of the general post office in Boston, which receives mail from the trains and assorts the mail and gives it to carriers, so that without question the average suburban mail here is two or three hours earlier in its delivery than it would be without this service.

What the writer of the paper says about the question of compensation I think is very true and important. I believe that something might be done by the association. We have never received a compensation here which has more than paid our running expenses. I think that any rate that should be fixed in an arbitrary manner, so much a car mile for carrying the mail, is entirely unfair. It all depends, it seems to me, on the conditions; what service is rendered,

what the character of the service is, whether combined with passenger service or whether it is done with independent cars, and what the local conditions of expense are. For example, I know that there are some street railway lines whose gross receipts from passenger business are not equal to our operating expenses for conductors and motormen in Boston. I have no hesitation in saying that the average expenses here per car mile for conductor and motorman, run to about 7.5 cents. The hours for labor are ten hours in twelve, fixed by law, and the compensation is \$2.25 per day, and 30 cents an hour for trippers. In some other cities the conditions are quite different; possibly they pay higher wages. On the other hand some mail routes are one straight away suburban route where a rate of ten cents a mile would be a good one, compared with one at thirty cents a mile, where the conditions are like those in Boston.

I feel, Mr. President, that what our Congress needs is enlightenment, that it does not comprehend the fact that the street railway service is better than the steam railway service, and is of a different character, and something which is such a public benefit that it would be a pity to have it stopped, and yet which is something we cannot afford to keep on unless we are properly remunerated. I am not without hope that something may be done through our association by getting at the conditions of service through the secretary, in correspondence with different cities. That might be done in an official way by finding out what are the various conditions under which different roads, which are members of our association are carrying mail, and what, if anything they are willing to do in the shape of concerted effort to bring these facts before the members of Congress who have to deal with these matters. Our Post Office Department is like all Government departments, it only sees so many general things, and not all the details that go to make up expenses and perfect service, but I believe the authorities mean to be fair, and if the true facts are put before them we shall probably be able to get a reasonable compensation for this service. I am obliged for the opportunity of saying a few words, and hope that some action will be taken by the association that will benefit us.

Mr. Beggs (Milwaukee).—I have listened to the paper which has been read with a great deal of interest, more particularly in view of the fact that the Milwaukee Company at the present time is going through the preliminary stages of establishing a mail service upon our lines which up to this date has not been instituted, not even to the extent of carrying the pouch.

I may say for myself that I have not been enthusiastic over it, because of the fact that it did not seem to promise a profit, and I think, as has been truly said in the paper, that the amount of protection that the various roads expected when they were established as mail routes, has not been of the advantage to them that they hoped, and it was because of the advantage that many of these roads expected to derive by carrying the mail, that they fixed an entirely inadequate rate of compensation to be paid by the Government. The Government took the rate of compensation established on the first few roads upon which mail was carried, and attempted to fix that as the basis of compensation to all roads whose services they require. I had presented to me by the post office officials at Milwaukee, the report of the second assistant Postmaster General, in which I found that there had been paid, not sixteen cents per mile, but in many cities, as shown by the report for the year 1896, about eleven cents per mile for postal car service, or an amount considerably below that which it costs to operate a car over the line, and yet that car is supposed

to be given the right of way at all times in order to make the service satisfactory. In making inquiries about this matter I found that the wagon service was costing nearly double what they expected to obtain a very much superior service for; and it seems to me that it is high time that this association in its capacity as such, should appoint a committee to take this matter up with the Government and establish some fair basis of remuneration, based, as Mr. Sergeant has suggested, upon the varying conditions. There are kinds of service that could be given in one city that might not be possible in another. In Milwaukee we could displace the wagon service because we control the entire street railway system, and on account of the peculiar location of the various lines, reaching to all the suburbs and running directly through the city, east and west and north and south. They propose there to do away with much of the carrier collecting service by having districts in certain sections of the city, and the carriers serving as collectors of mails, collecting the mail in certain districts and bringing it to one central point where the mail car passed, and which would pick it up periodically throughout the day, thereby reducing the number of collectors required.

As to the question of carrying mail pouches on the regular cars of the system, I seriously question its advisability. It may possibly be necessary in some of the smaller cities. I am free to say for the Milwaukee company that I do not favor carrying mail pouches on platforms of our cars. The platforms, as we all know, are too valuable to use to carry a mail pouch at three cents a mile, and it would very greatly inconvenience the patrons of the line, many of whom insist on using the platforms, whether you like it or not. It seems to me that if this association should appoint a committee to take this matter up in behalf of the street railways of the country, that committee could confer with the Government officials and establish some fair basis of remuneration, not simply for the purpose of having street railways established as mail routes, but, as in the case of steam railroads, to make them a source of revenue and profit. I think now is the proper time to do it, because the street railway mail service is established in a comparatively small number of cities. I understand that in Cincinnati, as Mr. Sergeant has stated, the cost of running the mail cars is about what is received from the Government, without any profit or compensation for the wear and tear or anything of the kind. I think the suggestion made by Mr. Sergeant that a committee of this association should be appointed to take this up with the Government for the purpose of having a fair rate of compensation, is an excellent idea, and it would be one of the most practical things that this association has done for its members up to the present time.

Mr. Farson (Chicago).—I have been impressed with this thoughtful and practical paper of our friend from Omaha. It is a question which will grow upon us from month to month, because, as has been stated, this service is just in its inception. When the street railway mail service is once started, there is no danger of going back to the old system, because the people will insist on the very best service obtainable. It is especially desirable for the large cities, because it gives a man an opportunity to send a letter in the morning and hear from it during the day, so that immediate action can be taken. It is an important matter to the street railway interests, for the reason that they should be reasonably and amply compensated for all the service rendered. The suggestion of the appointment of this committee is especially in point. Such committee could be appointed, and act under the direction of the executive committee, to collate from the different members of the association such facts as may be necessary for them to have. By acting unitedly we can secure much more

forcible and intelligent action. I would therefore move that a committee of five be appointed by the chair to act under the directions of the executive committee, and communicate with the different members of the association and get all the facts before them, keep the association advised of their proceedings and that they have authority to confer with the post office authorities.

Mr. Beggs seconded the motion.

Mr. Robert McCulloch (St. Louis).—I would state for the information of the association that one of the roads in St. Louis made a contract with the Government to carry the mail and had two cars built especially for the purpose. The compensation was entirely inadequate for the service alone, not counting the investment in special cars. The company expected to derive a benefit by being able to designate its road as a United States mail road, and had the inscription made on its cars "U. S. Mail." As soon as the cars appeared on the streets, at the suggestion or interference of somebody, no one knows whom, the Government required the sign to be taken off all the cars.

Mr. Dimmock (Council Bluffs).—After making an investigation and a conference with a number of Government officials, I think the secret of our success will lie in acting together as a body, and in the fact that we are not post roads. They treat us now as they would a contract with an individual, and if the committee will keep that point in mind it is in our power to dictate to them the terms that we will make instead of their dictating to us. That point is a critical one, and if we allow the present rates to continue there will come a time when they will demand of us to carry the mail at the same rates as they pay the steam roads, as mentioned in the paper, and that point should not be lost sight of. It is the most vital point in the whole subject.

Mr. Payne (Milwaukee).—Recently I had an interview with some of the department officials, the Postmaster General and Assistant Postmaster General, in regard to this subject. I found these gentlemen much interested in this question, but the difficulty with them is the lack of funds. The trouble lies back of the department. It lies in the appropriation available for this purpose, and you will have no difficulty I think in getting a reasonable compensation from the departments if a sufficient appropriation is made by Congress. I think the trouble lies largely there, and I have no doubt if the committee from this association will take the matter up and present it properly to the committee on appropriations having in charge the post office appropriation, that you will secure a very large increase. I have found the department officials willing to investigate the situation in the various cities, and to act as far as the means at their command will allow, and I have no doubt that the methods proposed will be the proper ones to pursue. But, of course, it will require the committee selected, if they hope for success, to visit Washington and press the claims of the street railroads on the proper committees of Congress before they take up each individual case with the department. I am thoroughly in accord with the resolution, but the committee will find that they have more to do than gather statistics and information. It will be necessary to go to Washington and present the case to the proper committee of the House of Representatives.

Mr. Farson's motion was then put to vote, and carried; and the president announced that he would appoint the committee later.

The President.—We will now take up the next paper, "Maintenance and Equipment of Electric Cars for Street Railways," by M. S. Hopkins, electrician, Columbus Street Railway Company, Columbus, Ohio. The secretary read the paper, which is found on another page.

Mr. Sloan (Chicago).—The main points in the paper just

read have been very thoroughly covered, I think, but there are some of the details with which I do not entirely agree. For instance, the gentleman states that he utterly condemns night inspection. With us night inspection works quite satisfactorily for several reasons; the main one being that we change our brushes every night. Every motor brush is changed each night. It works well on the commutators and results in very little burning down of the commutators. I have had commutators in for a year with not  $\frac{1}{8}$  in. wear, and I believe it is entirely due to the fact that we change the brushes every night. I think a car cannot be overhauled too often. With us it goes on constantly. When a motor comes in with the armature burnt out, the truck is run from under the car, and another truck already prepared is run in to take its place. In that way we inspect our trucks frequently, and find it works satisfactorily.

Mr. Hawken (Camden, Me.).—I am sorry the writer of the paper is not here, as I wish to ask him a question on an important point in regard to the series control of running motors. The electric people have always advised a certain point for hill climbing and efficiency of running the motor, and it has been stated that the series point with the fields in shunt has been the most efficient point. One question that I wish to ask Mr. Hopkins is that I notice that the rear motor on this point does about all the work, and the forward motor does very little. I know of one road in particular that uses this point very largely, and they have a great deal of trouble burning out armatures. I should like to know from some of the gentlemen here which is really the most efficient point in running the motors on series connections. I have made it a point for climbing hills to use the last notch on the series control with the motors connected in series parallel. I find that the most efficient point to run them, and the armatures have a long life.

Mr. McCormack (Brooklyn).—If there are no further remarks on this paper, I move that a vote of thanks be returned to Mr. Hopkins for presenting such an able paper. I learn from Mr. Kelly that Mr. Hopkins was unavoidably detained, as he had intended to be present and read his own paper, and I think a vote of thanks should be tendered to him.

The President.—Mr. W. Caryl Ely, the first vice-president of the Street Railway Association of the State of New York, has an invitation to extend to this association, and he will now be given an opportunity to present it.

Mr. Ely (Niagara Falls, N. Y.).—The annual convention of the New York State Street Railway Association will be held at the Manhattan Beach Hotel next Tuesday and Wednesday, and in behalf of that association, and upon the suggestion of Mr. G. Tracy Rogers, its president, I take pleasure in presenting the invitation of that association to such of you as may be able to do so, to meet with that association next week, and in that cool place, amid the singing of the murmuring waves, we may be able to get cooled off after the fatigues of this occasion.

Mr. Goff (Fall River).—I move, Mr. President, that the thanks of the association be extended to the New York association, through Mr. Ely, for their very kind invitation to meet with them next week. Carried.

The President.—The secretary has some communications in regard to the place for holding the next convention.

The secretary read letters from the Detroit Citizens' Street Railway Company, the Detroit Electric Railway Company and the Fort Wayne and Belle Isle Railway Company, Detroit, inviting the association to meet in Detroit next year.

Mr. Holmes (Kansas City).—I should like to introduce

Col. Morse, who will extend an invitation to this convention to hold its next meeting in Kansas City.

Mr. Morse (Kansas City).—Mr. Holmes this morning suggested advantages which we have as a place for holding the next convention; and we extend a most hearty invitation to the association to meet there in 1899. We trust that the invitation will be favorably considered by the association.

The President.—These invitations will be received and referred to the Committee on Nominations for consideration. I will now name that committee: Mr. W. Worth Bean, of Michigan, chairman; Mr. D. G. Hamilton, of Missouri; Mr. E. C. Foster, Massachusetts; Mr. W. F. Kelly, of Ohio; Mr. J. R. Chapman, of Illinois; Mr. Henry C. Payne, of Wisconsin, and Mr. E. H. Davis, of Pennsylvania.

The secretary announced that special cars would be in front of the Hotel Brunswick at 2 o'clock to take the delegates to the wharf to board the steamer at 2:30 P.M. for Nantasket Beach.

Mr. Kelly moved to adjourn until 9:30 o'clock Thursday morning.

#### THURSDAY'S SESSION

President Lang called the meeting to order at 10:30 A.M.

The President.—The International Association of Factory Inspectors is now in session at the House of Representatives. It has been suggested that we send them an invitation to attend our sessions and to inspect the exhibits.

Mr. Robert McCulloch (St. Louis).—Mr. Chairman, I move that such an invitation be sent. Carried.

The President.—We will now take up the first paper on this morning's programme, "To What Extent Should Street Railway Companies Engage in the Amusement Business," by Walton H. Holmes, general manager, Metropolitan Street Railway Company, Kansas City, Mo. Mr. Holmes read the paper which is published on another page.

The President.—I will ask Mr. Wyman to open the discussion on this paper.

Mr. Wyman (New Orleans).—Mr. President, at your request and by reason of my desire to accede to the same, rather than because I think there can be very much said that will not to a certain extent traverse the grounds that Mr. Holmes has so admirably gone over in his paper, I wish to perhaps only re-emphasize some of the points that he has made, and I do so very willingly because I have had a considerable amount of experience on both sides of this question. I have always believed, and was very positive in my belief for many years, that a strict railroad man should stick very closely to his line of work, and that he had very little freedom or time for going into the amusement business or any other sort of business that was not intimately connected with the daily operation of his cars, the management of his power plant and that style of business and methods that pertain specially and particularly to the working of his road. Therefore I have always said, keep out of it, don't go into the establishment of parks and the engagement of actors and actresses, musicians and all that sort of thing; do not establish skating rinks; let someone else in the dramatic line, some impresario or manager do it. If you do it at all, lease it out to him, encourage him in some way, but do not manage it yourself or try to run it.

I have discovered, however, that as Mr. Holmes very truly says, local conditions affect this matter to a very large extent. I have also discovered the truth of the old adage that if you want a thing done well you have to do it yourself, and my experience with the persons who are engaged



in the purveying of public amusements to the people is that they are not altogether the most reliable people in the world, and that it is a pretty good thing for you, if you want to establish amusements upon that line, to take them under your own control and management.

I have also found in a great number of cities where I have had both official and friendly relations with the company and its representatives that this promoting of amusement enterprises was a very good method of stimulating the business of the company. Now Mr. Holmes very rightly says that it was a proper thing for the street railway companies to aid in the development of the municipal improvements like public parks, etc., and on that score there is a philanthropic and humanitarian work, which we can do in this matter of amusements, especially during the summer seasons, for it is the universal custom in almost all cities to close the theatres and places of amusement during the summer. The wealthier classes of people then very often to a large extent leave the city for some summer resort, and the other class, the class from which we derive the major portion of our income, is left without amusements and healthful entertainments and pleasant outing resorts other than places like a simply plain field, or in many instances a pleasant park, but they want something more. Therefore, on the humanitarian side of the question we can say that we are public benefactors by furnishing amusement for the people.

Further than this it has not been in some cities the custom in hot weather for people to go out much in the afternoon and in the evening. In the southern cities this is particularly true. With the sun beating down, fairly warm, but not so warm as you have it here in the north even, we find that our people do not go out in the day time, and they were not accustomed as a rule to go out much in the evening; instead they visited from door to door, neighbor to neighbor, sitting on the galleries, as we call them in our country, and getting cool, and not getting out circulating about very much. Now we of the southern land have been trying to replace this practice with what we thought was better for them and incidentally for us, and we have provided in quite a large number of the southern cities, places of amusement, with music and attractions of one sort and another, by which we have cultivated to quite an extent the outgoing of the people in the evening. That local condition may not prevail in many cities, but it exists with us. We have found in the last two or three years, by having some of the resorts such as have been mentioned, open in the evening, with music and attractions, the people are commencing to go out, and travel has been greatly increased. Therefore upon that line wherever a habit of insularity on the part of the people exists, these amusement resorts, if well conducted, clean and pure in all their surroundings and in what is presented, will surely cultivate travel.

Now so far as the congestion of travel, which Mr. Holmes speaks of, on my particular line is concerned, I do not think that I fear that to a great extent. We are always willing to have a good deal of congestion in running a street railroad. It is always to be remembered that if a resort at the end of some particular line congests the travel upon that line, for the time being, in a great many instances we use that line as a feeder to the others. In one city with which I am familiar, there is one line at the terminus of which is a resort of this character; but while the cars are leaving at a minute or half minute, and sometimes twenty seconds headway upon that line, when it reaches the central part of the city the people immediately disperse to the other lines and the other lines get a large benefit therefrom. Fortunately the transfer system is not so extensively used as to preclude the other lines from getting some revenue. To that I think very often the congestion

which we suggested as being possibly injurious is not so harmful as one might think. Further than that the constant keeping before the people of a suggestion of pleasure, or interest, or something to amuse, of something to relieve the tedium of business is a most beneficial thing.

One thing we must always remember, that is that street railroad riding is after all a habit. As a habit it is growing. We can all look back a few years, when general riding was not so usual, when people walked a little more than they do now, when we sent out messages not by telephone but by messenger, and he walked. Now all these different improvements that we are introducing in the way of finer cars, of higher speed, of better facilities and, last of all, amusements, perhaps one of the most recent innovations, mean a constant tendency to increase the habit of street car riding; and I believe that anything that has that trend and tendency is certainly very beneficial.

As regards the detail of these things, we might discuss them ad libitum, as to how they should be conducted, etc., but that is mechanical, and will easily suggest itself to the mind of almost any manager. The main question is, does it pay? I think it does, and for reasons I have suggested. (Applause).

Vice-President Ely.—Are there not some other members present who will discuss Mr. Holmes' paper? The convention would be very glad to hear from them.

Mr. Davis (Williamsport).—I ask if there are any roads which keep their statistics concerning their amusement business, separate and apart from their general business, showing exactly the amount of their travel which is due as near as they can tell to the amusement feature of their business. The experience in Pennsylvania among the small parks is that the profits derived from the amusement business is not in proportion to the risk of the money spent, and in quite a majority of places the rule is that it is almost impossible for the manager to separate the hot weather travel on amusement lines from the travel due to the entertainment or park itself.

Mr. Holmes (Kansas City).—I will say that as far as Kansas City is concerned, where we have the out-of-town parks, we have kept careful records of the business, because we sell tickets to the park, and I would be glad to talk that over with anybody or send him information. I recently received a letter from Mr. Goodrich, of Minneapolis, who has a great deal of experience in the railroad business, and especially in the matter of parks. At Lake Harriett they have a nice pavilion, and they are relieved of the expense of maintaining the park entirely, and Mr. Goodrich is firmly of the opinion that it does not pay their company to employ a band of music or any other attraction for that park. I can easily understand why it would not because in our northern cities, and Kansas City is almost one, as compared with New Orleans, our summer season only lasts probably two and a half months, and we are compelled to depend upon the weather for our business. If the nights are cool travel is very light.

Speaking for Kansas City, I am convinced that we had better let the city furnish the parks and we contribute towards the music and attractions in the park. The real difficulty in establishing public parks in Kansas City was due to the fact that the street railroad companies had been quite liberal in providing parks. The people expected the companies to do it, and it is hard to overcome that feeling. The people would say, what is the use of our being taxed with a lot of parks and their maintenance, when the street railroad people will do it? But these conditions are changed. We now have a beautiful system of parks laid out for our city, and the company looks forward to great pleasure travel, contributing something to their support in the way of amusement.

Mr. Beggs (Milwaukee).—I quite agree with the general

trend of Mr. Holmes' paper. In our own experience for some years, we have in the public parks of the city band concerts of which the street railroad company paid the entire expenses, the city having no fund, as is the case in many cities. I thoroughly agree with that form of entertainment, and in behalf of our company we have a standing offer to duplicate any amount of money expended by the city, or raised by public spirited citizens for the purpose of giving music in the parks. Our experience, however, for two years was that where we paid the entire expense, as we did, taking the daily receipts of the particular lines leading to the resorts in which these entertainments were provided at the sole expense of the company, that we never got back at the outside more than seventy-five cents for each dollar spent. While we seemed to have an increase of gross receipts, which increased our gross receipts tax likewise, and made us seem to be doing an abnormal business, so far as dollars and cents left in our treasury went, we were the losers.

I am glad to hear this question discussed at this time, because we are having urged upon us now, by individuals, a scheme by which we would be called upon to put up a large amount of money for the parks by maintaining special amusements of this kind. From my experience and observation in various cities, I do not believe that it pays a street railway company to go into the amusement business. I think there is a great deal of misapprehension many times as to the manner in which this money is spent, by concentrating all the energies in this direction in one particular point of the city, and giving amusements at that place. They fail to recognize that much of the money spent there might have been spent in other sections, and with better effect; not to give so much special prominence to one point. I think our experience this year, where we have spent no money whatever on public entertainment, has convinced us pretty thoroughly that we are very greatly the winners by a refusal to contribute the entire amount necessary. I do believe in promoting the public parks of a city, as maintained either by the municipality or by public-spirited citizens, but I do seriously doubt whether any of these expensively maintained entertainment resorts pay the companies that promote them. I think it is because they have not carefully analyzed the total cost nor the effect upon the general system, and if the same enterprise had been expended in improving the facilities for travel, in making their cars more cheerful and comfortable, and improving the roadbed, it would bring much larger returns than in spending it for a couple of hours of diversion in the afternoon or evening. (Applause.)

Mr. Harrington (Camden).—We have a park, and we have had considerable trouble due to the fact that people would come to the park and take the best seats, and would not ride on our cars. The park is very near the city, and in order to guard against that, we furnished a ticket on the car to each passenger desiring to go to the park, and charge ten cents entrance fee to others. This method effectually shut out the objectionable element, and by the use of the ticket we determined the number of people going to the park. We find that while our travel is increased, owing to the expense of operating the park, we received only about 70 per cent income from the park of what the park cost to operate. The travel on the road, of course, is increased, and we can tell from the tickets just the amount. We think we are making some money, but whether we would make the installation and furnish the park if we had to do it over again is a question.

Mr. Farson (Chicago).—The coming railroad manager who will be highly esteemed, will be the man who not only gives his attention to reduce cost of operation, to the question of the very best electrical equipment, to the manner of

the very best handling of his cars, to seeing that his track is kept in the very best condition, but he will also devote a large part of his thoughts to the question of stimulation of travel. As has been well stated, the matter of riding on the cars is a question of habit, largely, and in many cases today where roads are operated at a loss, or just about even, or a small profit, a little attention to this line would mean dividends to the stockholders. From the standpoint of a stockholder I am very much interested in this question. It seems to me that the practical operators of roads could take this question up and study it from all its points of view, with great interest to people who own the stock. Conditions, of course, vary. In many small towns of ten to thirty thousand people, a little attention paid to the operation of a park either directly by the company, or by inducing someone to operate it for you, would mean today a dividend to the stockholders. Street railways, like other institutions, need leaders, and not followers. At the head of these institutions should be broad minded, wide awake, up to date men, who will study carefully the conditions in which they are situated, and use their effort and their energy for the purpose of bringing money into the treasury of the company. (Applause.)

Mr. Claflin (Boston).—We of the Norumbega Park, to which park you gentlemen are invited, have had a very different experience from some of the gentlemen who have spoken. We have adopted a different system from most of the street railway parks in Massachusetts, and it has certainly been a great success for the park and the railway. We have adopted the practice of charging an admission fee for the park, and discriminate in favor of our railway patrons. Our railway carries its patrons a distance of  $5\frac{1}{2}$  miles for five cents. We sell on our cars for fifteen cents a round trip ticket which includes admission to the park. We charge people going on foot or bicycle, ten cents admission. The result is that the railway patrons get admission for five cents, and the other people pay ten cents. That has a tendency to bring passengers to the railway company, and it has been a great success with us. The result has been that the park has maintained itself, and costs the railway company nothing whatever for its maintenance. The revenue derived from the road has been net. Our line is a small one, but the patrons there have been worth nearly 600,000 fares to us, at five cents each, as the result of the park's entertainments. The admission to the park is through a registering turnstile, and we know where the patrons come from. This statement may be of interest as showing circumstances where a park can be made to maintain itself as an enterprise, and the railroad not be put to any expense. The admission fee is small. We furnish theatrical entertainments, have a zoological garden, band concerts and other things, and manage to make the admission fee pay the entire expense, and also the interest on the money invested in the park, and the railway company gets its revenue net.

Mr. Lang (Toledo).—I want to offer a few suggestions that may be of value. Our city has 140,000 inhabitants. We are conducting a place of amusement on the lake shore, about  $5\frac{1}{2}$  miles from the center of the city. It was not established by our company, but is now controlled by it because we have purchased the road that built it. I had some misgivings about the value of the enterprise when it was started. We rectified some of the mistakes; one of them was that they started it on too large a scale and did not charge any admission. At the outset, a person who paid the street railway people ten cents could go on the ground and obtain free admission and a free seat in the casino building, where vaudeville and like comedy entertainments were given from 2 to 4 in the afternoon, and again from 8 to 10 in the evening. The ride on the cars included a seat

in any part of the house. At the same time they sold all kinds of soft drinks and had various amusements on the grounds. When it came into our possession we found it was losing money. It was said to have cost in the neighborhood of \$65,000 in land and buildings, and finding that it was running behind, we imposed an admission fee of five cents, which makes it correspond to what the gentleman from Boston says, fifteen cents for the round trip and admission to the grounds. As the patrons were registered by turnstiles, we knew at all times how many persons were going in. In addition, instead of giving free seats in the main part or body of the house, we put in reserved seats, for which we made a charge of ten cents. We found that plan working so well that we went into the gallery and put in reserved seats in the first two rows. The people of our city and friends of ours said we were making a great mistake in imposing this admission fee of five cents, and charging for reserved seats, but we tried it and it has been eminently successful. We have boxes that will seat four persons, which sell for twenty-five cents. We found this last year that we came out a few hundred dollars ahead of the operating expenses, but we run the Casino Company as an entirely independent company without any relation to the railroad company at all. It increased the earnings of the railroad companies about \$40,000 last year. This year the Casino Company will net about \$6,000, counting the fair depreciation upon the buildings, and the railroad company will increase its earnings over \$50,000. Now I realize that conditions differ in different places. What would be a desirable thing in Boston or New York might not be so desirable in another place of smaller population, and vice versa. But if any of you are further interested in this subject, I will be glad to give you any additional information I can, and hence will not take any more time of the convention in making further remarks.

Mr. Davis (Williamsport).—The practice in Boston and in the New England States has been for the railroads operating parks to furnish amusements and rely upon their car fares alone to reimburse them for their working outlays. I should like to have the experience of the managers of these parks as to whether they think it is profitable, and how long such parks have been operated at profit.

Mr. Wyman (New Orleans).—I do not like to weary you in this matter, and I am not from the New England States. In New Orleans we have the advantage of a long season. From the middle of April to September, usually a supplementary season during the month of September. This year the park closes on the 18th. We charge nothing for admission to our grounds. We have a resort on Lake Pontchartrain, about 6 miles from the city. We have a round trip car fare of fifteen cents. The grounds are very extensive, large hotels on either side which we own, and a large platform, a pier, bathing houses, boat houses, and of course anyone who uses the bathing houses or the boats has to pay extra, but the general thing is free. We provide a very fine band, our weekly pay roll for amusements running from \$2,000 to \$2,200 per week. The park has been operated as expensively as that for the last two or three years. We did not begin in such an expensive manner. We went at it in a small way, but finding it profitable, we have increased every year. We have chutes and merry-go-rounds, and all sorts of things of that kind. We keep an accurate record of our operating expenses and our receipts, keeping the road entirely separate from any other road, keeping an accurate record of all the cost of expenses at the beach, and we find that our proportion of receipts to expenses varies little from the ordinary electric road. In winter we do not do so well. Our operating expenses run from 70 to 90 per cent of the gross receipts, and that includes the winter time when the people do not go out,

but we run the road all winter. Of course we have some rentals there, and we find we are amply repaid by the travel. We charge nothing for entrance to the park to anyone who may come in a carriage—it is at the end of the Shell Road—we allow everyone free and absolute access, and it is our impression that the fact that it is there helps us. We carry a man 12 miles for fifteen cents, and give him a good show in the matter of good music and other things, as good as he can get anywhere else for half a dollar, and the people are inclined to come.

Mr. Holmes (Kansas City).—I notice a gentleman in the audience who was with our road in Kansas City for four years and laid out the first park for our company. He has had a good deal of experience with parks since that time, and we ought to hear from him. I refer to Mr. Chapman.

Mr. Chapman (Chicago).—I am somewhat rusty now on the amusement business, but I can give a little experience at Grand Rapids, Mich., where the lines were converted from cable and horse cars to electric, and a very pretty park was constructed at the Lake, where the average haul was 4 miles from the center of the city. We commenced, as nearly everybody else has done, in a small way. The first attractions were merry-go-rounds and things of that kind. It gradually became more and more expensive, better music, and unfortunately more and more bicycles, so that while the patronage largely increased, the expenses increased in much greater proportion. Since I severed my connection with the Grand Rapids property, they have found it advisable to build a small auditorium and help out their roads by charging admission to the reserved seat section of this auditorium, allowing the people to stand on the outside without extra charge. They furnish attractions costing them from four hundred to six hundred dollars a week, and are making the amusement feature more successful than it ever was before, since the days of the introduction of the bicycle. Before that time it was very satisfactory.

Mr. Thompson (Muskegon).—Mr. President, I came to listen, not to talk. It is true that we have a park at Muskegon, and also pavilion and theatrical attractions. The last three years we have conducted the attraction part of it on a little bit of a stage attached to the main building, and have found it fairly profitable. This year we went to an expense of two thousand dollars, and built a properly constructed addition for theatrical entertainments, with 584 reserved seats, and the stage lighted by electricity, which cost about two thousand dollars. Up to this year we allowed everybody in the park without any restrictions. This year we allow no one in the pavilion unless he purchased tickets on the cars. Passengers may go into the old part of the building, which has flat bench seats with a capacity of seven hundred, for the fare. The reserved seats cost five cents extra, and this year we have more than paid the cost of our theatre from the reserved seats. The increased travel in the months when the weather was fine was \$1,000. A good park, with good attractions, in my opinion, will be a paying venture for a street railway company.

Mr. Cahoon (Elmira).—One point does not seem to have been touched upon by any of the speakers, and that is the increased liability to accidents. If we increase the travel by means of amusements or parks or entertainments, in carrying the greater number of the people we are thereby inducing to go to these places, we certainly increase very materially the chances for accident; and it would seem to me that in the matter of expenses, the question whether these parks pay or do not pay, the matter of damage suits and of the liability for damages that are incurred should be considered. I think that would open up a profitable field for discussion. This amusement question is becoming a very vital one, especially to the smaller roads. The roads which I represent is of that class. We have a city of about

45,000 inhabitants, and at the end of our line is situated a public park. We cannot control any of the privileges, but we can pay all the expenses for having amusements there, and unless we do that we do not get any travel there to speak of. The question of damages has come up on two occasions, and I think largely on account of the greater number of passengers carried incident to the amusement.

Mr. Jones (Memphis).—It seems to me the whole question is one of locality and conditions. Take the case cited by Mr. Wyman. He has a resort there which was there before the electric road was put in. I have often paid five dollars for a carriage to drive out there. It is a beautiful place. The more advantages he gives the people, the better his patronage. Take a park in Boston. I do not see how a park could be profitable here, because the season is short unless you have a park which people will visit in the afternoon. If you expected people to go to a park in the afternoon at New Orleans and Memphis, it would be an absolute failure, because they do not go out at all except in the evening. We think we can do more in that line by having a park for the reason that our seasons lasts about eight months. Our people begin to go out in the evening early in April; and I have seen the temperature on Christmas Eve 78 degs. with us. We think that sort of a place would be better than it would be up here. I think the question solves itself down to one of local conditions.

Mr. Heft (Meriden).—I am glad to observe the gentlemen living up to the traditions of street railway men by being honest and coming here to tell us the truth. We are operating a park that we inherited when we bought the road. The people had spent about forty-five thousand dollars on the park. They had put up posts to tie their horses to, put launches and boats on the lake that everyone might take a ride, and they built a casino and a switch-back road. They provided a baseball grounds, and all of these things were free to every man who chose to enter there. I want to say to you that when the balance sheet was figured up at the end of the year, we found that our experience has been about the same as the gentleman from Milwaukee, and I think the street railway men of to-day have run mad on this question of amusements, providing everything without any recompense whatever, and if we are going to make these parks pay, they must be run upon a business basis, and an admission fee charged. We must not forget that when we add to the receipts we add to the operating expenses of the road, and all these things must be figured out, or at the end of the year we shall be short. I am very glad to hear from the gentleman on this question; and it seems that the only men who make money, with the exception of Mr. Wyman, who lives in the sunny South where everything comes to you free, is the man who charges an admission to his park.

The President.—As there seems to be no further discussion on this question, we will now take up the report of the nominating committee. Mr. W. Worth Dean, the chairman of the committee, will present the report.

#### REPORT OF NOMINATING COMMITTEE.

The nominating committee that was appointed by the president yesterday to select a place of meeting and nominate the officers and executive committee, desire to make the following report:

For president, Charles S. Sergeant, second vice-president Boston Elevated Railway Company, Boston.

For first vice-president, Henry C. Moore, president Trenton Passenger Railway Company, Trenton, N. J.

For second vice-president, Ernest Woodruff, president Atlanta Consolidated Street Railway Company, Atlanta, Ga.

Third vice-president, Walton H. Holmes, vice-president and general manager Metropolitan Street Railway Company, Kansas City, Mo.

Secretary and treasurer, Thomas C. Pennington, treasurer Chicago City Railway Company, Chicago, Ill.

Executive committee: Albion E. Lang, president Toledo Traction Company, Toledo, Ohio; George E. Yuille, second vice-president West Chicago Street Railroad Company, Chicago, Ill.; Frank G. Jones, president Memphis Street Railway Company, Memphis, Tenn.; John I. Beggs, general manager Milwaukee Electric Railway & Light Company, Milwaukee, Wis.; Ira A. McCormack, general superintendent Brooklyn Heights Railroad Company, Brooklyn, N. Y.

Moved and seconded that the next meeting of the association be held in Chicago, Ill., provided that facilities satisfactory to the executive committee, in the way of a proper hall for exhibition and convention purposes, shall be provided without expense to the American Street Railway Association.

Respectfully submitted,

W. WORTH BEAN, Chairman of Committee.

E. D. FOSTER,

ERNEST H. DAVIS,

JAS. R. CHAPMAN,

H. C. PAYNE.

Boston, Mass., Sept. 8, 1898.

Carried.

Mr. Shaw (Boston).—I move that the report of the committee be accepted, and that the secretary be authorized to cast the ballot of the association for the gentlemen nominated. Carried.

The President.—I appoint as tellers Mr. Chapman and Mr. Ely.

The tellers reported that the ballot had been cast unanimously for the gentlemen nominated, and the president declared them duly elected.

Mr. Farson (Chicago).—May I not compliment the committee on this admirable report and the splendid selection of officers, and also upon their selection of Chicago for the next place of meeting. I may say, on behalf of the street railway people of Chicago, that we will do everything in our power to make the convention interesting, profitable and instructive. We will welcome you, gentlemen, with open arms. (Applause.)

The President.—I will appoint as a committee, provided for in the motion of yesterday, regarding the carrying of United States mail matter on street railways, the following gentlemen:

John T. Burnett, Boston.

Henry C. Payne, Milwaukee.

Ira A. McCormack, New York.

D. G. Hamilton, Chicago.

W. S. Dimmock, Council Bluffs.

The president read a letter from the Boston Elevated Railway Company, inviting the delegates to visit any or all of the various power plants, shops, car houses, etc., of the company, and stated that special instructions had been issued to have particular attention shown to the visitors.

"The Chutes" on Huntington Avenue extended its courtesies to the delegates. A letter was read from Mr. D. B. Dyer, of Augusta, Ga., regretting his inability to be present at the convention, and a similar letter from Past-President C. B. Holmes.

The President.—I have been informed that Mr. T. Y. Dzushi, Chief of Finance and Manager of Stores of the Imperial Government Railways of Japan, and Mr. Sugahara, Chief Engineer of the Kobu, and of some street railroads soon to be built in Japan, are in the room, and have been attending this convention since it opened, and I think that in some way we should express our pleasure in meeting them.

Mr. Ely (Niagara Falls).—I move you, Mr. President, that the privileges of the floor be extended to these gentlemen and that they be invited to address the convention. Carried.

Mr. Sugahara.—It is a great privilege and honor to have

the pleasure of meeting you on this memorable occasion, and to occupy a seat in this national convention of street railways, in this great country. I desire to express my sincere gratitude for your hospitality extended to me as well as to my friend Mr. Dzushi.

Japan is achieving a great deal of material progress, and is striving to accomplish in rapid succession what she learns from abroad. Your venerated Commodore Perry opened our gate to Western civilization some forty-four years ago, and to-day your generous discoveries and inventions lead us hand in hand to the march of material civilization, for which we are greatly indebted to your people and country. To tell you of my experiences regarding the construction of street railways in Japan, I wish to inform you that I was the first engineer of a private company which has built steam street railways for passenger traffic in Tokyo, in 1896 and since then. I am naturally devoted to the investigation of street railway construction, and you can hardly imagine how interesting and helpful it is to me to be present in this great convention.

The progress of our street railway system is very slow, and it is in a primitive stage as yet. For instance, there are only about 60 miles of street railways in Japan, and most of them depend on horse power, except the Kyoto and Nagoya electric lines. Several electric railways, however, have been projected in different cities and towns throughout the country. We are firm in our belief that in the near future Japan will be found a network of electric street railways. Should I engage in the construction of street railways in Tokyo after returning home, and apply the knowledge I have gained here, I shall be very much indebted to you all. We have about 40,000 of jinrikshas and 90,000 of wagons drawn by men as a means of transportation in Tokyo, and these greatly interfere with the progress of street railways. Notwithstanding these difficulties, Tokyo horse car railway companies pay, on the capital invested, thirty per cent dividends annually, and our steam road company pays thirteen per cent. We have no doubt that to build street railways in Tokyo is one of the most promising enterprises. It is my great desire that our country shall progress in such a degree that when any of you shall come to Tokyo, you may go to any place in the city by street cars, not by jinriksha, and that our country may be considered one of the industrial countries of the world, and not only as a country of beauty and curiosity.

The President.—Gentlemen, I am sure that I express the feelings of all the members of this convention when I say that it is a great pleasure for us all to meet you. I take pleasure in presenting you a badge that will admit you to all our sessions and every exhibit in the building, and I believe to every home in the city of Boston. I trust you will carry these with you with our best wishes. I also desire to present you with tickets to the banquet to-night, and we will be glad to have you join us at that time. (Applause.)

Mr. Dzushi.—Gentlemen, it affords us great pleasure to meet you here. I desire to express our hearty thanks for your kind invitation. (Applause.)

Mr. Payne (Milwaukee).—I desire on my own behalf, and I have no doubt on behalf of all the members of the association, to return to the members of the Massachusetts Street Railway Association, and to the members of the local committees, and all those who have interested themselves in entertaining us in the city, our sincere thanks for the magnificent manner in which they have done their work. I think it is not too much to say that the arrangements for this convention have not been excelled in any place where we have met, certainly not where I have been in attendance upon the meeting. It is but proper that we should make known our feelings

in that regard, and I offer a resolution that the secretary be instructed to tender to the persons the heartfelt thanks and appreciation of the members of this association.

Mr. Chapman seconded the motion, which was duly carried.

Mr. Payne (Milwaukee).—One thing more. I do not know whether it is the proper time, but I think the members of the association will desire to place upon record their appreciation of the manner in which the officers during the last year have performed their duties; and I therefore desire to move that the thanks of the association be tendered to the retiring president and the other members of the executive committee of the association.

Mr. Payne put the motion, which was unanimously carried.

President Lang.—I thank you very much, gentlemen, for this expression. We have only done our duty, and we hope the result of our labors will be beneficial to all who attend our meetings and all who may read the report of the meeting when published.

Mr. Ely (Niagara Falls).—I move that a special vote of thanks be extended to the members of the ladies' reception committee, who have been so untiring in their efforts to the entertainment of the visiting ladies, and who have expended so much time and pains in making their stay pleasant here. Carried.

The Secretary.—I will announce the names of some new companies that have joined the association since the opening of this meeting.

Warren, Brookfield & Spencer Street Railway Company, Warren, Mass.

Brockton, Bridgewater & Taunton Street Railway Company, Boston, Mass.

Providence & Taunton Street Railway Company, Taunton, Mass.

Milford, Holliston & Framingham Street Railway Company, Framingham, Mass.

South Chicago City Railway Company, Chicago, Ill.

St. Joseph Railway Heat, Light & Power Company, St. Joseph, Mo.

Gloucester Street Railway Company, Gloucester, Mass.

Fair Haven & Westville Street Railway Company, New Haven, Conn.

The President.—We will now have the paper on "Inspection and Testing of Motors and Car Equipments by Street Railway Companies," by Mr. Frederick D. Perkins, electrical engineer, Toledo Traction Company, Toledo, Ohio.

Mr. Perkins was present, but owing to his indisposition, the paper was read by the secretary. It will be found on another page.

Mr. Chapman (Chicago).—In view of the lateness of the hour, I move that this paper be accepted, with the thanks of the convention, and filed without discussion. Carried.

The president announced the trip to Plymouth in the afternoon, and the annual dinner in the evening, after which the meeting adjourned.

#### FRIDAY'S SESSION

The president called the meeting to order at 10:40 A. M., and announced that the first business would be the paper on "Cost of Electric Power for Street Railways at Switchboard, both Steam and Water," by Mr. R. W. Conant, electrical engineer, Boston Elevated Railroad Company, Boston, Mass. Mr. Conant read the paper, which will be found on another page.

Mr. Sergeant (Boston).—I move that the thanks of the association be tendered to the writers of all the papers that have been presented to this meeting.

Mr. Goff (Fall River).—I feel that in relation to Mr. Conant's paper, I would be remiss in my duty as a member of the association if I did not urge that it should be specially recognized as a most valuable piece of work. Mr.

Conant has devoted a very great amount of time to its preparation, and he deserves every credit for the work; but it is a paper of such a nature that we cannot discuss it here. We can discuss it after we have it before us in the printed report of the proceedings, but I feel that there should be a special mention of Mr. Conant's name in this connection.

Mr. Beggs (Milwaukee).—I desire to reiterate what my friend has just said. I took occasion to give my personal thanks to Mr. Conant. From my experience as a manager of electric light and street railway plants, I thoroughly appreciate the vast amount of labor which he has expended upon the tables in compiling the data from various companies which is not always placed as clearly as it might be before persons who are going to perform a service of this kind. Mr. Conant's paper is worthy of special mention. It is hardly practical to discuss the paper in this meeting. It is rather a paper which we can take up with our technical men, our engineers, and men in charge of power houses, and I believe if the paper is thoroughly considered it will result in a large saving of money to every railroad company who takes the subject up in that way. I desire to second all that has been said in regard to the importance of the paper, and the careful manner in which it has been prepared, also for the way in which it was presented to this meeting.

Mr. Sergeant's motion was put and carried.

Mr. Conant (Boston).—I wish to thank the members of the association for their very kind words, and also for their uniformly courteous replies which I have received from them when asking information.

The President.—We will now take up the report of the committee on "Standard Rules for Government of Conductors and Motormen," of which Mr. W. J. Kelly, of Columbus, Ohio, is chairman. I understand that Mr. Kelly is indisposed this morning.

Mr. McCormack (Brooklyn).—Mr. President, I am a member of the committee, and have been looking for Mr. Kelly, the chairman of the committee, who has formulated a set of rules and regulations for the government of conductors and motormen, to submit to the convention. It was the intention of the committee to ask that the rules, as formulated, be submitted to the convention, and we would ask that the committee be continued for another year, and that the sum of \$200 be given to the committee to have the rules printed and mailed to the association, in order that any suggestions or criticisms might be made; and after it is printed, if any member of the association desires to adopt the rules in part or in their entirety, they can do so. It was our idea that after the rules are printed and subjected to this criticism, then the association can pass on the adoption of the rules next year. The committee thinks that the rules should be taken up separately, and a discussion had on each rule, and each rule adopted or rejected by the convention, somewhat in the same way that the standard code of rules was adopted by the Superintendents' Association of Steam Railroad Men.

Mr. Goff (Fall River).—I move that the committee be granted the extension of time asked for, and that we appropriate the sum of \$200 as they request.

Mr. Beggs seconded the motion which was adopted.

The president announced that it was the desire of the secretary that members of the association should indicate topics upon which it would be desirable to have papers prepared for the next convention, and that they should also suggest a person who would prepare the paper.

Mr. McCormack (Brooklyn).—I offer a motion that the thanks of the convention be given to the press of Boston, for the intelligent manner in which they have written up the proceedings of the convention. Carried.

The President.—The only remaining thing for us to do is to install the newly elected officers, and the installation of the officers is usually represented by the installation of the president. I will appoint Mr. Chapman, of Chicago, and Mr. Davis, of Williamsport, a committee to escort the newly elected president to the chair.

The secretary then read the names of all the officers elected.

The President.—It is needless for me to introduce Mr. Sergeant to you, but I desire to say that I appreciate the high honor you conferred upon me a year ago in electing me to this office, and I bespeak for Mr. Sergeant your kind and considerate attention to his communications. If you do so much for him as you have done to make this Boston meeting a success, we shall have a splendid meeting at Chicago next year.

President Sergeant.—Gentlemen and Members of the American Street Railway Association: I wish to thank you most heartily for my most sudden elevation to office. I feel proud to be permitted to serve you for the coming year. I cannot hope, perhaps, to give as good an administration as my immediate predecessor, Mr. Lang, whose efforts in behalf of the association I am sure you all appreciate. The success which has crowned these efforts, and the long line of past presidents, fills the mind of a new incumbent with some embarrassment, based on the idea that there is a standard which must be upheld.

As to this association, I feel strongly that it has a great work to do, that its meetings are not merely a pleasant vacation, that it is not called together merely for the purpose of reading and discussing the papers, but I believe in the complex relations which are continually coming forward as between the committees and the municipalities, and the State Governments and the street railways, that much is to be gained by concerted action. Certainly in Massachusetts we have benefitted very greatly from the fact that our street railways have pulled together for what they knew was right, and they have succeeded, after a struggle covering many years, in obtaining a settlement which, I suppose, looked at from all sides, could be called a fair settlement of the relations of the street railways and the community. I hope that the trial which is being made here of this new plan by which the oppressors of the street railways in a great many communities have been shown by an act of the Legislature how far the street railways are liable to perform work which is not in the line of street railway practice, and by which the street railways themselves are compelled to pay a portion of their receipts for the benefit of the highways. It seems to me that all this work which has been done here is instructive, and is the beginning of a proper recognition of our industry over the whole country. I assure you, gentlemen, when I first went into the street railway business, particularly in the operating department, I was perfectly appalled. It seemed to me that I was in an unlawful business, and everybody was down on the street railway; for it was hampered and troubled by one requirement and exaction after another, and when we made complaints the answer to it all was, "You are in the public streets, you encumber the streets, and you must pay for it." How much better it is to know what we have to pay for, than it is to be put to such payment that may devolve upon us in the judgment of some subordinate road department official in some municipality.

I think in such ways as that, and in this matter which was taken up the other day, of the mail service, simply in having our case presented in order to get proper recognition, the association had a field, perhaps greater than any it has yet filled, and I can only say in closing, that so far as it lies in my power to further the work of the asso-

ciation and benefit the interests of street railways, I shall certainly do so. I thank you very much, gentlemen, for the honor.

Ex-President Lang.—I now declare the newly elected officers to be duly installed, and take pleasure in handing to the new presiding officer the gavel with my best wishes. (Applause.)

President Sergeant.—I believe that the constitution of our association provides that the newly elected officers shall enter upon their duties after the annual meeting is adjourned. And as it seems almost as if some duties were about to be forced upon me, I suppose for that reason a motion to adjourn would be in order.

Mr. Goff (Fall River).—I move you, Mr. President, that we adjourn to meet in Chicago in 1899.

Adjourned.

#### THE SOCIAL HISTORY OF THE CONVENTION

All who visited Boston during the recent convention returned with many expressions of the hospitality shown them during their visit in that city by their host, the Massachusetts Street Railway Association. No effort was spared to make the time in Boston pass pleasantly, and while the delegates and supplymen were busily engaged in the morning at the Convention Hall, special trips were arranged by the ladies' committee for the ladies in attendance. If the members of the committee on entertainment could have heard one-half the words of praise spoken concerning their efforts, they would certainly feel that their plans were entirely successful.

The first trip undertaken was that scheduled for 2:30 P. M. on Tuesday to Concord and Lexington. Promptly at 2 o'clock a long line of special cars drew up in front of the Brunswick and were boarded by those intending to make this excursion. On their way to the Union Station the cars passed through the subway, giving the delegates a good opportunity of viewing that completed structure, and at 2:30 a special train loaded with street railway men and others, with many ladies, drew out on the Boston & Maine tracks for Lexington. The latter place was soon reached, and a visit was made first to the historical square where gathered the first body of armed men assembled to resist British attack during the War of the Revolution. A short but interesting address on the chief historical points connected with the town was made to the assembled delegates by Rev. Mr. Staples, historian of the Lexington Historical Society, after which the visitors inspected some of the most interesting sights close to the square. From Lexington the party was carried by the same special train to Concord, where the visitors were met by a large number of carriages, barges and omnibuses specially chartered for the occasion, and inspected the many points for which that place is noted. The first objective point was the famous battlefield, and afterward the party was driven about the town, passing the former homes of Emerson, Hawthorne, Thoreau and Alcott. Later a visit was made to the Sleepy Hollow Cemetery where many of the illustrious dead of Concord are buried. The visitors returned to the city about 7 o'clock.

Later in the evening an enjoyable reception was given at Paul Revere Hall in the Mechanics' Association Building. This reception was largely attended by many ladies of Boston, and was a great social success. Many indulged in dancing, and later in the evening an elaborate collation was served.

Wednesday morning the ladies in attendance at the convention were taken on a special excursion around Boston, during which the historical points within the city were visited. In the afternoon the visitors went on a special steamer to Nantasket, where a clambake was served. Many

improved this opportunity of taking a dip in the surf and in shooting the chutes and testing the other seaside attractions. The return to the city was made late in the evening.

Thursday morning, while the delegates were engaged at the Convention Hall, the ladies in attendance were taken for an extensive drive through the elaborate system of Boston parkways. About twenty-five carriages were required to carry the party. The afternoon was devoted to a trip to Plymouth by special train. The points made memorable through the landing and sufferings of the Pilgrims in this old and interesting city were visited, notably the Pilgrim Stone, Pilgrims' Hall, and the old Burying Ground, while the Miles Standish Monument at Duxbury, across the bay, could be seen by all. The party returned to Boston by about 7 o'clock, many of them bringing as mementos of the trip souvenirs which had come over in the Mayflower—perhaps!

In the evening the annual banquet was held in the large dining-room of the Brunswick Hotel, at about 9 o'clock. After the banquet proper, which was an exceptionally good one, came a series of toasts, the speakers being called upon in order by President Lang. It was expected that Governor Wolcott and Mayor Quincy would be able to respond, but both were unable to be present, the former through the unexpected return to the city on that day of a regiment of Massachusetts volunteers coming from Santiago, and the latter to keep some other and earlier engagements. General Patrick A. Collins was also to respond to a toast, but was obliged to retire from the dining-room early in the evening on account of the discomfort the brilliant lighting of the room caused to his eyes.

Hon. George G. Crocker, chairman of the Boston Rapid Transit Commission, the first guest called upon to speak, described the subway and the conditions that called it into being, and in referring to its success, now that it is finished, said much credit is due the street railway company for its co-operation in making it successful. Samuel J. Elder, who was assigned to speak for the bar, talked about a great many things, and in a way that created lots of fun, incidentally paying a high tribute to the New England bar of today for having produced such men as Tom Reed, John D. Long and Richard Olney. Stephen O'Meara, in speaking for the press, traced many points of resemblance between street railways and newspapers, notably in their liability to receive strong public criticism, but he thought that if both did their full duty, the reward would be found quite ample in the end. Hon. Carroll Paine, attorney for the Atlanta Consolidated Street Railway Company, then made a patriotic speech that aroused warm applause. He was followed by General William A. Bancroft, of the Boston Elevated Railway Company, and Charles S. Sergeant, the newly elected president of the association. Both spoke of the pleasure of railway men of Boston in entertaining the association, while General Bancroft paid a high eulogy to the ability of Mr. Sergeant as a railway manager, as shown by the history of the West End Railway. It was nearly 12:30 A. M. when the gathering adjourned.

Friday morning was devoted by most of the ladies to visiting the large stores in Boston, and in the afternoon, although the convention was then nominally over, a large number of visitors waited to take the trip by electric cars to Norumbega Park, by way of the Boston Elevated Railway and Commonwealth Avenue Street Railway systems. Those who made the trip felt fully repaid for waiting over. Untiring and energetic to the last, the entertainment committee, finding a sufficient number of visitors still in Boston available, arranged a theater party for Keith's on Friday evening. This was not on the programme and it came as a pleasant surprise to the delegates. The body of

Keith's Theater was reserved for the party and was well filled. The performance was well up to the Keith standard and was heartily enjoyed, particularly in view of the fact that the performers lost no opportunity to make the party feel wholly at home. Many good jokes were perpetrated at the expense of the railway men. The personnel of the entertainment committee follows: P. L. Saltonstall, Boston, chairman; H. F. Eldredge, Portsmouth; A. B. Bruce, Lawrence; C. C. Pierce, Boston; C. W. Wilson, Boston; J. F. Shaw, Boston; J. H. Goodspeed, Boston; J. H. Cunningham, Boston; B. J. Weeks, Quincy; W. W. Sargeant, Fitchburg.

### The Street Railway Accountants' Association

The second annual convention of the Street Railway Accountants' Association of America was held in Boston, Sept. 6, 7, 8 and 9, simultaneously with the convention of the American Street Railway Association. The room in which the accountants were assembled was just across the hall from the main convention, and during the sessions a number of the members of the American Street Railway Association paid brief visits to the accountants.

The first session was called to order at 11 o'clock on Tuesday morning, with President H. L. Wilson in the chair. The minutes of the last meeting, having been published in full in book form, were not read, but instead were formally approved in that shape. President Wilson then read his annual address as follows:

#### PRESIDENT'S ADDRESS

Why this association has continued to shower honors on my unworthy head is something I have been unable to understand. When I found it would be impossible for me to be present at the first annual convention of the association at Niagara Falls last year I naturally supposed that my career as presiding officer had come to an untimely end, and the only reason that has occurred to me since why this was not so, is that you all felt so sorry that it was necessary for me to forego the many instructive features, as well as the many pleasures, which you, who were present, enjoyed on that occasion, that from pure sympathy you concluded to give me another opportunity to occupy the chair. You have my assurance that whatever the reason may have been your generosity was fully appreciated, and I thank you for the double honor you have conferred upon me.

The interests of all persons connected with the street railway business are, or should be, the same, and it is a pleasure to note how much closer the accounting and operating departments are constantly coming together. Accounting is now looked upon as a much more important branch of the business than was the case a few years ago, and we must make it the aim of the association to make it still more important each year. In order to accomplish this much desired end we must steadily look forward, and use every endeavor to shorten, improve and perfect our methods in such a way that the results will give more complete information in as concise a manner as possible to all departments of the company.

That a thing is good enough is a mistake we must not allow ourselves to fall into. How many of us to-day would be satisfied with what our grandfathers considered was good enough for them?

Most of you are thoroughly familiar with what this association has already accomplished, and while some may possibly think that the improvement has been so rapid that it may have been caused by the enthusiasm of youth, and cannot continue in the same ratio, I for one think we have only begun the good work, and that it is bound to continue if only the same interest is shown in the future as has been shown in the past by all our members.

The committee appointed to further consider the question of a standard system for street railway accounting has been very active during the past year, and three of the five members, namely, Mr. Duffy, Mr. Ham and Mr. Davies, have worked very hard in trying to perfect what the previous committee so ably accomplished in the short time they had to devote to this subject previous to the last convention. They have consulted with members of the Association of State Railroad Commissioners, with the Interstate Commerce Commission, and with members of the Association of Railway Accounting Officers, and have asked for suggestions from all our own members, and have carefully considered all questions which have been submitted to them. They held a meeting in New York a few weeks ago, and met again at Cleveland only a few days since. They have rendered the association much valuable service at no inconsiderable sacrifice to their time, and have refused to allow the association to pay the personal ex-

penses of their meetings, and they should receive our unbounded thanks for what they have accomplished. The report which they will submit is the most important matter we have to consider, and I trust that every one present will have some views on this subject, and will not hesitate to give us the benefit of their ideas.

The association has continued to grow in a manner that is quite encouraging, and if it is not all that we might have hoped it would be by this time it is at least quite gratifying that the membership has steadily increased, and that while its growth may have been somewhat slow it is still very healthy and the scope of the territory covered is constantly widening. Before the final adjournment I hope that our membership may be doubled, and we ought to feel that if we can induce any of the railway officials who are now in this city to join our association we are doing them and their company a favor, as I feel assured they will consider themselves well repaid when they know the benefits to be derived from a membership in our association.

During the year we have admitted another company from the Republic of Mexico and one from the city of Honolulu, in the Hawaiian islands. I do not know whether our having admitted this latter company to our association was all that was necessary to influence Congress to annex these islands, but it is a fact that it was only a very short time afterward that they obtained the recognition they had so long sought.

It is with the deepest regret that I have to announce that the grim messenger of death has entered our ranks and taken from us three members, Morris W. Hall, of Camden, N. J.; James A. Stratton, of Birmingham, Ala., and C. B. Reavis, of Atlanta, Ga. All of these gentlemen were deeply interested in everything pertaining to the welfare of our organization, and many of us feel a personal sorrow at the loss of our friends.

The American Street Railway Association clearly demonstrated by the recognition they accorded our association at the last convention that they have a kindly interest in our well being, and we shall always consider that we owe them a deep debt of gratitude for all the delicate attentions they have shown us.

The two leading street railway publications have also shown us many favors, and have done all that lay in their power toward bringing our organization prominently before the railway fraternity of the country, and I take this opportunity to thank them in the name of the association. I shall not consider my duties completed without first calling your attention to what our secretary and treasurer has done, and is still doing, for us. To his tireless energy we owe to a large degree our present high standing, and the tasks which he is constantly imposing upon himself would well tax the strength of a much stronger man.

The report of the treasurer, W. B. Brockway, was next presented as follows:

#### REPORT OF THE SECRETARY AND TREASURER

In reviewing the transactions of this office for the second year of the association there is much to encourage us to continued effort in the extension of the interest in our aims and reasons for organizing. That the importance of the results we desire to reach and that our aim to be of more assistance to the street railway properties of America is being appreciated can best be shown by the following statement of our membership:

Total companies joining at Cleveland, Ohio, March, 1897....	25
Number joining between Cleveland and Niagara Falls meeting .....	12
Number joining at Niagara Falls, N. Y., October, 1897.....	16
Number joining since Niagara Falls meeting.....	16
Total .....	69
Less Cincinnati Street Railway Company, withdrawn.....	1

Total membership Sept. 2, 1898..... 68

The companies joining at the Niagara Falls, N. Y., meeting were:

- Brooklyn City & Newtown Railroad Company, Brooklyn, N. Y.
- Columbia Railway Company, Washington, D. C.
- Wilmington City Railway, Wilmington, Del.
- Tonawanda Electric Railroad, North Tonawanda, N. Y.
- Milwaukee Electric Railway & Light Company, Milwaukee, Wis.
- Manchester Street Railway, Manchester, N. H.
- Memphis Street Railway Company, Memphis, Tenn.
- Hamilton Street Railway Company, Hamilton, Ont.
- Fitchburg & Leominster Street Railway Company, Fitchburg, Mass.
- Denver Consolidated Tramway Company, Denver, Col.
- Colorado Springs Rapid Transit Company, Colorado Springs, Col.
- Columbus Central Railway Company, Columbus, Ohio.
- Metropolitan Railroad Company, Washington, D. C.



Union Depot Railroad Company, St. Louis, Mo.  
 West Chicago Street Railway Company, Chicago, Ill.  
 Cicero & Proviso Street Railway Company, Chicago, Ill.  
 Those joining since the Niagara Falls meeting are:  
 Capital Traction Company, Washington, D. C.  
 Brockton Street Railway Company, Brockton, Mass.  
 Detroit Citizens' Street Railway Company, Detroit, Mich.  
 Atlanta Railway Company, Atlanta, Ga.  
 St. Joseph Railway, Light, Heat & Power Company, St. Joseph, Mo.

United Traction Company, Pittsburgh, Pa.  
 Hartford Street Railway Company, Hartford, Conn.  
 Salt Lake City Railroad Company, Salt Lake City, Utah.  
 Aurora & Geneva Railway Company, Aurora, Ill.  
 New Orleans & Carrollton Railway Company, New Orleans, La.  
 Hawaiian Tramway Company, Honolulu, Hawaiian Islands.  
 Market Street Railway Company, San Francisco, Cal.  
 Oakland Transit Company, Oakland, Cal.  
 Federal District Railways of the City of Mexico, Mexico.  
 Haverhill & Amesbury Street Railway, Amesbury, Mass.  
 Concord Street Railway Company, Concord, Mass.

Thus our membership includes nearly all of the States in the Union, several cities in Canada, two in Mexico and one in the Hawaiian Islands; inquiries have been received from Europe, Brazil and Sidney, N. S. W.

The finances to be reported are as follows:

Receipts from new members .....	\$320.00
Receipts from interest on deposits, etc.....	6.13
Receipts from 1898 dues .....	460.00
Balance on hand Oct. 20, 1897.....	222.08
	<hr/>
	\$1,008.21
Expended, services of secretary, 1897-1898.....	\$200.00
Expenses of secretary's office and to New York.....	181.17
Printing and stationery .....	50.15
Stenographer, Niagara Falls meeting, October, 1897.....	201.92
Printing report of Niagara Falls meeting.....	198.18
Expenses of committee on standardization of accounts....	106.45
Printing, committee on standardization of accounts.....	18.50
Balance in Home Savings Bank, Toledo, Ohio, Sept. 2, 1898 .....	51.84
	<hr/>
	\$1,008.21
Dues for 1898 unpaid .....	\$60.00
Amount in bank .....	51.84
	<hr/>
Total amount due and on hand.....	\$111.84

Some of the above expenses will not have to be duplicated the coming year, so a relatively better showing will be made.

The sincere thanks of the association are due to the members of the permanent committee on a standard system of accounts for their generosity in paying their own expenses to their meeting held at Manhattan Beach, N. Y., in July of this year. It is by their action the treasurer is enabled to report a balance on hand.

Three times we have been called upon to feel the loss of one of our members—Morris W. Hall, secretary Camden & Suburban Railway Company, Camden, N. J.; James A. Stratton, secretary Birmingham Railway & Electric Company, Birmingham, Ala., and C. B. Reavis, secretary Augusta Railway & Electric Company, Augusta, Ga., have died. Mr. Hall was the chairman of the organization meeting, and Mr. Reavis was the third vice-president for 1897. They were of our most helpful members.

The secretary is deeply under obligations, and is pleased to acknowledge the valuable services and encouragement received from the officers of the American Street Railway Association, to H. H. Windsor, of the "Street Railway Review," and E. E. Higgins, of the STREET RAILWAY JOURNAL; to A. O. Kittredge, editor of "Accountics," (in charge department of "Accountics," STREET RAILWAY JOURNAL), for the presentation of a book for the association library, and to the "Street Railway Review" for the loan of type matter for use in the annual report. These and others have materially assisted in the handling of the duties of the office.

After the appointment of committees on nominations and resolutions, and listening to a preliminary report of the executive committee, the substance of which was that its complete report would be presented at a later hour, a paper on "Statistics. Their Use and Abuse," was read by the secretary, W. B. Brockway, in the absence of the author, E. B. Hibbs, auditor of the North Jersey Street Railway Company, Jersey City, N. J. This paper is published elsewhere.

A discussion followed this paper, in which F. E. Smith, W. M. Barnaby and Mr. Mackay took part.

President Wilson directed attention to the fact that statistics are frequently made use of to a limited extent when new, because of

the interest that they excite at that time, and are afterward neglected. The maximum value of statistics would follow only upon regular use of the data supplied.

P. V. Burington explained the advantages of lead pencil abstracts, as he described them. While not neglecting in the least the preparation of statistical tables in proper form for permanent preservation, he was in the habit of giving the officers of his company, in the briefest possible form, on a memorandum pad in pencil, the salient features of the compilation. In this way the officer had presented to him, at a time when he was most interested in it, that which was of the greatest use in shaping his plans and policy.

Mr. Calderwood referred to the work and expense of the preparation of statistics, and said that it was an important matter for the accounting department to have clearly defined before it just what statistics are desirable for the operating department, in order that nothing more may be undertaken than the operating department can make use of, and also to be sure that everything that the operating department requires in the way of statistical information is available.

At this point the secretary read several letters, covering invitations from different points, for the next convention of the association. One of these was from Detroit, signed by Wm. C. Maybury, Mayor, and indorsed by the Business Men's League. Another was from the Mayor of Niagara Falls, N. Y., accompanied by the indorsement of the Superintendent of the State Reservation at Niagara Falls, and by representatives of different business interests. The secretary also read the circular relating to the purposes and work of the association, sent out in December last, and which has already appeared in these columns, and gave some account of the response which it called forth.

As the hour approached for adjournment, Wm. F. Ham, in behalf of the committee on standardization of accounts, directed the attention of the convention to the somewhat voluminous report which his committee would submit on Wednesday. He assured the members that there would be enough to keep them busy for the balance of the convention, if as careful attention were given to measures which his committee would propose as he believed their merits demanded. He also mentioned that Wm. O. Seymour, of the National Association of Boards of Railway Commissioners, was in the city, and would undoubtedly be present at later sessions of the convention. Adjournment was then taken until Wednesday morning.

#### WEDNESDAY'S SESSION

The convention was called to order at 10:45 Wednesday morning under adverse conditions, so far as weather was concerned. The temperature was excessive, and the degree of humidity almost up to the point of saturation. Notwithstanding the discomfort of those present, there was a larger attendance upon this session than at any other of the convention. Conditions were made somewhat more tolerable by removing from the room in which the first session had been held to another, which was at once larger and subject to a more favorable exposure.

The first order of business was the report of the executive committee, which was read by Mr. Ham as follows:

#### REPORT OF EXECUTIVE COMMITTEE

The committee met once in Niagara Falls immediately after the election of officers, and passed favorably upon fourteen applications for membership. During the year they have taken three mail votes and have passed favorably upon the applications of fifteen members. We have also had one meeting at Boston, and passed favorably upon the applications of five members, making a total increase in membership during the year of thirty-four members, there having been no withdrawals.

Considering the fact that the Association is still very young, this showing is particularly satisfactory, and if the members of the Association will show as much interest during the coming year as they have in the past, we believe that before we meet again our membership will exceed one hundred.

Your committee has audited the books of the secretary and treasurer, and found them correct in every respect. We desire to express the appreciation of this association for the thoroughness and care with which Mr. Brockway conducts the duties of his office.

The meeting of the Association at this time of the month is particularly unfortunate and the absence of many of our members is due to that fact. We should not be discouraged if our attendance at this meeting is not as large as we had hoped, for, while some members may be unable to be present on account of the time of the month, we feel sure that we have their hearty good will, and that they would be present if it were possible.

The next order of business was the paper entitled "Car Mileage," by A. H. Ford, secretary and treasurer of the New Orleans Traction Company, which, in his absence, was read for him by the secretary. This paper appears in full elsewhere.

The permanent committee on the "Standard System of Street Railway Accounts, Covering the Classification of Operating Expenses, Classification of Construction and Equipment Accounts, and Form of Annual Report," was then presented by Mr. Ham, in the absence of C. N. Duffy, chairman. It is given elsewhere in this issue.

The report was received with applause, and upon motion of Mr. F. E. Smith, it was agreed that it should be taken up section by section for discussion.

Before the discussion was commenced, however, Mr. Ham introduced to the convention Wm. O. Seymour, representing the National Association of Street Railway Commissioners, who was invited to address the meeting. Mr. Seymour responded very briefly, recounting that he was present at the invitation of Mr. Duffy, chairman of the permanent committee on the Standard System of Street Railway Accounts. He was very much pleased to meet the street railway accountants of the country, and particularly the committee who were giving such earnest work to the matters in hand. He said the report of the committee, to the reading of which he had listened with great care and interest, appeared to be very complete, and was not apparently open to severe criticism in any important particular. There was only one point to which he would direct attention as being something that very possibly could not be indorsed by the association which he represented, and that was the location in the classification of the item of taxes. He believed that the Association of Street Railway Commissioners was committed to a course with respect to this item that was opposed to the recommendation of the accountants' committee. He did not believe that his association would be in favor of considering taxes an operating expense. He did not wish to be understood at this time as giving an official opinion in this regard. He directed attention to the matter as a suggestion of what might possibly need argument pro and con, as a preliminary to the adoption by his association of the scheme of classification which the accountants' committee had submitted. In all leading particulars he thought the report was not to be criticised. He felt very certain that when it was properly brought to the official notice of the organization which he represented it would meet with cordial approval, except, of course, some such mooted point as that of taxes already referred to. Further referring to the location of the item of taxes, he said that close attention had been given to this matter by the steam railroad accountants of the country, with the result that they had come to regard taxes as a fixed charge, being an item that is not controlled nor affected by the management.

Mr. Seymour's remarks were greeted with hearty applause. Considerable discussion of details followed.

Finally a vote was taken on construction and equipment accounts, A to O inclusive, and as the result the report of the committee in this regard was approved. It was remarked by one of the speakers that the accountant of each company may use more or less of the accounts suggested, according to the conditions under which its operations are conducted. Adjournment was then taken to Thursday morning.

#### THURSDAY'S SESSION

The order of business was a continuation of the discussion of the report of the permanent committee on a standard system of street railway accounts, etc. On motion of Mr. Babcock, the three grand divisions of operating expense accounts, namely, their subdivision into classes entitled maintenance, transportation and general, was approved. The accounts under these heads were then taken up seriatim.

No. 1, maintenance of track and roadway, and No. 2, maintenance of electric line, were approved, after questions on unimportant points asked by different members had been replied to by Mr. Ham in behalf of the committee.

There was considerable discussion on the question as to the line to be drawn between maintenance and renewal. Mr. Babcock pointed out that the management of his company required that renewal accounts be kept separate, on account of their statistical importance. It soon developed in the discussion that in many cases the line to be drawn between repairs and renewals is purely arbitrary. Indeed, this was pointed out by the committee, with the explanation that in cases where it was very difficult to decide on which side of the line a given item should be placed, the committee had felt it was more important to reach a definite decision than to split hairs over a choice. Uniformity in matters that were immaterial, as well as those which are more important, was extremely desirable.

After discussion a member asked how many of those present kept depreciation accounts or were ready for such a radical innovation. The reply was rather mirthful than serious, indicating that the majority of the accountants present were not yet ready for reserve accounts for depreciation, etc.

Mr. Ham called attention to the fact that the discussion had got

outside of the line of the report, and suggested that it would be better to have it held strictly to what was before the meeting.

After much further discussion on the various itemized accounts another section of the committee's report was approved and adopted substantially without change.

At this point Captain McCulloch, ex-president of the American Street Railway Association, entered the room. He was invited to address the meeting, and to express an opinion upon some of the points which had been under discussion, particularly as to the location of certain expense items, whether they should fall to one account or to some other account. Mr. McCulloch said in reply:

"Our secretary (Mr. Duffy) places such items just where you gentlemen agree that they should go. I accept that decision as entirely satisfactory, and that ends the matter. I came in just to see the vim and vigor with which you are performing your work. It is evidence of your earnestness. I know much good will result from the work you are doing. Standardization of accounts will be worth a good deal to street railway companies in general. I hope you will persevere in what you have undertaken to do. Do not allow small difficulties to discourage you. You can always count on my support."

Mr. McCulloch's remarks were received with applause.

Mr. Green then offered a resolution directing the proper officers to have the minutes of the convention printed and distributed in the same general manner as last year; also, to follow the good example of the American Street Railway Association by having a carefully engraved portrait of the retiring president as a frontispiece to the book. Mr. McCulloch begged permission to offer a few words with respect to printing the proceedings of the association. He said he believed it would be greatly to the advantage of the organization if the distribution of the printed proceedings could be restricted to the membership. He believed that such a course would have the good effect of enlarging the membership, particularly if those outside desiring the benefit of the work of the association were thereby impressed with the fact that it could not be obtained except through membership. This sentiment was heartily approved by the meeting. Mr. Brockway explained how the reports of the last convention were distributed, and mentioned the number of persons who applied for copies who were not entitled to them. Mr. Green's resolution was then put and unanimously carried.

At this point the nominating committee submitted the following report: For president, J. F. Calderwood; first vice-president, E. R. Tighe; second vice-president, R. L. Williams; third vice-president, E. R. Smith; secretary and treasurer, W. B. Brockway; chairman of the executive committee, H. L. Wilson; H. E. Babcock, H. C. Mackay and J. D. Frazer.

By motion duly put and carried, the secretary was instructed to cast the ballot of the association for the election of all these officers. This was done and the persons above mentioned were declared elected to the offices named for the new year. The meeting then adjourned.

#### FRIDAY'S SESSION

The convention was called to order a few moments before 11 o'clock. The consideration of the accounts of general expenses was at once taken up. Accounts Nos. 25 to 38, inclusive, were passed without discussion. Account No. 39, taxes, as had been foreshadowed by much that had taken place in previous sessions of the convention, came up for discussion. Remarks were made by Messrs. Wilson, Smith, Green, Ham, Burrington, Davies, White and others. The committee explained that in part its members had experienced a change in sentiment with respect to taxes since their report of a year since was submitted. The committee was a unit at present in favor of the recommendation of regarding taxes as an item of operating expenses, save only in the case of Mr. Wilson, who, keeping in mind the requirements of the Massachusetts law, thought it was inexpedient to charge taxes into operating expenses.

In the course of the discussion Mr. Ham asserted that taxes as an operating expense in the case of a street railway was entirely analogous to taxes in the case of a mercantile or manufacturing concern. He said he desired to ask the opinion of an accountant of wide experience, Mr. Kittredge, who was present, with respect to what was customary in the matter of taxes among mercantile and manufacturing establishments. Mr. Kittredge replied that so far as his experience went, it was the universal custom to consider taxes as a part of the general expenses of a manufacturing establishment, and as a part of the expenses of doing business of a mercantile establishment. Mr. Wilson took exception to Mr. Kittredge's remarks, and said that his experience was somewhat different; that in manufacturing enterprises it was almost invariably the rule to consider taxes as a part of the cost of product, something to be spread with other general expenses over the output of the concern. Mr. Kittredge, in reply to this, said

that he must have been misunderstood in what he had first said, for that was exactly what he had claimed, namely, that taxes are a part of the general expenses of a manufacturing concern, to be spread over product. He did not see the difference between the cost of a wheelbarrow, for example, as the product of a factory, and the cost of the transportation of a passenger, which is the product of a street railway. The wheelbarrow is what the factory sells and the ride is what the street railway sells. Taxes are a part of the cost of each. He believed that the committee was logically correct in considering taxes a part of operating expenses.

As the result of the discussion on this point, the recommendation of the committee was approved as made.

### Annual Convention of the New York State Street Railway Association

The sixteenth annual meeting of the Street Railway Association of the State of New York was held at the Manhattan Beach Hotel, Manhattan Beach, New York, Sept. 13-14. The president, G. Tracy Rogers, of Binghamton, called the meeting to order at 11:15 A. M. Delegates were present from Amsterdam, Binghamton, Brooklyn, Buffalo, Catskill, Elmira, Fredonia, Herkimer, Hornellsville, Ithaca, New York, Schenectady, Stillwater and Syracuse. Messrs. Baker, Cole and Dunn, State Railroad Commissioners, were also in attendance, as were a number of representatives of manufacturing companies, making a total of about 150 persons.

The president announced the first order of business to be the calling of the roll.

President Rogers then read the annual address. After paying a high tribute to the memory of Hon. Edmund O'Connor, attorney for the association during the past three years, whose death occurred recently, he said in part:

"The return upon the capital invested in street railway enterprises is generally overestimated by the public; many lines are constructed or extended and operated at an actual loss for years, but I believe that the public begins to see and appreciate the great advantage on their side, and that a more liberal policy will prevail. Within the past year the development of rapid transit has been remarkable, notwithstanding adverse circumstances, including the war with Spain. The advance has been steady and prosperous, noticeably so in the city of Brooklyn, whose honored guests we are to-day.

"The interest in the cable system is now purely historical. It has served its purpose and served it well, but its day is done. From the railway standpoint, there is nothing to be hoped from it, but we all look back on it with gratitude, as it was first instrumental in displacing the horse. Its availability for overcoming heavy grades cheaply remains unimpaired, but its merit for average transportation have been excelled by the electric system.

"It is also noticeable that the problem of developing the compressed air system has been taken hold of with great energy in New York City, and in the hands of competent men in control of it, it is anticipated that it will prove effective on lines fitted for the use of such form of power.

"The much-feared monopoly in the beginning of this decade has proven to be a great benefit to the traveling public, which I am satisfied they now recognize. There was no chance for competition between two or more roads in the early days unless attended by disastrous results to themselves and the public whom they served. The free transfer, which has been one of the greatest blessings that the traveling public has ever received in this country, was largely the outcome of this consolidation. The railroad company owning all the lines can now cater to the necessities of any one or more localities in its municipality, and there is no one thing, to my mind, that would be as beneficial under the present situation as the consolidation and control by one company of all surface and elevated railroads, and the underground railroads (if any underground line is ever built).

"It is safely estimated that there are to-day upward of 170,000 people in the United States employed on the street railway, and an invested capital of over \$850,000,000, and trackage of over 16,000 miles.

"Stimulated travel is to-day the dividend and profit of most street railways. The manager of a street railway has found that in order to make his road to do anything more than pay expenses and interest, he must increase travel. The manner of stimulating travel is governed largely by the environment or surroundings with which he is confronted. The necessity is so apparent that in large roads there is a special department set aside for this purpose. I am satisfied that the morals, health and habits of communities have been largely benefitted at a very small expenditure

on their part by the entertainments and inducements furnished by the railroad companies. The rich and poor Sunday schools and the various societies, one and all, travel together.

"The spirit of emulation in employees is being more cultivated each year, the management learning by experience that an educated, satisfied employee will give much better satisfaction to the management and more efficient service to the public. Too much interest cannot be taken, I believe, in this department of our business."

The report of the executive committee was then read. It reported the association as larger and more representative than ever before, as free from debt and with a comfortable balance in the treasury.

The treasurer then submitted a report showing the gross receipts for the past year to be \$6205; balance on hand from last year, \$1,359.71, making a total of \$7,564.71. Disbursements during past year, \$6,400.26, leaving a balance on hand to the credit of the association of \$1,164.45.

The President.—The next is the reading of papers. The first paper to be read is by H. M. Kennedy, on "Methods of Developing New Traffic on Street Railways." This appears elsewhere.

Mr. Johnson.—The Nassau road some three years ago introduced what is known as the five-cent system in Brooklyn. Last season we had practically a monopoly on Coney Island business or seashore business. This season the other street railways, which represent 75 per cent of the carrying capacity of Brooklyn, have gone into Coney Island, Bergen Beach, as Mr. Kennedy has described, and the different seaside resorts. Nevertheless our business has increased steadily throughout the summer, notwithstanding the fierce opposition we have had. It only goes to prove that in a large community of this kind, if proper inducements are offered, there are plenty of riders. Our Sunday business has been limited only by our capacity. I believe that is equally true of Mr. Rossiter's road and Mr. Hein's. Of course they have a great many large, well-equipped city lines from which they can take their cars on Sunday and turn them toward the seashore without robbing, to any great extent, the regular Sunday riders on those business lines. I know that is equally true of the Nassau road. We have lines, such as the Seventh Avenue, on which we do about half the business on Sunday that we do during the week, and on Sunday half the cars are taken from those lines and turned into Coney Island, Canarsie, etc., with very good results. One of the things to which I would like to call your attention is this: I have a car that is not the dream of an inventor, but a thing that has come about, I think, in a natural way—an open car of ten seats which is 31 ft. 6 ins. in length—the longest four-wheel open car with which I am acquainted. I discovered as soon as I put open cars on in April, although it was chilly and cold, our receipts always went up. The moment we took them off in the fall, while the weather was not by any means summer weather, our receipts immediately went down. The average closed car that we had, which is 20 ft. in length, seated about twenty-four people. There are times when they will seat twenty-six, but they will average twenty-four. The car that we ran through the summer will seat comfortably fifty. So we have virtually taken off the ten-bench car and replaced it with a five-bench car. My endeavor has been to keep that ten-bench car in service the year around. In loading or unloading a closed car at the other end of the Brooklyn Bridge the passengers, as a rule, went in at one end and out at the other. Now with this open car, converted as I have it, we have six exits—one at each platform and four doors. I have simply taken the car and made the seats that formerly all faced forward into vis-a-vis seats, and utilized the dead space by moving the backs of the seats closer together. I have closed up the inside of the car entirely and put four doors on it. I ran that car through the entire summer. I shall have 250 on the road by Oct. 1. That car I ran during the months of June and July with a few newspaper people in it; one side solid with glass with two front windows which can be held at three different heights. With a temperature of 93 degs. the car is as pleasant as any average open car you can ride in. That car, I believe, will be warmer in winter than any closed car I have on the road, for the reason that the doors on the front end of a closed car are bound to be made with from 1-16 in. to 1/2 in. play to have the door work backward and forward easily. When that car is in motion you have the natural air pressure plus the speed driving that air into the car. With this car that I speak of, the front of the car is entirely closed and there is only the natural pressure to drive the cold air in from the side of the car. I have a heater directly under each seat, placed in such a way that it is not possible for a woman's dress to come in contact with it. One of our difficulties last winter and the winter before was from heaters scorching people's clothes. We expect to run these 250 cars constantly through the winter. There are only four windows in the car that move. My object in not putting a window in the side

was in order not to have the working of the frame. Stationary glass has less maintenance account than any other. From June 15 to Sept. 15 it is a question whether the car is quite as inviting as an open car, but through those three months I have arranged to take the permanent glass out of one side of the car and to have a long curtain that is moved by the motorman or conductor and not by the passenger.

Mr. Vreeland.—The travel on Manhattan Island is peculiar, differing from that of any of the street railroads of the United States or abroad, in that the average of the traffic for the day holds almost uniform, making it possible to run the same number of cars all hours of the day, and most of the time a larger number in the evening. In winter, with some twenty-five or thirty theaters close to Broadway, our traffic for a certain number of hours at night will average more than it does for any hour through the day. On other lines with which I am and have been connected in an advisory capacity in other parts of the country, we have found that a very large business can be built up through systematic efforts to stimulate and encourage the traffic. The Consolidated Traction system of New Jersey has a traffic which is very similar to that in Brooklyn. It has a large number of public parks and beach resorts. It also has the large traffic coming toward New York for Coney Island and such points to handle, and commenced a few years ago to systematically encourage the traffic on its lines. Its evening traffic was very light. Its Sunday traffic was a fair proportion—say a third or a half of the average week-day traffic. By arranging a number of through cars on several lines leading to parks and so forth, and by special advertising, it succeeded in building up a business which, on Sundays and holidays, during the last two seasons, has exceeded the average daily traffic by nearly 100 per cent. The Atlantic Coast Line is the only line with which I have ever had anything to do where I recommended the railroad company to go into the amusement business. I do not believe much in it, as a rule. I never did while I was in the steam railroad business, and I think it is a pretty good application of the old saw—shoemaker, stick to your last. A man who operates his railroad out on the line, and not in his office, has got pretty much all he can do to attend to the average daily requirements of his business. While he is looking after this special amusement business he is very frequently running away from his 365-days-in-the-year business. But in this special instance we extended the line to a shore resort in which it was impossible to attract any local interests, because they did not want it there. They claimed that it would bring a lot of people there that they did not want. So that we purchased all of the shore front and made a park, expended a large amount of money, put in merry-go-rounds and dancing platforms, gave fireworks exhibitions, and so forth. It was a peculiar business. There are 200,000 people along the coast that had absolutely nothing to do but be entertained, and they wanted to be entertained. They had money to spend and they wanted to spend it, and they did not know where to spend it except in these local places. Through fireworks, special exhibitions, water exhibitions, and so forth, in some six exhibitions, sufficient extra travel was secured to pay the interest on the money invested, and the balance of the season the receipts were net. It meant a very large increase in the business—some 500 or 600 per cent—to this particular point the first summer it was operated, and it has continued to increase, until this summer it was simply limited by the track capacity and facilities of the property. In Philadelphia the effort was made, systematically, to encourage the evening and afternoon traffic to the various parks. While they would not there engage directly in any amusement business, they lent their encouragement and aid, both in advice and financially, to various enterprises around Philadelphia. This has built up a very large late afternoon and evening riding, something which was never known on that property prior to those efforts. The same thing followed the efforts in Pittsburgh and the various parks there, and it was followed by a large addition to the business. As I said I never have advised or approved of a railroad company itself having anything to do with the amusement end of the business, even if it wants to lend its financial aid to that purpose. I think that is a peculiar business that requires a special tact and ability which the average railroad man, who has given his time, attention and energy to the developing of himself in his own line of business, does not possess. and if we go into these various lines we will reach the point of a monopoly of everything and leave nothing for the other fellow to do. The general proposition of having some special man to give special attention to these features is a very necessary point in railroad organization. It is just as much a part of a street railroad as it is of a steam railroad. I was connected with the Long Island system in its various ramifications in the early days when Manhattan Beach, Brighton Beach and Long Beach were established, and in the old days we were satisfied with going along in the old style and running a few trains to these various points.

When new blood was infused into the operating management of the railroad and a department was created with men broad enough to consider these various questions and to put new ideas into effect, Manhattan Beach Brighton Beach, Rockaway Beach and Long Beach grew in one summer so that the company had to bring special trains from all points on the road to handle the traffic at all. If that can be done by steam railroads I see no reason whatever why the street railroads, with the proper organization, cannot add very largely to their business and stimulate it. At the same time there is one point that has got to be carefully guarded. Whatever you do always look out for the regular short distance riders. If you take that business and let the other fellow have the excursion business you will come out ahead. We have built up right in the city of New York on Sundays and holidays some of our best traffic. It comes from giving quick, short service and paying attention to it. There are some lines which are endeavoring to stimulate traffic to ride for five cents anywhere from 15 to 25 miles, and probably bring them back if a fellow is smart enough to get a transfer. That is the thing we have endeavored to guard against, and wherever we have had competition we have endeavored not to go too far into the excursion business. The history of the Long Island Railroad was one of giving the very best facilities, the best motive power, the best cars and the best service to cheap Coney Island and giving poor motive power and poor service to the development of the central part of the system, which meant 365-days-a-year business. The result was that within 25 miles of New York City the development has been so great that we street railroad men thought we would come in and help them cut their pie, and we have done it very satisfactorily because they got their whole development within street railroad distances. Beyond that circle the average of traffic for the 365 days a year is very small and concerted effort is now being made to develop the property that is outside of the limits or circle of electric operations.

Mr. Cole.—In cities of the second class we have conditions different from the larger cities. This spring in Elmira the Board of Trade held a meeting. The merchants were very anxious to promote excursions into the town, practically for the traffic that they could get. They met with a complete failure, as the merchants of the surrounding towns combined together and went to the railroads and represented that such excursions would be injurious to the smaller towns. The street railroads then took hold of the matter of getting excursions over the steam roads. We sent out men to the neighboring towns to confer with the different organizations—that is the Red Men and the Odd Fellows and Knights of Pythias, and all organizations which run excursions every year. By representing to them the attractions of the parks and giving them the privileges of the dancing pavilion, where they charge a nominal sum for dancing, we showed the organizations they could run excursions and make money out of them. The steam railroads give them such rates that they can charge a little higher to each person going on the excursion. This enables the organization to make a very fair sum, and resulted in a number of large excursions into town. In Elmira this summer we have had about five or six excursions each week brought in by the steam railroads, and this has added very largely to the traffic over and above what we should have done by merely depending upon the local traffic.

J. E. P. Clark.—For the past ten years at Binghamton we have maintained two parks. One of these belongs to the city. We arranged some nine years ago with the authorities, for a small sum, to furnish the amusement privileges, paying them a stated sum for the privilege and taking in return such privileges as we could run and reap a revenue from, that were in keeping with the character of the place. We provided a merry-go-round, a large pavilion, a switchback railroad, accompanying popcorn stands and the like. We engaged an orchestra of twelve pieces, and gave concerts every afternoon and every evening and have continued doing so from the inception up to the present time, and we feel with a very high degree of success. We have a population of about 45,000 people, and most of our lines radiate within the city limits, so that there is really only a certain amount of traffic that it is possible to secure by the simple operation of cars, no matter how frequent or how excellent the service. For instance, our winter months average probably from \$10,000 to \$12,000 in gross receipts, and by stimulating the traffic by the operation of these parks we increase that to \$22,000 or \$23,000 a month during the five summer months. We calculate to open about June 1 and close Oct. 1. Our plan in running these resorts is to cater to the respectable element only, and fundamentally to arrange not to incur too great an expense. At Ross Park we make a special feature of picnic parties. We provide there a dining pavilion, a full-fledged kitchen with dishes, and all appurtenances, so that parties can come there without burdening themselves with those conveniences. We have found that that has brought as high as six picnics in a day, and from five to ten thousand people at that

resort daily is not an uncommon occurrence. That for a city of our size means greatly increased travel for those days. At our other resort, which is 9 miles out of the city, and for which we have a 25-cent round-trip fare, we have what we call a casino and thirty acres of land. We provide there a series of entertainments, which we arrange and control ourselves entirely, as well as all the privileges, and we have been very successful there as well. We charge a slight admission for a chair only, and except where the weather is exceptionally bad we have made the receipts for the chairs pay for the entertainment proper. We have found a great advantage in having an orchestra that we can furnish to picnic parties free of expense, or, by changing a few pieces, we can turn it into a brass band and furnish music for a parade. To make the receipts anything like adequate to meet the expense and interest account the travel has got to be stimulated in this way. We cater to ladies and children in particular, because they are the only ones in cities of that kind that you can depend on in afternoons. Our experience has taught us that when you attract the ladies and the children the better element of the male gender will follow.

The President.—Have any here charged admission to their parks, and if so, what has been the result? Some, I think, started in to charge admission to those who did not ride on the cars, but came on bicycles. I think all will be interested in hearing on that subject.

Mr. Vreeland.—On the Atlantic Coast line park that we located on Pleasure Bay, we found that many came on bicycles or by vehicles during the first year the park was opened. The second year we arranged an enclosure at the entrance and put a man in charge to check bicycles and assume the responsibility of their care without charge, but to collect 10 cents admission to everyone who came on foot, on bicycles or by vehicle to the park. On many nights when we had fireworks we had as high as a thousand bicycles in that enclosure. It is simply a matter of figuring how much at 10 cents that amounted to, plus the fact that we had a great many carriages coming there.

Mr. Ely.—Those who have visited Norumbega Park near Boston have noticed that they charge 10 cents admission there, and in addition charge for the checking of bicycles. Last year a charge was made for entrance only and nothing for the checking. An admission of 5 cents is charged to all persons who ride in on the electric road, and 10 cents to others. Inside the park is a summer theater which is conducted most admirably. The stage is of rustic work and is open except at the top. There is a rustic cover some 18 or 20 ft. from the stage, with dressing rooms large and commodious at either end of the stage also of rustic work. No charge is made for the ordinary seats in the amphitheater, but a charge of 10 cents is made for reserved seats, of which there are a few rows in front, also some boxes that are merely railed off with rustic work on either side of the amphitheater. The receipts from the reserved seats are more than enough to pay for the cost of the entertainment. The latter is provided in what seemed to me a novel but most admirable and business-like way. One J. W. Gorman, an amusement manager of long experience, a very successful man, has organized a circuit of street railway park amusements, and has in his circuit about twenty places. That enables him to hire in the beginning of the season a large number of people of good talent and to present a fresh bill of entertainment at each street railway park every week, thereby, of course, making the entertainment much more attractive. The entertainment given is absolutely clean, and is very inviting. The management of the park caters to the ladies, and to the respectable element of the people. There is no beer or stimulants sold in the grounds. Another feature is that they have quite a large number of hardy animals, animals that will winter well in the New England climate. These are in large and commodious enclosures, and are very attractive to children. In another place are swings and piles of sand and things of that sort for the smaller children. There is no admission fee to any of these places. There is also a beautiful electrical fountain which cost \$5,000 to install, and that plays in the evening during the intervals between the playing of the band and the performance of the actors on the stage of this theater. In addition to the other attractions there is a band of seven pieces. The street railway fares from Boston amount to 20 cents. The 5 cents admission makes the quarter. The Commonwealth Avenue line is  $6\frac{1}{4}$  miles in length, and, with the exception of a few houses along the line, it has absolutely nothing to induce traffic except the park at the end. On Labor day there were more than 25,000 people there, and their attendance was brought about almost entirely by this park and the quality of the entertainment there offered. The railroad is a very paying enterprise and the park is paying the interest on the investment and enough in addition, so that Mr. Ahl said that if they did no better it would pay for itself in five years. The investment is

about \$50,000—\$25,000 for the land and \$25,000 for improvement. There is a large, commodious building with a restaurant in the second story so arranged with reference to the slope at the entrance that the lower part may be used as a resting place and shelter for cars. There are also a lemonade stand and a place where soft drinks are sold, and that is a concession.

Mr. Cooper.—There was a point brought out by Mr. Ely to which I would like to call the attention of the small companies, and that is the interchange of amusements. I have a small park at home and I would very much like to put in some sort of amusement, but I found it would cost entirely too much for any town of 25,000 inhabitants to have vaudeville or anything of that sort. Several years ago I wrote to the papers calling attention to the necessity of having an amusement league, and I had quite some correspondence with smaller towns. I thought it a good chance while we are all here together to mention that fact and see if something could not be done in that way among the smaller towns having parks, so that they could have that circle of amusements giving a variety all the way through the whole season without extra cost to themselves.

Mr. Johnson.—On that subject I would say that I have a railroad in Allentown, Pa., and run through sixteen small towns. It carries 15,000 to 18,000 passengers a month in winter and 25,000 to 30,000 in summer. We have a park and had animals in it, but we found the feeding and taking care of animals was far too expensive, and we are trying a different kind of animal now by giving a variety entertainment in summer time. We get shows for from \$250 to as low as \$200 a week. We have a stage and the reserved seats about pay for the performance. There is no liquor sold in the park, but directly opposite this park across the railroad track we have a grand bicycle track and hotel in which liquor is sold. We have no trouble in finding performers, as there are organizations now that travel in and about Philadelphia, and Allentown being only a few miles away it is easy to get a good company for the price mentioned. We give an entirely free show and have a performance every night excepting Sunday. On Sundays we give a band entertainment.

Mr. Stedman.—At Norumbega Park the cars in approaching the park swing around a circle and discharge their passengers at the entrance gate. To prevent the coming together of those going in and those coming out there is a tenece, which divides the sections until it meets the railroad track, and there the space is filled from rail to rail and 3 ft. outside with water, so that the car can pass over it and the passengers cannot.

The President.—Is bicycle riding increasing or decreasing in the State of New York? What is the general voice of the convention on that subject?

Mr. Rossiter.—I think it is increasing for practical use. A great many are using it to get to and from their business places.

Mr. Bebe.—Around Syracuse we hear less about it now than we did a year or two ago.

Mr. Powers.—In the vicinity of Troy the hotels that have been furnishing dinners on Sundays to bicycle riders report that their business has very largely fallen off in the last year or two. I think that answers your question in regard to that locality as well as any statistics that can be had.

The President.—Those reports are very encouraging. The bicycle has been our worst enemy so far. The next paper is "Signal Service for Single Track Roads." This paper is found on another page.

Mr. Powers.—I have just about completed a single track road about 12 miles in length. We have put in only so many switches as the actual schedule requires, and have made it the first rule of the road that a motorman who leaves his switch without passing a car, except on telephone orders from the office, gets his final and absolute discharge. We do not allow a motorman to run by a switch under any circumstances whatever. If the telephone line breaks down he stays there until he gets an order. That may sound like blocking traffic. It does. It limits the schedule capacity of the road, and, therefore, as we dislike very much to use the system of double heading the cars, and only do it under pressure, we have gone to the other extreme of enlarging our cars to the extreme capacity. We are using open cars seating ninety passengers, fifteen-bench cars, six passengers on each bench, and carry frequently 135 to 150 passengers on a car. In that way we accomplish upon a comparatively limited schedule a good deal of business. But the needs of the situation are growing in the direction of some safe system of signaling and safety blocking upon electric railroads. If we could devise or have devised for us a system by which it would be impossible for a car to enter upon a block where a car was already without becoming derailed that would be the system that we should all like to adopt. But I must say I have not been able to find anything in the nature of signaling that has offered sufficient inducement for me to put it on this new

line, and my only remedy so far has been to put in force this absolute rule of discharging the motorman if he leaves the switch on which he has to meet a car except on orders from the despatcher.

Mr. Johnson.—On our Allentown road we have a system of signals. The conductor turns a switch, and it throws a light on at the point where he starts, and also shows the danger signal at the other switch. When he arrives at that switch he throws that light off, and we have that on every switch on that line. On the fifty odd miles of that road we have a signal at each switch. It is the duty of the conductor to put the signal on before leaving and to take it off when he arrives at the second switch.

Mr. Cooper.—In regard to the system Mr. Johnson speaks about I tried that a number of years ago, and while it is a good when properly carried out it wastes an enormous amount of time. What we want is something that will save the time and bring the schedule right back to where it ought to be in case of accident and trouble. You can get up plenty of signal systems for orders, but you want something that will bring it right back and save time.

Mr. Johnson.—He changes that signal while the car is simply passing slowly.

Mr. Cooper.—That is all right so long as the things are working properly, but when anything gets out of order you want something to despatch the system.

Mr. J. P. E. Clark.—We are using on our Union extension in Binghamton the same signal system Mr. Johnson mentioned. We have had it in practical operation three years, and it works very nicely. It does not agree with Mr. Power's theory, however. To work it successfully frequent turnouts are an advantage. We have got frequent turnouts, and we find it works excellently. We have had it in practical operation over three years, and all who have seen it in operation have pronounced it a good thing, and I think I could say that I could safely recommend it. We run between those switches at about fifteen miles per hour. In our three years' practical experience we have not had any difficulty with the system.

Mr. Ely.—I am connected with a road that has just been put operation between Buffalo and Lockport, and we have large cars heavily equipped and geared to run 60 miles an hour. We have actually run as high as 55, but we are giving a half hour service between Lockport and Buffalo. That increased the number of train units to such a degree that it makes a problem extremely hard to solve satisfactorily. We would have sixty-two trains a day, thirty-one each way. Such a number of train units as that, I think Mr. Vreeland and Mr. Rossiter would say, prevents operation at high speed upon a single track road. Now, 15 or 18 miles an hour may do. But my judgment, from the short time we have had the Lockport road in operation, is that the only safe way to run at high speeds like that on a single track road is to double track it, and double track it quickly. (Laughter.)

Mr. Rossiter.—We built some three years ago a 5-mile extension to the village of Flushing, which has some 12,000 inhabitants, and the question was very carefully gone over by myself as to whether it would be expedient to build a single track road. We did not want to put money into the double track, but it took me very little time when I looked into it to make it a double track road.

Mr. J. P. E. Clark.—I would say that the signal system I mentioned is not without its disadvantages. A car which happens to get off its schedule time is unfortunate in not being able to get back on it, because it is always just behind the block. That is one disadvantage we have discovered in the operation of this system. I fully agree with Mr. Ely that where cars run under frequent headway and high rate of speed that the double track is the only safe signal system you can adopt.

The President.—If there are no further remarks on this paper we will have one by Mr. Fenner on "By-products of Power Stations."

Mr. M. M. Fenner.—I probably represent the smallest property and smallest capitalization of anybody here. It extends between Dunkirk and Fredonia, and in 1891 it was converted to electric power. In 1893 we had our best receipts from passengers, viz., about \$23,000. The passenger receipts have been on the decline since, owing to several local causes, and are now a little less than \$18,000, so we had to look into by-products. What I have to say here is on exhaust steam, which has acted with us and still keeps us on a 6 per cent basis. In fact, the road has earned 8 per cent from the day it started until now—no matter what the capitalization was. (Laughter and applause.)

Mr. Fenner then read the paper, which is given elsewhere.

Professor R. C. Carpenter.—I have listened to the paper with a good deal of interest, and it has struck me that there were a good many conditions which might make the heating profitable, and again in other cases might not make it so profitable. One of those conditions depends very largely on the nature of the power. If

you have an economical engine, a compound condensing engine of the best class, in which you can get a horse power from 2 to 4 lbs. of coal on the one hand, and on the other hand, if the engine requires from 6 to 10 lbs. of coal, as some do, it would make a very great difference as to whether you can do the heating or not. With the economical engine you can not save very much by the use of exhaust steam for heating. With a non-economical engine on the other hand, you could save a great deal. I think such conditions as these would have a good deal to do in deciding the question whether it is economical or not. Taking Ithaca, and also Cortlandt, N. Y., we have united the lighting with the railroad service, and in both those towns it has been very advantageous. I do not know how we could have kept our power house expenses in reasonable limits and made any sort of profitable showing unless we had them united. There was no difficulty whatever in making the necessary combination. In both cases it is a combination of two companies, however, rather than one company having two functions. That is, there are really two companies which have common stockholders and common officers, and thus they perform these various functions. In neither place are the power houses situated so that heating could be advantageously applied. In both cases we have got economical engines, and I do not think the gain would be very great even if we use the exhaust steam for heating.

Mr. Cooper.—There is a question I would like to ask the gentleman, and that is whether he has made any experiments as to the distance that steam could be carried with economical results, as to the percentage of loss per mile or so?

Mr. Fenner.—I would say with reference to that that we have, perhaps, a mile of pipe line, and there is not any part of the line any more than one-third of a mile away from the power house, so ours would not be a very good test. But at Cedar Rapids, Ia., they run over a mile before they get to the point of distribution, and then heat satisfactorily. With reference to the practicability of steam heating, I think there would not be any difficulty in any railroad company in the State getting its charter amended so as to do steam heating. The people of the towns, the small towns particularly, would aid them, as they did us. The village council of Fredonia aided us in getting our charter amended. Now we run gas and electric light and steam heat and power. The power and the steam heat are not in competition with anybody. We bought the gas plant, so we are not in competition with anybody on that. We did not use compound engines in our station at first, because our plant was too small. It is large enough now to use compound engines economically, but there you only save, I understand, about 25 per cent. Now, this exhaust steam is worth 100 per cent. So we could not afford to change, and if we were already changed we could not afford to operate. Some of the plants I have mentioned are not running with exhaust steam. Wilkesbarre is not running with exhaust steam, nor is Scranton. The same is true of Lockport. They run with live steam. Some of them go as far as 2 or 3 miles away. They make profit in selling live steam. Now, of course, if it would pay expenses to take live steam the exhaust steam you have is worth its weight in gold.

Professor Carpenter.—Just one other question regarding the loss which occurs from exhaust steam mains. I have made two or three tests of several existing plants in Cornell University that sent steam half a mile from the power house in order to heat our buildings, and I have tested the losses which occur in that plant. I also tested a plant which the Lehigh Valley Railroad Company put in for handling coal a short distance west of here, in New Jersey, a few years ago. I found that with the best insulation the losses could be reduced to about one-fifth of what would occur if the pipes were exposed to the air and suspended above the ground. Now, you can usually count in ordinary conditions of weather and wind that about 1-3 lb. of steam will be condensed in the air for each square foot of exposed pipe. You can insulate your pipe without excessive cost so as to reduce the loss to about one-fifth of that. That is pretty good insulation, however. A great deal of the insulation will not reduce the loss to more than one-third of what would take place. In that way we can figure pretty well what the loss is. I might also say that there are two companies in existence now who are doing exhaust steam heating and carrying steam a long distance at less than atmospheric pressure, and make a success of it; so that it is entirely practicable and possible to do this kind of work without bringing an excessive back pressure on the engine. If the buildings are properly piped there is no reason why there should be even 1 lb. pressure. The heating is just as perfect with a pound pressure as with 5 or 10 lbs. It is to overcome vertical resistance in the pipes in buildings that requires excess pressure.

The President.—It is easy enough for the large roads to make their dividends, but for the smaller roads it is quite necessary that they have every opportunity for selling power, heat and light.

There is now on the statute books a law that allows an electric lighting plant to build a railroad, I think, of 20 miles, but the moment a law is proposed whereby an electric railroad may sell light there is bitter opposition to its passage. Another matter in that connection is the sale of power. They all claim, of course, that we have a grounded return current, and the insurance is immediately doubled or trebled, and that prevents us from selling power. I think it would be very advantageous to the smaller roads if we could sell power. I do not see how we are going to do that until we get a metallic circuit.

The paper on "Track Bonding," by R. P. Brown, was then read. It will be found on another page.

Mr. Powers.—I would like to ask if there is any particular reason for abandoning the tinning of the bonds.

Mr. Brown.—Yes, sir. When the bond is tinned it gives a very much better contact with the earth than the steel does. If there is any tendency for the current to leave the track it goes to the bond. If the bond is insulated it must go from the steel, so very little corrosion takes place.

W. J. Clark then read a paper on "Electric Railways as Auxiliary to Coast Defense." It was followed by Mr. Moxham's paper on "Rails, Their Construction from a Scientific Standpoint," and one on "Track Construction," by Mr. Carver. These are published on other pages. There was no discussion on the first two. That on the latter follows:

Mr. Littell.—Do you recommend the laying of joints opposite?

Mr. Carver.—No, staggered.

A Member.—I would like the gentleman to specify a little more clearly what the joint that he is using is.

Mr. Carver.—Here is a sample. It is the Weber joint.

The President.—Has Mr. Littell used the concrete beam in place of the wooden tie?

Mr. Littell.—Yes, we put in in the year 1897 about 5 miles of track without any ties. We dug the trench 20 ins. wide and 17 ins. deep, and then we suspended our rail. We had an appliance made so that we could line it perfectly and surface it perfectly, with small screws, and then we mixed the concrete and tamped under it so that the concrete came just above the base of the rail. After leaving it in that position for twenty-four hours we took away our clamps, and then filled on the sides of it with concrete. We laid the joints staggered and used a 60-lb. rail, and within a week I walked over a part of it immediately after a rain. I saw no movement or perceptible change of any kind, and after a car passed it I could not see a bubble or the least movement of the rail. It was perfectly solid. We used Portland cement and very fine broken stone. There have been 17 miles of railroad built in Buffalo, where they put down the concrete base first, and then put the rail on top of it and then filled up the space with Portland cement and fine sand, but there are places in that concrete base where you can see a little movement once in a great while—very few places. So that I think that the process of tamping the concrete under the rail is very much better than first laying the concrete base. We use in this a twelve-bolt splice bar and a rail weighing 94 lbs to the yard. If I were laying a new track I would always use a concrete base. It is a difficult track to lay, however, if the track has to be used by the cars soon after. This spring we had to reconstruct some track, and in that case we put in a tie every 10 ft. simply to hold the track to alignment. We surfaced the ties on the ends first on sand or gravel and then tamped under the ties with concrete, and then removed the gravel from the ends and tamped that with concrete so as to get perfect surface and alignment, and then tamped with that concrete base under the rail. That track we were able to use five to six days after it was laid, and it is very difficult to find the joints. You have got to look for them. They were laid just as tight as we could lay them, and it is what I call a perfect track.

The President.—Do you hold your gage by tie-rod?

Mr. Littell.—Not in this case. We used the same process of filling the space between the head and the base with concrete. We set our tothing in cement and asphalt on the outside.

Mr. Cooper.—Did you try carrying the asphalt right up to the back of the rail?

Mr. Littell.—We have got 50 miles of track laid that way. I am sorry to say. Asphalt next to the rail is a very serious problem in a street railroad. Where the street is used a great deal, where vehicles will keep it ironed out, as it were, it will stand fairly well, if the track is solid. But where the street is not traveled on very much the concrete disintegrates, and water gets in. We find the use of the concrete base in the manner described reduced the cost of laying very much, and I think reduced the repairs enormously.

The President.—Before we pass to the next paper I want to ask another question for the information of all present: How many are using storage batteries, and with what success? I know that Buffalo is using it.

Mr. Littell.—I cannot say very much about the storage battery, excepting that we have one in use. It has been in use about nine

months as an auxiliary of our power house. As many of you are aware, we get a certain amount of our power from Niagara Falls—2000 h.p., and we have nominally 7000 mechanical h.p. in the plant—steam power. This storage battery was put in partly as an experience. I had great difficulty in convincing my directors that it was a good thing. When we put it in we made a contract for 1200 h.p. hours. But in making my contract I provided that the cells should be large enough so that I could increase the battery 66 2-3 per cent. I think we will soon increase it, and we are very much pleased with it. I cannot tell you very much about it, but it has the same effect upon our plant as a safety valve would have upon a steam engine or as a standpipe would have upon waterworks—it takes all these sudden calls upon us for energy, and there have been times when we have but one engine in use, a 1200-h.p. engine, and 2000-h.p. up in the Falls, and the Falls power for some reason stopped on us, but the cars went on. The people didn't know it. It held us for fifteen or twenty minutes until we could get in more engines. We had cases at night where we shut down the power from the Falls and ran three or four hours with the battery. We have tested it in every possible way, and I am a firm believer in it. I think it is a good thing for a steam plant, as well as for a plant like ours. I am not interested in a storage battery or any accumulator. Simply, I am a believer in it.

Mr. Vreeland.—As a result of considerable experience with storage accumulators as an auxiliary to power plants in Philadelphia and in Pittsburgh we have just contracted for one of the largest storage battery plants that has ever been erected for a street railway company as an auxiliary in our work the coming winter. Our situation is a little peculiar. We are building a very large power station, 70,000 h.p., and it will not be ready until next spring. We have not sufficient power to carry us over the winter by direct current from the generators, and we determined that we could buy a portion of the accumulator plant at the present time and get sufficient storage capacity to take the peak of our load during the winter months. When we get our large house completed we will probably put in batteries of three or four times the capacity of the present, using this part as part of the batteries. The experience of our plants throughout the country where they have been used, both in electric lighting and electric railroading, is that it is an economical auxiliary to any plant which has reached the limit of the power capacity in very heavy hours. The plant in Philadelphia was placed at a point where some extensions had been made, and where the house that fed that section of the city had reached the limit of its capacity. It was necessary either to build another house or add some storage capacity in that section of the city. The storage battery as an auxiliary is very satisfactory, as is shown by the tests in electric lighting stations and lately with the street railroads.

The President.—Mr. Vreeland and Mr. Littell, may I ask a question? Are those storage batteries economical for smaller roads in provincial cities, say 25 to 30 cars or 50 cars, where the plant has reached its maximum? Is it economical, or are they too expensive for us to put them in?

Mr. Littell.—I think that any road running 30 to 40 cars can afford a storage battery, and would be justified in putting one in.

The President.—Is the expense of the storage battery being reduced?

Mr. Littell.—The original cost is quite expensive. I think we will get our cost back the first year.

The President.—The last paper, gentlemen, is from T. J. Little, Jr., of the Metropolitan Street Railway, on "The Relations Between the People and the Street Railways."

On motion of J. E. E. Clark, a committee to nominate officers for the ensuing year was appointed consisting of H. H. Littell, of Buffalo; Ira A. McCormack, of Brooklyn, and T. D. Rounds, of New York.

The convention then adjourned until the following day.

#### WEDNESDAY'S SESSION

The convention was called to order on Wednesday, September 14, at 10:15 A. M.

The President.—The order of business is the report of the nominating committee.

The nominating committee submitted the following report:

Mr. President and Gentlemen of the Convention: The committee to whom was assigned the duty of nominating a ticket for the officers and executive committee for the ensuing year is now ready to report. We nominate the following gentlemen:

For President—G. Tracy Rogers, Binghamton.

For Vice-President—W. Carl Ely, Niagara Falls.

For Second Vice-President—Albert L. Johnson, Brooklyn.

For Secretary and Treasurer—Henry A. Robinson, New York City.

For Executive Committee—Herbert H. Vreeland, New York

City; John W. McNamara, Albany; Henry M. Watson, Buffalo; Clinton L. Rossiter, Brooklyn.

Respectfully submitted,  
H. H. LITTELL,  
IRA A. McCORMACK.  
F. D. ROUNDS.

Sept. 14, 1898.

The secretary was empowered to cast the ballot for the officers named. Ithaca was named as the next place of meeting.

The entertainments provided by the local committee for the delegates and visitors to the New York Street Railway Association at Manhattan Beach were most enjoyable. On Tuesday evening a special display of Pain's fireworks, "The Fall of Manila," was arranged for the visitors, and was much appreciated. This entertainment was followed by the annual banquet, which was given in one of the large dining rooms of the Manhattan Beach hotel. There were about 125 present at the tables, and a very excellent menu was provided. After the banquet the usual toasts and story telling were indulged in. Among the speakers were H. H. Vreeland, who replied to the toast, "Transportation in Greater New York;" Addison B. Colvin, "Our Best Patrons—the Ladies;" J. H. Stedman, "Our Host;" J. A. Cantor, "The Busy Boys—Our Legislators," and by W. Caryl Ely, "Our Association." Wednesday was given over quite extensively to pleasure trips. At 11 o'clock special parlor cars belonging to the Brooklyn Heights and Nassau Railroad companies left the Beach and took a large party through different parts of Brooklyn to the Navy Yard. One of the cars, No. 876, was equipped with the Christensen air brake system, and a number of emergency stops were made on the trip, this being one of the interesting features of the ride to street railway men. Some time was spent at the Navy Yard inspecting the large battleships recently returned from Santiago, among which the Oregon and Iowa were of special interest. On leaving the Navy Yard the party was conveyed by the cars to the dock beneath the Brooklyn Bridge, where a special steamer was in waiting. On this the party proceeded up the East River to Hell Gate, then through the Harlem River, the Government canal and Spuyten Duyvil Creek, down past the Palisades and Grant monument to the Battery, a stop being made at 130th Street for those who desired to disembark there. A very enjoyable luncheon was served aboard the steamer, and everything possible was done by the committee having the trip in charge to help everyone to have a good time, and their efforts were fully appreciated by all on board. Before landing three cheers were given for the members of the committee by name, and also for President Rogers.

An interesting feature of the convention was the exhibition of models, etc., made by the electrical supply houses. The exhibition was held in one of the large halls of the hotel, and received careful attention from the delegates. The number of exhibitors was about twenty, and the following apparatus were shown:

"Compo" brake shoes, by the Composite Brake Shoe Company, of Boston, Mass.; three-rail systems, by the Campbell Traction Company, of Tonawanda, Pa., and the Safety Third-Rail Electric Company, of New York City; a current-saving device, by the Falk Manufacturing Company, of Milwaukee, Wis.; overhead material, headlights and lamp socket, by the Bibber-White Company, of Boston, Mass.; specimens of street car woodwork, by J. P. Sjöberg & Company, of New York City; car seats, by the Hale & Kilburn Manufacturing Company, of New York and Philadelphia; trolley pole catcher, by the Wilson-Thomson Company, of Brooklyn; car fender, automatic wheel guard and track scraper, by George A. Parmenter, of Cambridgeport, Mass.; circuit breakers, by the Cutter Electric & Manufacturing Company, of Philadelphia; uniform caps, by F. H. Newcomb, of Brooklyn; samples of vitrified conduits, by the American Vitrified Conduit Company, of New York City; the Rooke fare register, by the Rooke Register Company, of Peoria, Ill.; drawings of rigid draw bar design for both electric and steam traffic, by the W. T. Van Dorn Company, of Chicago, Ill.; mechanical track-switch or turnout, by William Preston, of Brooklyn; and single, double and triple registers, by the New Haven Car Register Company, of New Haven, Conn.

### Exhibition of Blanks and Forms

A very prominent feature of the recent convention of the Street Railway Accountants' Association was the exhibit of blanks and forms in charge of a committee consisting of F. E. Smith, auditor of the Lynn & Boston Railway Company; E. G. Tripp, treasurer

of the Lowell, Lancaster & Haverhill Street Railway Company, and R. L. Wallis, treasurer of the Fitchburg & Leominster Street Railway Company. A very large number of blanks and forms were shown, contributed by different companies throughout the United States, in response to the invitation of this committee.

In some instances, apparently, entire files of the forms used by the companies were shown, and in other cases only those blanks of special importance and more particularly interest or quite recently devised were presented. For the most part the blanks were sorted by the committee, according to their kinds, and arranged on Shannon files, with a placard on top of each group, indicating its character.

Among the groups were the following: Receivers' reports and records; conductors' reports, including day cards, remittance slips and envelopes used for returns; pay rolls and time books; special books and forms; daily, weekly and monthly reports made by the accounting departments; blanks for purchase and use of materials; overs and shorts; maintenance of way and structure; blanks used in general transportation department; blanks relating to collections of sundry bills; daily and monthly statement of earnings; accident forms; special car service; maintenance of equipment; cash book forms; reports serving as a check on conductors' returns; voucher covers; journal entry forms; receipt blanks, etc.

Among the companies whose blanks were prominent in the collection the following were noted: Lowell, Lancaster & Haverhill Street Railway Company; Worcester Consolidated Street Railway Company; Market Street Railway Company, San Francisco; Lynn & Boston Railroad Company; Davenport & Rock Island Railway Company; Tri-City Railway Company; Columbus (Ohio) Street Railway Company; Toledo Traction Company; Cleveland Electric Railway Company; Milwaukee Electric Railway Company; Brooklyn Heights Railroad Company; North Hudson Company; United Traction Company; Capital Traction Company; Boston Elevated Railway Company; Savannah Thunderbolt & Isle of Hope Railway Company; Denver Consolidated Tramway Company; Bergen County Traction Company; Brockton Street Railway Company; Toledo Electric Street Railway Company; Concord Street Railway Company; Fitchburg & Leominster Street Railway Company; Detroit Citizens' Street Railway Company; Harrisburg Traction Company; Rockland & Abbington Street Railway Company; Chicago City Railway Company, and others.

C. N. Duffy, secretary and treasurer of the Citizens' Railway Company, St. Louis, contributed a sample money pouch made of canvas, leather trimmed, and employed by his company for conductors' trip returns of cash and tickets collected. In a letter accompanying this exhibit, Mr. Duffy stated that the manila envelope, which had formerly been employed for the same purpose, had been found unsatisfactory, among other reasons because it became ungummed and liable to spill its contents in the safe or other place provided for the deposit, and also because the envelope, used only once, was a considerable item of expense. The money pouch, on the other hand, he said, is durable, and, the flap being fastened by a peculiar construction of button, is both convenient and safe.

The Columbia Railroad Company, Washington, was represented by a special collection of blanks, embracing many, if not all, the forms in use by this corporation, and constituting something that was very carefully scanned by all who gave attention to the exhibit.

The contribution of the Montreal Street Railway Company was probably the most carefully arranged exhibit of the entire lot. Several large, specially constructed blank books contained the exhibit. These books had indexed margins, and were so arranged as to constitute sections of one volume. The several sections were designated by letters of the alphabet, being from A to H, inclusive. The blanks contained in the section A-B related to maintenance; those in C, to expense of transportation; in D, to general expenses; in F, to income; in G, to pay rolls and vouchers, and in H, to reports. W. G. Ross, comptroller of the Montreal Street Railway Company, who was present, received many compliments for the special quality of the exhibit his company contributed.

The Richmond Traction Company, of which R. Lancaster Williams is treasurer, contributed its quota in the form of a large blank book, in which the forms were pasted, the dimensions of the book being considerably in excess of any other shown.

The exhibit of the Hartford Street Railway Company, arranged by Elmer M. White, cashier of the corporation, served to illustrate the peculiar accounting and checking features of the Hartford register, a device originating with this company and employed in all its cars. The blank included tickets, transfers, reports and slips taken from the register, showing the impressions made automatically by the device at the end of runs, etc.

In addition to all that is specifically enumerated in this account, there were fragments from various other companies, special blanks



for different purposes, forms of transfers, trip passes, coupons, etc., and also various banks and forms contributed by different State boards of railroad commissioners and the Interstate Commerce Commission.

### Charles Spencer Sergeant

Charles S. Sergeant, the newly elected president of the American Street Railway Association, was born in Northampton, Mass., in 1852. He was graduated from the Northampton High School in 1868, and at once engaged in business, spending four years as a bank clerk in Easthampton, Mass., then going to Lake Superior as cashier and paymaster of the Marquette, Houghton & Ontonagon Railroad. He was also connected with several iron, mining and furnace companies. He returned East in 1876 to take the position in Boston of general clerk of the Eastern Railroad. He was afterward made general auditor of this company, and while filling this position thoroughly reorganized the company's entire accounting system. He left the employ of this company shortly before its lease to the Boston & Maine Railroad, and was for a time employed in the Boston office or fiscal agency for a large number of Western railroads, land companies, etc., taking the position of auditor of the West End Street Railway Company, of



CHARLES S. SERGEANT  
PRESIDENT AMERICAN STREET RAILWAY ASSOCIATION

Boston, in December, 1887, at the time of its consolidation with the former street railway companies of Boston.

Here again arose the necessity of organizing an accounting system, and adapting it to a large business. Mr. Sergeant successfully did this, his steam railroad experience coming well into play. In 1891 he was elected second vice-president, and in 1892 general manager, of the entire West End Street Railway System. Under Mr. Sergeant's management the greater part of this system has been converted from horse traction to electricity, many extensions built, and the entire property thoroughly overhauled and improved. Upon the lease of the West End system to the Boston Elevated Railway Company he was appointed second vice-president of the new company.

Mr. Sergeant held the office of first vice-president of the American Street Railway Association two years ago, and has always taken a great interest in the association.

### Foreign Engineers at the Convention

There were the usual number of foreign engineers in attendance at the convention. Among them were M. Marcel Delmas, civil engineer, of Paris, France, and in the employ of the French Government; Alfred Wiseman, chairman of directors of the Light Railway & General Construction Company, Limited, and managing director of the Electric Tramways Equipment Company, of Birmingham, England; T. Y. Dzushi, chief financier, Imperial Japanese Government Railway, of Tokyo, Japan; Koran Sugahara,

chief engineer to the Koku Railway Company, and to the Buso Chuo Railway Company, of Tokyo, Japan.

### Meeting of the Massachusetts Street Railway Association

The annual meeting of the Massachusetts Street Railway Association was held in Boston on Wednesday, Sept. 14, 1898, and the following officers were elected for the ensuing year: President, P. F. Sullivan; first vice-president, John R. Graham; second vice-president, E. C. Foster; secretary, Charles S. Clark; treasurer, W. F. Pope; executive committee, A. A. Glasier, William A. Bancroft, E. P. Shaw, F. H. Dewey and S. M. Thomas; auditing committee, John N. Akarman, Robert S. Goff and P. L. Saltonstall.

### G. Tracy Rogers

G. Tracy Rogers, who has been elected for the fourth time president of the New York State Street Railway Association, is president of the Binghamton Railroad Company and one of the most prominent business men in that city. He has been identified with the street railway interests of Binghamton for a number of years, and it was mainly through his efforts that the various street



G. TRACY ROGERS  
PRESIDENT NEW YORK STATE STREET RAILWAY ASSOCIATION

railways in that city were consolidated and formed into the system now owned by the Binghamton Railroad Company. The system has grown rapidly under his management and now connects the city with many of the outlying towns and villages.

Mr. Rogers has always manifested great interest in the State association and has been of great benefit to the street railway interests of the State by his services in the position which he has held in the association. In addition to his street railway interests, Mr. Rogers is engaged in manufacturing in Binghamton, is a director in some of the largest financial institutions of the city and possesses other business interests throughout the State.

A curious accident took place at the Houston Street power station of the Metropolitan Street Railway Company, on Sept. 5, which resulted in an experience which to New Yorkers of the present day was most novel and interesting, namely, the running of horse cars on Broadway for a full half day. During the night an automatic damper, which controlled the chimney draft, was closed by the rising pressure of steam, and while so closed a number of bricks fell down upon it from the interior of the chimney and prevented its reopening. This shut down the entire power station of the cable lines until the bricks could be removed. This was done by relays of men, working two at a time, breaking into the chimney above the damper and removing the bricks. The weather was exceedingly sultry, the chimney, of course, hot, and the men could work but a little while at a time. The cable cars started up again about noon of the 5th, and no further trouble was experienced.

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Now that Porto Rico and the Hawaiian Islands are American territory, and Cuba and the Philippines are virtually under American protection, our far-seeing business men are entering upon the peaceful conquest of this new territory, and will surely bring about immeasurable improvements in living conditions and general prosperity. Already many companies have been formed, and more are still forming to carry on enterprises of various kinds in these newly acquired possessions. Street railway interests will not be overlooked, and "prospectors" are even now at work studying the islands and their possibilities of development. Cuba and Porto Rico particularly should be grid-ironed with trolley systems, for both are so narrow as to make electric lines from the northern to the southern coasts along their entire length possible and probably profitable, in spite of the cheapness of water carriage by vessels, though if building be carried on too rapidly and before the traffic necessity is created, there will doubtless be the same

kind of financial troubles and insolvencies as have taken place in our great West, where railroads were built in advance of population. As far as purely city traffic is concerned, some idea of the tramway possibilities may be gained from the statement that in Cuba there is one city, Havana, of 200,000 inhabitants; one, Santiago de Cuba, of about 75,000; one, Puerto Principe, of about 50,000; and five of between 25,000 and 35,000. The total population of the island in 1894 was 1,631,696, of which 65 per cent was white and 35 per cent negro. Ten per cent of the area of the island only is cultivated, 7 per cent is unreclaimed and 4 per cent is under forests. The population of Porto Rico was, in 1887, 813,937, of which about 300,000 was negro. There are but three important towns in these islands, San Juan (25,000), Ponce (40,000) and San Germain (30,000). In the 400 islands of the Philippines, besides the capital, Manila (154,000 population), are four other towns of from 30,000 to 45,000. The Hawaiian Islands are eight in number, and contain 6640 square miles. In 1890 their population was about 90,000, of which 35,000 were natives and the remainder of many other nationalities. Honolulu, the capital, has 28,000 inhabitants and is the only important town.

The new officers and executive committee of the American Street Railway Association are among the best known men in the industry. All except two have been for many years identified with street railway interests and upon important roads. Mr. Sergeant, the new president, was until recently vice-president and general manager of the great West End system, of Boston, and is now the second vice-president of the Boston Elevated Railway Company, to which it is leased; Henry C. Moore, first vice-president, was formerly president of the People's Passenger Ry. Co. of Philadelphia, and is now president of the Trenton Passenger Railway Company; E. Woodruff, second vice-president, is president of the Atlanta Consolidated Street Railway Company; W. H. Holmes, third vice-president, is vice-president and general manager of the Metropolitan Street Railway Company, of Kansas City; Albion E. Lang, the retiring president of the Association, is president of the Toledo (Ohio) Traction Company; G. A. Yuille is second vice-president of the West Chicago Street Railway Company; F. G. Jones is vice-president and general manager of the Memphis (Tenn.) Street Railroad Company; John I. Beggs is general manager of the Milwaukee (Wis.) Electric Railway & Light Company, and has been for many years one of the most prominent figures in electric lighting circles; and Ira A. McCormack is general superintendent of the Brooklyn Heights Railroad, and has had a long experience in steam railroading. It will readily be seen how important are the street railway interests represented by these nine gentlemen, while never has more care been taken by the nominating committee to have all sections of the country fairly represented.

As a convention month, September is in some ways a success; in others, not entirely so. There was certainly no complaint about chilliness in the Convention Hall or at the exhibition this year, but quite the contrary. Overhead the weather was fine, and during most of the time, both in Boston and at Manhattan Beach, the temperature sufficiently cool. Nevertheless, September is a bad month for man-

agers to leave their roads, while exhibitors have to forego their vacations and work rather too hard in the two foregoing months for health or comfort. Altogether, we look forward to an October Convention next year with a sense of relief.

The warmth of Boston's greeting to the National Association could not have been exceeded even in the warm-hearted and hospitable West. Never has there been a more successful Convention from the standpoint of exhibits, of entertainment and of all pleasurable features. As an anniversary of the organization of the Association in Boston seventeen years ago there was certainly excuse for giving much time to entertainment and reminiscences, but the real business of the Convention could but be somewhat neglected. The exhibits occupied nearly 35,000 sq. ft. of space, and in variety and attractiveness of display were the most interesting by far of anything yet seen at conventions, and a large portion of the members' time was rightly given to their examination.

The Association's treasury is stronger even than last year, its cash balance on hand August 25 being \$3656, as against \$2931 at a similar date last year, and \$1641 the year before. A part of this favorable showing, it is true, is due to the Massachusetts Street Railway Association, and particularly to the street railroads in and near Boston, for the generous way in which they undertook a large portion of the Convention expenses. The hall and exhibition space was furnished by them at a cost said to be \$2000, and they bore the cost of all the entertainment features, together with a portion of the banquet expenses. The Association should certainly be most grateful to the Massachusetts companies for their generosity.

Mr. McCulloch's paper was the first attempt that has been made so far as we know to actually place a money value upon the different elements of advantage and disadvantage of four-wheel and eight-wheel cars, and to do this with figures obtained from actual comparative working of both types of cars on the same system. This paper, and the interesting discussion thereon, brought out very clearly the fact that the double-truck car is becoming more and more a standard among street railway companies, and deservedly so, as there are obviously many traffic advantages to be derived from its use. No testimony could be more positive, straightforward and unequivocal than that given by Mr. Beggs and Mr. McCormack, and their reasons for the adoption of double-truck cars in Milwaukee and Brooklyn appear unanswerable. Mr. McCulloch, it is true, shows that the cost of wheels and brake shoes is greater both absolutely and per passenger carried for the double-truck cars than for the single truck; that the cost of repairs and maintenance of trucks and motors is also greater absolutely and slightly greater relatively; and that the power required, too, is greater per seat capacity, though less per passenger carried one mile. Nevertheless, the weight of testimony appears to be that these cost disadvantages are counterbalanced by two important traffic advantages possessed by the double-truck cars, particularly when equipped with cross seats, as is usually done; first, that the public likes to ride in them and traffic

is actually created by their use; and, second, that the problem of a standard car for all-the-year-round traffic is, in many places, at least solved by their means.

It is obviously highly desirable to have one car which can be used both summer and winter and in rainy weather as well as bright. The open cars now in use, particularly in the East, are a development of horse car types, and have always been highly popular, furnishing one of the pleasantest means for transportation so far found. Ordinarily, however, they can be used in northern latitudes for from three to five months only of the year, and during this time the entire closed car equipment of a company must lie idle, the interest on its cost is lost, and the cars themselves, are, of course, subject to some deterioration. During the remaining months the open car equipment cannot be used. On a rainy day people will not ride freely in the open cars and grumble if they are compelled to do so. If the closed cars are run out and the skies clear, they must be housed as quickly as possible and the open cars put into service, or again there is grumbling by the public. Moreover, there is the question of duplication of electrical equipment to be considered or the change of motors from closed to open cars, and vice versa, in spring and fall. Double barn capacity, too, is required by a mongrel equipment of this kind, and altogether it is self-evident that the double equipment idea must sooner or later give place to something better, as the burdens of carrying it out are too great to be borne. As above stated, the double-truck car plan, with cross seats, large windows and low sills, is one method of solving this problem, and an excellent one. Another method, though an imperfect one, is that of running combination cars, half open and half closed, such as have recently been introduced on the New York City system. Still a third method is the use of a "duplex" or "convertible" type of car, two styles of which were shown at the convention. One of these is built on the roll top desk principle and the other on a modification thereof. Both these cars when used for summer travel closely resemble the present style of open car, and for winter travel the present style of closed car. They furnish a promising means for accomplishing the desired object, and we believe they will be largely used in purely city business, and in places where the traffic is not large enough to call for double-truck cars, though in principle they are not themselves limited in size or length.

Mr. Dimmock, in his paper on the carriage of mail matter by electric railways, calls attention to the great value to the Government of the electric railway service and to the inadequacy of the compensation. He certainly has not overdrawn the picture, for on all sides we hear from street railway managers that they are not getting the cost of service from the Government, particularly where separate mail cars are used. Mr. Dimmock points out the fact that for the carriage of closed pouches on ordinary electric trains the Government pays out \$ .03 a mile, while the Star Route service, which this replaces, costs nearly \$ .05 per mile, though greatly inferior in speed and reliability. The regular wagon transportation in various cities costs the Government \$.157 per mile, while for the enormously superior electric postal car service it pays the companies but \$.16 a mile. It is well known that the compensation re-

ceived by the steam railroads of the land for the carriage of mails is grossly inadequate, and is based on an illogical and antiquated system. Recent commissions appointed to investigate the subject have advocated increased pay. Mr. Dimmock urges that street railway companies also agitate for an increase in their compensation, and we strongly support this recommendation, believing that it would even be wise in many cases to refuse to handle the Government mails at the compensation offered where it means a positive loss. The thanks of street railway managers are certainly due to Mr. Dimmock for his able and suggestive paper.

Mr. Holmes's paper on amusement resorts brought out valuable and interesting discussion. It has been evident for a long while that street railway managers in many places have been taking great risks in this amusement business, and not infrequently have been giving far too much to the public. It has been our belief that amusement resorts should be self-supporting, independent of street car profits, for, unless the increase in riding, due to the amusement attractions, means a practically clear profit over and above that from ordinary travel, the effort expended is hardly worth while. The fact that, in northern cities, at least, open air amusement resorts usually serve their purpose for only three or four months of the year, makes it especially necessary to be cautious in undertaking an investment which must lie idle for so large a proportion of the time. Moreover, ours is a novelty seeking people, which is apt to become tired of the same place year after year. Altogether, the plan of promoting all public amusement enterprises which will tend to increase street railway traffic by money contributions from street railway companies, instead of by the assumption by them of the entire investment, has much to recommend it.

The successful managers of to-day are those who watch their traffic carefully and regulate their car service by their day receipts. In some cases the financial rehabilitation of properties which have been in a bad way has been brought about by quietly and carefully withdrawing cars from service on lines where the patronage is less than a satisfactory sum per car day. In others car speeds have been gradually increased to a point where one or more cars on a line could be withdrawn while giving the same service, or both speeds and headways have been so increased as to make possible the withdrawal of more. Transportation wages are, of course, reduced by this means, reserve equipment is obtained, and maintenance charges ought to be somewhat reduced, if not proportionately. As we have more than once pointed out, managers, particularly in the West, have often made the mistake of trying to give the public too frequent a service, and it has been the almost invariable rule that with the change from horses to electricity has come a large reduction in the gross receipts per car mile.

The paper by F. B. Perkins on "Inspection and Testing of Motor and Car Equipment by Street Railway Companies," that by M. S. Hopkins on "Equipment and Maintenance of Electric Cars," and that by R. W. Conant on "Cost of Electric Power for Street Railways at the Switchboard—Steam and Water Power," are of great practical interest to those in direct charge of operating street railroads, and should be read with the greatest care. It is im-

possible to satisfactorily abstract these papers, or even to comment upon particular features of special value. Every sentence in them tells of useful experience, and the writers' conclusions are entitled to great respect.

That is a good suggestion which Mr. Sloan made in the discussion on Mr. Hopkins's paper, that motor brushes should be changed every day. There is nothing which will so quickly rut a commutator as a badly fitting brush or one which may have developed imperfections. It may be urged that, if the brush is wearing well and the commutator has that peculiar dull glaze which betokens good condition, there is no need of changing. This means, however, that the inspector must use his judgment, and it is probably better to establish an invariable rule and to depend upon the judgment of the one man who watches and knows about all the brushes than to distribute the responsibility. Moreover, if the commutators are always kept in a condition such that the brushes can be interchangeable, they are obviously in the best condition for wear.

The New York State Association's Convention, at Manhattan Beach, was, as usual, bright, snappy, businesslike and full of the most interesting discussion. None of the entertainment features were allowed to interfere with the business programme, and on Tuesday President Rogers kept the Convention steadily at work on papers and discussions from 10 o'clock to nearly 6, in spite of the attractions of a glorious day outside and an ocean tantalizingly in sight from the windows of the meeting room. We are forced, for lack of space, to reserve until next month comment upon the many valuable papers read before the New York State Association, with the suggestive discussion thereon.

The Street Railway Accountants' Association feels that it must be just before it is generous, and that its first duty is to its own membership rather than to the accounting public. For this reason, and also because in its discussions its members are necessarily on delicate ground and frequently talk over matters which should not be given general circulation, it has requested that a brief report only of its proceedings be published in the technical press. Its members will later on receive, as last year, a verbatim report, in numbered copies, to be considered as "confidential." This association has done more work in a short time, we believe, than any similar one ever formed, and it is perfectly true to say that the papers and reports which have been presented at its meetings, while of the greatest possible value, particularly the report of the committee on standardization of accounts, the discussion in the meetings has been of even more value, and has in many cases assisted to clear up questions which every street railroad accountant in the country must have had to consider and decide upon for himself. The membership fee in the association is so small (\$10 per annum) that the printed report of the proceedings alone is far more than an adequate return, and we earnestly recommend and urge street railway companies all over the country to enter their names as members for the benefit of their accounting departments, feeling sure that, irrespective of the question as to whether the heads of these departments can or cannot attend the different conventions, they will derive far more advantage from membership than is represented by the fee.

### Notes and Comments on the Street Railway Accountants' Convention

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

The convention of the Street Railway Accountants' Association of America in Boston this year was very much like the convention of the same association at Niagara Falls in October last. The leading feature in each case was the report of the committee on standardization of accounts, and the discussion which followed. Much the same ground was covered, both in the report and in the discussion, and yet there were radical differences—differences better defined than those which frequently exist between the original and the revised edition of a book. In both instances the committee to which had been intrusted the special investigation was found to be far ahead of the rank and file of the membership in all those matters which were debatable. The committee was also found to be better entrenched, so to speak, in its position this year than last year, not alone because it had further studied the question, but because the practical experience in the use of the accounts by numerous street railways had given its members abundant reasons for the faith that is in them.

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The attendance at the accountants' convention was not as large as many had hoped it would be, though it was entirely representative. The reason for the comparatively small number of accountants present is not far to seek. The date of the convention was early in the month, a time when it is extremely difficult for auditors, accountants and secretaries, of whom the membership is almost entirely composed, to get away from their duties. Many of those who were present spent the week in Boston only at considerable personal inconvenience. A resolution was offered at the close of the convention looking to a conference with the management of the larger association to the end of fixing a date for the next annual convention later in the month.

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There is given elsewhere in this issue a brief account of the exhibition of blanks, forms, etc., which constitute an important feature of the convention. The display was notably far in advance of what was presented at Niagara Falls last year. For the most part the blanks and forms were shown, classified under leading heads, thus facilitating comparisons of the forms of one company with another. In some instances the companies had presented complete files, handsomely arranged in book form. There were few, if any, members present who did not make copious note-book memoranda of different items which commanded their attention.

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Any account of the proceedings of the convention of the Street Railway Accountants' Association that we might publish, however full, would, from the standpoint of those who took part, appear to be incomplete and inadequate. The work of the association is entirely technical, and is in a field long neglected by street railway managers, as well as by business men in general. Accordingly many of those points which are of great importance to accountants are matters to which the attention of the busy manager has scarcely been directed. Nor was the full importance of the meeting measured by what was done in the stated sessions. Committee work, informal conferences and comparisons of notes on various points wherever two or three were gathered together, constituted a very considerable share of the value of the gathering. So much was the informal part

of the occasion appreciated that a motion was made the last day of the session that at the next convention a stated headquarters for the accountants be arranged for. The thought underlying this motion was that the accountants profit so much by contact with each other, that instead of in Boston, they should arrange, so far as possible, to be together. One member suggested that as the accountants have so little to do with or gain from contact with the supply men, it would be greatly to their advantage to be located where the hotel office and corridors were less thronged than is usual at the headquarters of the principal association. We refer to this as showing the devotion of the accountants to the special work they have in hand.

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The convention work as embodied in the report of its committee on the standardization of accounts, seems likely to stand out in special prominence in the annals of American accounting practice. The pamphlet report which was distributed among the members, barring a few unimportant typographical errors, is a model for other accounting associations. Its technical excellence was only equalled by its practical form. The committee, while discharging its duties with great credit to each of its members, also cast lustre upon the association which it represented by the thoroughness of its work and the handsome shape in which its results were presented.

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It was eminently wise that the committee on standardization of accounts, composed of Messrs. Wilson, Duffy, Calderwood, Ham and Davies, should be continued for another year. No other set of men, however high may be their qualifications, could carry the work forward from its present state so well as these, unless, indeed, they undertook, as a preparatory step, the same careful investigation into the hundreds of details which the members of this committee have made in the two years in which they have been engaged in the work. What the committee will have to do for the current year is likely to be less arduous, even though more important than has been its work in the past. The association has got to that point where it has attracted the attention of the railroad commissioners of the different States. Therefore various conferences between State officials and representatives of the association are likely to be had in the near future. Certainly there are no others who could give the information the State officials may desire concerning the classification that has been adopted, nor who could answer questions with reference to the fine points that are likely to come up with those who introduce the system, as well as these gentlemen. Their contact with State railroad commissioners during the ensuing year will undoubtedly give them abundant material for a report, to be made at the next convention, that will be both interesting and important.

\* \* \*

The only questions that were discussed at length at this meeting were what may be defined as balance sheet or profit and loss questions, and the only feature of the very complete report of the committee on standardization of accounts which was apparently neglected by the meeting was the form of balance sheet or general statement. This assertion may seem paradoxical. The point which called out the freest discussion and on which the meeting was most seriously divided, was the location of the item of taxes in the scheme of classification. Are taxes an operating expense, or are they of the nature of a fixed charge? Should taxes be charged in as an expense of operation, or should they be regarded as of the nature of a fixed charge,

to be deducted from income? It may not have been clear to some of those who took part in the debate that this is essentially a question of the form of the profit and loss statement, and yet one of the speakers (Mr. Davies) in the course of his remarks asserted that he would be more willing to see interest on bonds and floating debt charged in as an expense of operation than to have taxes omitted from the expense classification. This remark certainly verged upon balance sheet considerations, and left the question in about this shape.

\* \* \*

Investors in a street railway enterprise put their money into it for the sake of the return or dividends that will flow therefrom. To the average stockholder the problem of the result is simple. What are the expenses? What are the earnings? The difference must be what is available by way of dividends on investment. Has the company, for lack of capital, borrowed money, either on bonds or on book account (floating indebtedness)? If so, how much have its expenses been increased thereby? Of course, taxes must be paid before dividends. Rents of leased lines must also be paid before profits are declared. If real estate has been mortgaged, the interest on the money thus borrowed or the portion of the purchase money unpaid must be taken into account before profits are declared. The profit and loss statement, therefore, to the unsophisticated stockholder becomes simply a comparison of expenses and income. He would most naturally take the total on each side of the account.

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His advice to the management, expressed in the simplest terms, would be: "Get all the income you can from every possible source, including operation of road, advertising, rent of land and buildings, rent of tracks and terminals, interest and dividends on the securities we own and interest on our deposits in bank. Keep down expenses, including interest on funded debt, interest on real estate mortgages (if we have any), interest on floating debt and all miscellaneous items, to the lowest point; then the difference will be what is available for dividends on the capital which we have invested."

\* \* \*

Almost every man who took part in the discussion at this convention approached the subject whatever the point under consideration was, from a point of view different from that of any of his fellows. Almost every one was more or less influenced in his position by his conception of the requirements of the Board of Railroad Commissioners of his State. The laws of the different States, with respect to taxation, had a material influence upon the discussion relating to the location of the item of taxes. It was manifest to all that the discussion proceeded not upon the merits of the case from an accounting point of view, but instead was influenced by various considerations that have nothing to do with accountings.

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It occurred to me, as I listened to this discussion, that if the order of procedure in the whole matter of standardization of accounts had been somewhat different, the question of taxes and still others could have been more satisfactorily handled. If an ideal balance sheet and profit and loss statement had been constructed by the accountants before classification of expenses had been considered, and if this balance sheet and profit and loss statement had been formed with a view solely to meeting accounting require-

ments, disregarding for the moment all preconceived notions of requirements of the Interstate Commerce Commission, and all the forms laid down by the different State Boards of Railroad Commissioners, the result would have been to place taxes, interest on bonds, interest on floating debt, and other items which at present are regarded as deductions from income, in their proper relationship as accounts. Upon this plan it would have been easy to locate them.

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No accountant handling the records of a street railway corporation or any other financial enterprise at the present day would dare rely upon single entry, but would insist upon double-entry principles throughout; and yet the monthly report, as well as the annual report which was submitted by the committee on standardization of accounts, first a year ago and second at the convention just closed, in the latter case in a somewhat modified form, are constructed upon what may be fairly described as single-entry principles. There is, first, earnings from operation, properly classified, from the total of which is deducted the sum of operating expenses. To this is added income from other sources, and the total thus produced is characterized as gross income. Then follow deductions from income under various heads, resulting in what is defined as net income. From this, in turn, is another set of deductions resulting in what is called surplus. All this, I take it, is in character and form the same as would be done by single entry. Contrast with this a profit and loss statement that recognizes two sides to the account, debit and credit, and that reaches a result not by subtraction, but by comparison of the two sides; that is by the difference between the debits and the credits.

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Far be it from me to criticise adversely anything which the Accountants' Association may do or its committee on standardization may recommend. What is here mentioned is in the nature of a suggestion rather than a criticism, and is offered at this time only by way of pointing out some of those things which must come up for consideration before the work of the association, and perhaps that of the present committee, has been fully completed. The precedent created by the different boards and commissions, State and National, who have had to do with railway reports, banking reports, insurance reports and building association reports, have unfortunately been established by men who were not accountants, and who, however sincere and earnest they have been in their work, have been compelled to proceed without that breadth of view to which a thorough accountant, if he had been called in as counselor, could have helped them. Hence the necessity in getting up an ideal system of accounts to proceed without regard to them.

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I do not suggest going contrary to State laws or the regulations of boards and commissions having control of reports, but I do enter a plea for accounting on accounting principles, irrespective of State regulations, knowing full well that after the accounting has been correctly done, a report can be made out in any form that the law may require. Nor do I forget that State and National boards and commissions are ever ready to correct manifest errors and to advance in the form of their regulations and requirements as often as advancement becomes possible. The very fact that a committee of the National Association of State Boards of Railroad Commissioners has been instructed to confer with the Street Railway Accountants' Association, is evidence in point.

## PAPERS READ AT THE SEPTEMBER CONVENTIONS.

### Cost of Electric Power for Street Railways at the Switch-Board Steam and Water Power

BY R. W. CONANT

It is my privilege to be able to communicate to you facts and figures bearing on the operation of forty-four power stations located at the important street railway centers throughout the country. These figures cover for the most part the operation of the stations during the past year, and were obtained through the kindness of members of this association, as well as from experience on the roads in Boston. The aggregate capacity of power stations represented is 98,387 k.w., or 131,800 electrical h.p.

The total cost of operation for the production of power alone from these stations during the past year has been \$1,825,000, and if the power had been produced by all at as low a cost as it was in a number of the more economical stations the saving for the year would have amounted to \$443,300. It is the chief purpose of this paper to explain the if, and to obtain some idea of its size.

In what has been published on this subject there are a great variety of opinions as to what should be included in the cost of power, and also as to whether the basis of comparison should be the car-mile or k.w. hour, this latter being due to the fact that up to within a few years there has been no reliable instrument adopted by street railways for the measuring of their output.

The car-mile basis is not a fixed standard. A car-mile up hill takes a great deal of power, while a car-mile down hill should take none, and may be made a source of power.

In the analysis of costs of operation of power stations of various sizes and types it is first necessary to adopt a standard for the unit of power. We have seen that the car-mile is unreliable. Recording wattmeters are at present constructed which will measure the output in k.w. hours. They can be made to give results which are accurate within a very few per cent. This statement is abundantly verified by actual experience, and is gradually becoming universally recognized. It is no doubt difficult for one who has been accustomed to figure cost of power production on a car-mile basis to reconcile himself to the k.w. hour. It should, however, be very easy for the steam engineer who is accustomed to deal with h.p., since the k.w. hour equals 1.34 electrical h.p. hours.

It was evidently the idea of your executive committee in limiting the title of this paper to cost at the switchboard to abolish the car-mile and adopt the k.w. hour as the unit of power. And in comparing the costs from the various stations I shall use this unit. For the benefit of those who are accustomed to considering the costs per car-mile it will be interesting to know that on many roads a car-mile takes just about 1-k.w. hour. This is not true where grades and equipments are extremely heavy; in such cases two or three times this amount may be required.

In the costs of power, whether it is produced by steam or water, should be included the fixed charges as well as the cost of operation. Under fixed charges are: interest, depreciation, insurance and taxes on the capital invested in the land, buildings and machinery of the power station. Under operating expenses are fuel, labor, supplies, repairs, superintendence and general expense. In both the fixed charges and operating expenses the component items vary between widely different limits, and it becomes impossible to construct a law that will predict the cost under all circumstances. On the other hand, for one who has had experience it is comparatively easy to predict what the power ought to cost under a given set of conditions. What it will cost must, of course, depend on management as well. In view of the variety of the circumstances governing these costs I have deemed it advisable to establish for purposes of comparison a standard plant whose conditions are fixed.

It is not my intention to imply that the performance or equipment of this station, which I shall employ as a standard, is ideal or could not be bettered, but rather to assume equipment and performance based on facts obtained from stations in actual commercial operation during a long period of time. As this station is described, its performance may seem to border on the ideal, and there is no question but that its performance is consequent on favorable circumstances, very nearly, we may say, test conditions. It is, however, in my opinion, best to err on this side rather than on the other in establishing a station for comparison.

I shall assume the station to be located on the water front, the exact spot is unimportant, but since this association has chosen Boston as its meeting place we can consistently locate the station here as well. I have fixed the capacity at 3600 k.w. The build-

ing erected on firm ground requiring but little piling or filling, building and chimney of brick.

For equipment, three cross compound condensing engines, cylinders 28 ins. and 56 ins. x 5 ft. stroke, speed 80 r.p.m., steam pressure 150 lbs., three 1200-k.w. direct connected generators, six water tube safety boilers, 500 h.p. each, economizers and exhaust feed water heaters, electrically driven feed pumps and coal handling apparatus. Such a station would cost to install as follows:

#### CAPITAL INVESTED

Building, foundations for engines and boilers, chimney, coal handling apparatus .....	\$120,000
Engines and condensers, heaters, separators and piping...	91,800
Feed pumps and economizers .....	18,000
Boilers and flue connections complete .....	61,000
Generators and switchboard complete .....	73,800
Land and docking facilities .....	17,000
Engineering and sundries.....	5,000
Total .....	\$386,600

or about \$107 per k.w. capacity.

To obtain the figure for fixed charges I assume interest at 6 per cent, insurance and taxes 3 per cent, depreciation 2 per cent, total 11 per cent, which makes an annual fixed charge of \$42,526.

I shall assume that this station produces 10,500,000 k.w. hours per annum; dividing the annual charge by this figure gives \$.004 per k.w. hour for the fixed charges. The depreciation is not intended to cover repairs, which will be included under operating expenses. The 2 per cent assumed for depreciation is to establish a sinking fund against the time when the station will have to be entirely replaced by one of more modern and economical design. Time of replacement being taken at fifty years. A few years ago the time of replacement should have been assumed much shorter, owing to the imperfect design of power station apparatus then existing. But with the present advanced state of the art improvements cannot be expected to develop as rapidly.

Before arriving at the cost to produce power from this station, it will be necessary to obtain the operating expenses. In making comparisons between stations of different sizes and types the cost of labor is the most perplexing item.

Some stations operate with two shifts, others three. Some have engineers paid at different rates, and men which appear on the records of some are in a capacity which in others is absent or replaced by men of another class and rate of pay. I therefore give the following method of analysis of the labor item, which gives satisfactory results when applied to station operation.

I can illustrate the method and at the same time derive the operating expenses by applying it to our standard station. It is assumed that this station operates with three shifts of men, the duration of each shift being eight hours. This makes the shift-hours per day twenty-four or 8760 for the year. The same number of shift-hours would of course be obtained by two shifts of twelve hours each, as is the case with some stations. For the three-shift station, the first two probably would have the full complement of men, while the third would not, as the station might be shut down on that shift. But as there is considerable inspection, cleaning and overhauling, this shift requires almost as many men, though their rate of pay may be less. The highest rates of pay would be on the shift of heaviest load. The crew to operate the standard plant would be about as follows: Two engineers, one oiler, one helper, two firemen, one coal passer; total, seven men per shift.

The average rate of pay per man is taken at twenty-seven cents per hour. This would be calculated from an actual station by dividing the total amount paid for wages, including chief engineers' salary, by the product of the number of men operating with the hours each has worked. The number of men per shift for this station being seven, I will divide this figure by 3.6, which is the figure expressing the capacity in 1000-k.w. units. This division gives 1.94 as the number of men per shift per 1000-k.w. capacity. This figure will vary with the type and size of station, as we shall see later. The fractional part of the man, of course, only appears in figuring.

Multiplying the 1.94 by the rate of pay, \$.27, gives \$.52 as the cost of labor per hour per 1000-k.w. capacity. This multiplied by 3.6, the number of 1000-k.w. capacity, gives \$187 as the total cost of labor required to operate the station per hour.

It will further aid in the analysis of the labor item to introduce the load factor. As this term is sometimes employed in a dif-

ferent sense from that used in this paper, I shall define it to be that per cent which when multiplied by the capacity of the station in k.w. and by the shift hours, for the period gives the k.w. hours' output for the time considered. I take as the load factor this station 33.3 per cent, average for the year. You may remember that in the consideration of the fixed charges I gave as the k.w. hours per year 10,500,000, which is 33.3 per cent of 3600 k.w. multiplied by 8760, the shift hours per annum.

It has been shown above that \$1.87 is the average cost of labor to operate the station for one hour, and if we obtain the average k.w. during the hour, which is k.w. hours for that period, a simple division will give the figure for the cost of labor per k.w. hour. The load factor gives the means of obtaining the k.w. hours, and by multiplying 3.6 by 1000 and 33.3 per cent gives 12000 as the average k.w. for the hour, or k.w. hours for that period. Dividing \$1.87, cost of labor to operate the station per hour, by 1200 gives \$.00157 as the cost of labor per k.w. hour. But 3.6, the figure representing the capacity, was used as a multiplier in obtaining both the cost of labor, \$1.87, and 1200 k.w. hours. It therefore disappears in the division, and the expression for the cost of labor per k.w. hour is made independent of the capacity of the station to that extent. The rule then for obtaining the cost of labor per k.w. hour for any station is to multiply the rate of pay of the men by the number of men per 1000-k.w. capacity and divide by the product of the load factor and 1000.

that it required 3.7 men instead of 1.94. Price of labor and load factor being \$.27 and 33.3 per cent respectively; 3.7 followed on the diagram up to 33.3 per cent gives \$ .003, as against \$ .00157 for standard.

The cost of fuel is the next item to be considered in the operating expenses of the standard station. Considering coal as the fuel used its cost per k.w. hour depends on the price per ton and on the efficiency of the station, which is best expressed in pounds coal consumption per k.w. hour. The coal for standard station I have assumed to be clear bituminous, costing \$3 per short ton delivered.

As to the efficiency, I am able to quote from tests in which I was personally engaged on a station of the same size and similar equipment. The duration of the test was forty-five hours, made under actual conditions of railroad service during the day, and at night the load was kept on the station by means of a water rheostat. I will say here, however, that the test on the steady night load did not show any great gain in efficiency, due to the fact that the day load of the station was steadied by feeding in with others. The average efficiency of transformation i.h.p. to e.h.p. at the switchboard was 90 per cent. The steam consumption of the engines was 14.5 lbs. per i.h.p. hour. This record on a later test has been lowered. The boiler evaporation was 9.4 lbs. water lb. of coal from actual conditions. The coal used was New River bituminous. The economy of the station, represented by the coal consumption

TABLE No. 1.—SHOWING COST OF OPERATION OF POWER STATIONS.

NO. OF STATION.		S.	1	2	3	4	5	6	S.	1	2	3	4	5	6	S.	1	2	3	4	5	6
TYPE.	Cap. in 1,000 k. w.	3.6	.6	2	1.6	12.68	2.38	.744	3.6	.6	2	1.6	12.68	2.38	.744	3.6	.6	2	1.6	12.68	2.38	.744
	Units E	3	3	2	2	8	2	4	3	3	2	2	8	2	4	3	3	2	2	8	2	4
	Units G	3	3	2	2	8	7	12	3	3	2	2	8	7	12	3	3	2	2	8	7	12
	Units E per 1000 k. w.	.83	5	1	1.25	.63	.84	5.4	.83	5	1	1.25	.63	.84	5.4	.83	5	1	1.25	.63	.84	5.4
	Units G per 1000 k. w.	.83	5	1	1.25	.63	2.94	16.2	.83	5	1	1.25	.63	2.94	16.2	.83	5	1	1.25	.63	2.94	16.2
	B. D. C.	D. C.	D. C.	D. C.	D. C.	B. B.	B. B.	D. C.	D. C.	D. C.	D. C.	D. C.	B. B.	B. B.	D. C.	D. C.	D. C.	D. C.	D. C.	D. C.	B. B.	B. B.
	S. C. T.	C. C.	C. C.	C. C.	C. T.	T. S.	S. S.	C. C.	C. C.	C. C.	C. C.	C. C.	C. T.	T. S.	S. S.	C. C.	C. C.	C. C.	C. C.	C. T.	T. S.	S. S.
N. or C.	C. C.	C. C.	C. C.	C. C.	C. C.	C. C.	N.	C. C.	C. C.	C. C.	C. C.	C. C.	C. C.	C. C.	C. C.	C. C.	C. C.	C. C.	C. C.	C. C.	C. C.	
PERIOD.	Days	365	365	343	365	365	365	31	31	31	31	31	1897-1897	31	31	30	30	30	30	30	30	30
LOAD FACTOR.	Per Cent.	33 1/3	22.3	33.6	46.4	34.8	52.2	47	33 1/3	30	152	176	140	192	145.5	33 1/3	17.7	84	130	83	128	43
	Per Cent. of S	---	67	101	139.5	104	157	141	---	90	152	176	140	192	145.5	---	53.2	84	130	83	128	129
LABOR.	Shifts	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Duration	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
	Shift-hours	8,760	8,760	8,232	8,760	8,760	8,760	8,760	744	744	744	744	744	744	744	744	720	720	720	720	720	720
	Men per 1000 k. w.	1.94	4.67	2.91	3.36	1.9	4.79	5.95	1.94	4.66	2.95	3.24	1.93	4.93	6.36	1.94	4.96	3	3.8	1.77	4.5	6
	Rate-pay	27	26.8	25.7	25.8	28.6	26.6	25.3	27	26.5	26.2	25.	29.	25.8	25.6	27	25.	25.6	24.4	28.4	27.6	24.2
	Per k. w. hour	.157	.56	.223	.187	.156	.243	.321	.157	.41	.153	.138	.121	.198	.336	.157	.705	.273	.215	.182	.292	.338
	Per Cent. total op	27.	46.7	32.5	29.4	22.6	28.7	29.1	27.	47.	27.2	23.	18.3	26.8	27.7	27.	51.4	49.6	32.5	25.9	31.8	31.7
Per Cent. S	---	356	142	119	99.1	154	204	---	261	97.4	88	77	127	214	---	448	174	137	116	186	215	
FUEL.	Lbs. per k. w. hour	2.2	3.18	2.48	2.61	2.86	3.24	4.13	2.2	3.07	2.36	2.65	2.74	3.19	4.74	2.2	3.3	2.34	2.48	2.84	3.3	4.05
	Price per short ton \$	3	2.6	2.62	2.6	2.72	2.6	2.9	3	2.75	2.65	2.54	2.88	2.71	3.08	3	2.48	2.56	2.53	2.43	2.56	2.44
	Kind, A or B	B.	3 A.	25 A.	3 A.	B.	2 A.	B.	B.	3 A.	25 A.	3 A.	B.	2 A.	B.	B.	3 A.	25 A.	3 A.	B.	2 A.	B.
	Per k. w. hour	.33	.414	.325	.340	.369	.42	.599	.33	.421	.313	.337	.395	.430	.729	.33	.409	.299	.314	.345	.423	.494
	Per Cent. total op	57.	34.5	47.4	51.6	55.2	43.7	54.3	57.	42.	55.6	56.4	59.9	58.4	60.1	57.	29.8	44.3	47.5	48.8	46.1	46.4
Per Cent. S	---	125.5	98.5	103	117.5	127	182	---	127.5	94.5	102	120	130	220	---	124	91	95	104	128	140.5	
REPAIRS, SUPPLIES & GEN. EXP.	Per k. w. hour	.093	.225	.138	.132	.159	.182	.182	.093	.172	.0975	.123	.144	.109	.147	.093	.258	.102	.133	.176	.203	.233
	Per cent. total op	16.	18.8	20.1	20.	22.6	21.6	16.5	16.	17.	17.2	20.6	21.81	14.8	12.2	16.	18.8	15.1	20.	25.1	22.1	21.9
	Per Cent. S	---	242	148	142	171	196	196	---	185	105	132	155	117	158	---	278	110	143	189	218	250
TOTAL OPER. COSTS.	Per k. w. hour	.58	1.198	.686	.659	.704	.845	1.102	.58	1.003	.563	.598	.66	.737	1.212	.58	1.372	.674	.662	.703	.918	1.065
	Per Cent. S	---	205	118	114	122	146	190	---	172.5	97.	103	114	127	208	---	236	116	114.5	121	157	184
FIXED CHARGES	Per k. w. hour	.405	---	---	---	---	---	---	.405	---	---	---	---	---	.405	---	---	---	---	---	---	---
	Per Cent. total op	70	---	---	---	---	---	---	70	---	---	---	---	---	70	---	---	---	---	---	---	---
Grand Total		.985	---	---	---	---	---	---	.985	---	---	---	---	---	.985	---	---	---	---	---	---	---

The use of this method will be illustrated if we compare the cost of labor per k.w. hour in the first two columns of table No. 1. It is \$ .00157 for the standard and \$ .0056 for station No. 1. It is rather difficult to account for this great increase until we notice that the men per 1000 k.w. is 4.7 as against 1.94. The rate of pay and load factor also enter, as I shall show later.

I have constructed a diagram, which gives the results of this expression for cost of labor for all usual rates of pay, load factors and men per 1000 k.w. This diagram is based on a rate of \$.27 per hour, and there is also given a reduction table, which gives the per cent to be added or subtracted for other rates than this. To illustrate its use, suppose we have a station whose equipment requires five men per shift per 1000-k.w. capacity. During a month of high output it might operate at a 30 per cent load factor. On the diagram following 5 up to 30 gives cost of labor at \$.0045 per k.w. hour. In a lighter month the station might operate at a 15 per cent load factor. Following 5 up to 15 gives \$.009, or twice as much for labor per k.w. hour.

To further illustrate the use of this diagram let us consider that the equipment of our standard station is cut into so many units

in pounds per k.w. hour was 2.3. I have assumed 2.2 for this figure for the standard station.

Reducing price per ton to price per pound and multiplying by 2.2 gives \$.0033 as the cost of coal per k.w. hour. This appears in table No. 1 under cost of fuel. As an illustration of what the cost would have been had the engines required more steam, say 26.6 lbs. per i.h.p. hour, as might be the case with a non-condensing engine. Referring to the fuel diagram and considering the electrical efficiency, boiler evaporation and price of coal to remain the same, 26.6 to 9.4 lbs. water per pound of coal gives 3.8 lbs. coal per k.w. hour. Following this line down to horizontal \$3 coal line and vertically upward from this point to cost of fuel in cents per k.w. hour we obtain \$.0057, were the efficiency of transformation 100 per cent, but since it is assumed to be but 90 per cent, 11 per cent has to be added to this cost, as shown in the reduction table. This gives the cost of coal per k.w. hour \$ .0063, as against \$ .0033 for the condensing engine.

There remains to be included in the operating expenses for this station, water, oil, small supplies, repairs, superintendence and general expense, which I have estimated at \$ .00093 per k.w.



hour. The total operating expense foots up to \$.0058, which added to the fixed charge of \$.004, makes the total cost power from standard \$.0098, or very nearly one cent per k.w. hour.

Before comparing the costs from the various steam plants I will review briefly the circumstances governing the production of power by water.

The application of water power to street railways has the following points of advantage: In plants operated under any but very low heads the generating machinery may be installed at a less cost than for steam. The fuel expense also disappears, as well as a portion of the cost of repairs. A part of the labor expense will be saved, inasmuch as no engineers, firemen or coal handlers are required.

The main disadvantage in the application of water power to street railway operation lies in the fact that generally railroad power stations are quite distant from waterfalls, and that it is very expensive to transmit the electrical energy to any considerable distance, the distance of transmission being hundreds of miles for the majority of street railways. That it may be made more profitable to employ water power when its location is nearby the road and the price of coal is high also, there can be no doubt.

The cost to produce power from water is often compared with the cost to produce from coal on the basis of continuous operation for twenty-four hours a day. For street railway service this method gives a false impression, since it implies that the machinery is working at its full capacity for 8760 hours per annum, or 100 per cent load factor; as a matter of fact, for street railway service a load factor of 33 per cent is high.

To look at this from another point of view, the demand for power for street railways cannot be increased at will, as it may be in a manufacturing concern. In the latter, if it is found advisable to run night and day at full capacity, instead of ten hours there is produced a correspondingly greater amount of the product, be it flour, steel rails or carbide of calcium, and this output is produced at a correspondingly decreased cost per unit. For street railway service, on the other hand, there has to be installed sufficient machinery to take the peak of the load.

This is usually three times the average, and is only of a few hours duration each day. If it were necessary or profitable to use this full capacity continuously for other industries it would be possible to do this with very little increase of labor, no increase of fixed charges and the additional expense of producing the greater output would be merely the coal and a slight increase of supplies and repairs. This combination is the feature of the Niagara work.

When the expense of transmission shall have been decreased by the successful employment of higher voltage, it will then become a problem as to whether it will not be profitable to produce power from a steam plant located at a coal mine, coal costing in this case but eighty cents a ton. This would bring the cost of fuel down to \$.0012 per k.w. hour, as against \$.0033 for standard plant. Further, this expense would only continue for the comparatively small number of hours that the plant would have to be operated for street railway service. This might be better economy than to pay the fixed charges that would accrue from the expensive development of water powers at possibly much greater distances. It is to be noticed in this connection that the cost of installing the steam station would be considerably less when located at the coal mine, since it would then be unnecessary to equip with the most economical and expensive machines.

Water power produced in various parts of the country varies greatly in its cost. It is reported that the electrical energy so produced costs from \$14 to \$32 per annum per k.w. continuous output. This expense is largely made up of fixed charges, which increase rapidly as the expense of making the necessary improvements is greater. The standard steam plant produces power with \$3 coal for \$29, and with \$.80 coal for \$22 per k.w. per annum, which compare very favorably with the above for water power.

A disadvantage occurring in the use of water power is that in some cases on account of certain periods of low water an auxiliary steam plant has to be kept in reserve, which is, of course, an additional expense. There can be no general rule given that will determine whether it is more advantageous to use water or steam power. Each case must be figured by a competent engineer and decided on its merits.

The great majority of street railways being operated by steam, I shall not dwell longer on water power, as there is considerable ground to be covered in the consideration of the steam stations. I have compiled and classified the data on representative ones throughout the country; tables No. 1 and No. 2 give the results.

The general arrangement of the tables is as follows: Each vertical column contains the data for a different station during a stated period. Each station is represented by a number, which appears at the head of the column; only a portion of the table is

TABLE No. 2.—DATA ON "OPERATION OF POWER STATIONS."

Table with columns for Station No. (S, 10-50) and rows for various metrics: Cap. in 1,000 k.w., Units E, Units G, B. or D.C., S, C, T, N, or C., Period-Days, Load Factor-Per Cent, Taken from Car-miles, Labor (Shifts, Duration, Disconnection, Men per 1,000 k.w., Rate of Pay, Cts. per k.w. Hr.), Fuel (Lbs. per k.w. Hr., Price (\$ per Ton, Kind-A, or B, Cts. per k.w. Hr.), Gen. Exp.—Per k.w. Hr., Total Op.—Per k.w. Hr., Fixed Charges.

exhibited to you on the large diagram, for obvious reasons, but I will describe the different items as they appear in the completed table. The first column is headed *S*, for standard station; following down the column, first comes the capacity expressed in multiples of 1000 k.w., 3.6 meaning 3600 k.w. The number of units of engines 3, ditto for generators 3, number of units engine per 1000-k.w. capacity is .83, obtained by dividing 3 by 3.6; ditto for generators .83. The next line under type is a description as to whether the engines are belted or direct connected to the generators. *B* for the former and *D C* for the latter. The two lines marked *S C T* and *N* or *C* refer to engines, simple compound or triple non-condensing or condensing, as in standard. *C C* is compound condensing.

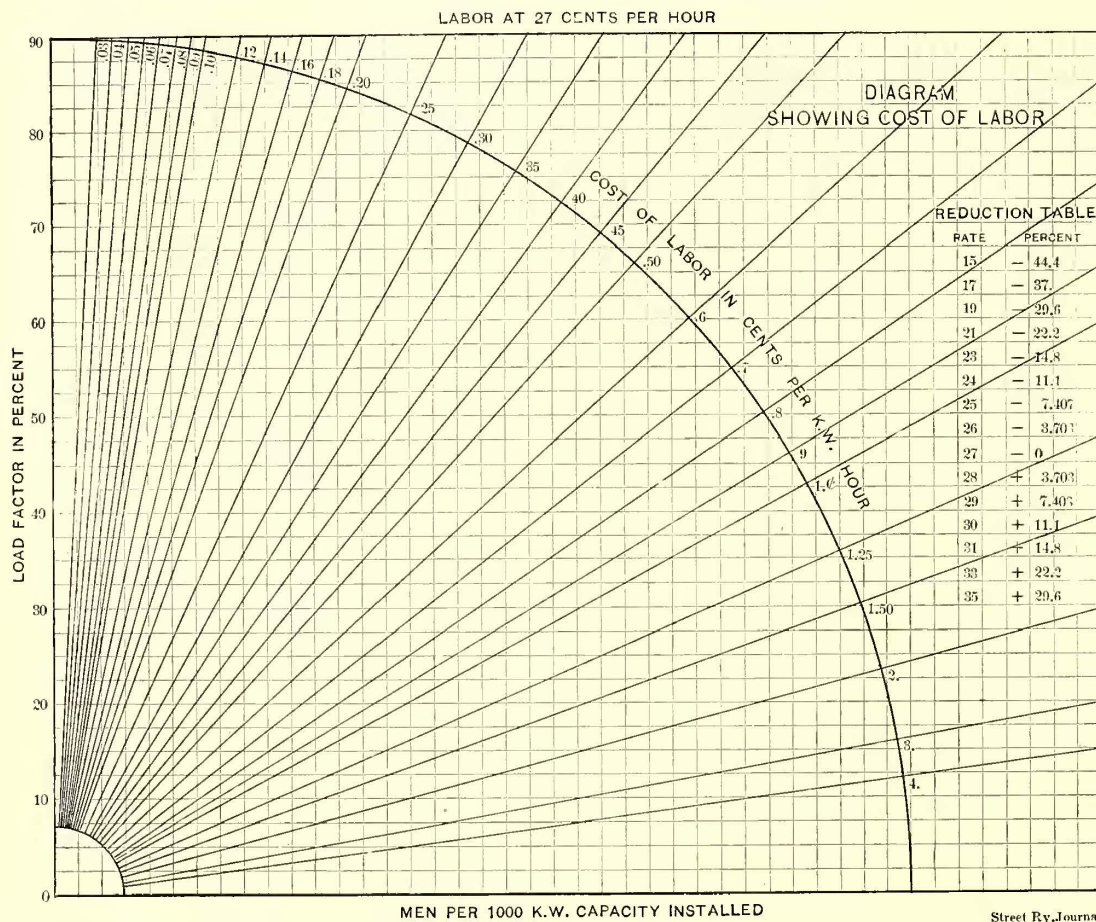
The period during which the averages are taken is given in days. Load factor is in per cent. Inserted in the proper place under costs are the per cent, *S*, and per cent total, which figures represent the per cents the items bear to the corresponding ones for standard, and to the total operating expense respectively.

The number of shifts, duration in hours and shift hours, to-

distance between 0 and 1, so that, including fixed charges, the cost of power per k.w. hour per annum for the standard station amounts to about one cent. It also appears that the fixed charges are approximately equal to the coal. Labor is roughly about half the coal, and general expense about half the labor. These proportions are simply and easily remembered, and we might expect them to hold approximately for stations under similar governing conditions.

I shall next call to your attention station No. 3, whose equipment differs from the standard as follows: It has two units instead of three. Each generator is 800 k.w., making a capacity of about half that of the standard. The generators and engines are direct connected, the latter being compound condensing, smaller, of course, than the standard, but in other respects similar. Three 500-h.p. water tube boilers, economizers and heaters complete the important part of its equipment.

Group No. 3 indicates the cost of power for this station. At the extreme left is standard. The next column showing costs per k.w. hour, averaged for one year. At the extreme right of the



gether with the rate of pay of men, in cents per hour, and number of men per shift per 1000-k.w. capacity complete the data necessary for the analysis of the cost of labor. Costs are all expressed in cents per k.w. hour. Opposite fuel, pounds of coal per k.w. hour and price, which is dollars per short ton, give the necessary figures to analyze the cost of fuel per k.w. hour. Kind *A* or *B* refers to anthracite or bituminous.

Repairs, supplies other than coal, that is, water, oil, waste, lamps and miscellaneous, as well as superintendence and general expenses, are treated as one item, hereafter called general expense.

As a supplement to the tables, in order to more clearly illustrate the relation of the costs, I have constructed diagrams in which these are represented by different characters of lines as to shading.

It will be noticed that these shaded lines are of various heights, their height corresponding to the cost of the power in cents per k.w. hour. Four kinds of shading are used, horizontal equaling the cost of coal; vertical, cost of labor, and diagonal, general expense. These, which are operating expenses, are laid out above the line, and black, equaling fixed charges, is plotted below the line. The distance from the base line 0 up to 1 represents one cent, and the magnitude of each item is denoted by the length of its shading. The diagram for table No. 1 is laid out in six groups, one group for each station. The first or left hand column in each group represents the costs for the standard station. It will be noticed that its total length, including black, is about equal to the

of pay is lower and the load factor enough higher to bring the labor expense to nearly standard figures.

To illustrate the effect of a high load factor in reducing the cost of labor per k.w. hour it will be interesting to look at the next shaded column for this station, which represents the cost during January. In this month the load factor was fifty-nine, as against forty-six for the year, and it will be noticed that the labor is reduced to less than the standard. The reduction in the total cost for this month, as against the yearly, is also apparent, and this is due principally to the reduction in labor.

It will be seen that the coal expense is but slightly less, and seems not to be much reduced by the increased load factor. The explanation of this lies in the fact that the station is tied in with others, which keeps its load from fluctuating even on the low load factor. This will be still further exemplified by referring to a light month; the column at the right of the group gives the costs for September, during which the load factor was forty-three, as against fifty-nine for January. The coal expense is still further diminished, and, by reference to the table, will be found to be due to an increase in the efficiency of the station. This might be found to be on account of not having to force the boilers. The increase of labor due to the low load factor is to be noticed.

I wish to say at this point that it is impossible for me in the limited time to give you more than a general idea of the large number of interesting facts which may be obtained by careful study of the tables.

Plant No. 2 is somewhat larger than the last, and is equipped with two 1000-k.w. generators direct connected to compound condensing engines. It has also economizers and heaters. Its costs are in column No. 2. In looking at the yearly average it will be noticed that the total costs rise above the standard, and is due to an increase in labor and general expense. Coal, as before, is the same, the decreased efficiency being balanced by the lower price per ton. Examining the table with a view to accounting for the increase of labor we find the load factor approximately the same as standard, but an increase in the number of men per 1000 k.w. This is accounted for by the smaller size of the station. General expense is greater, as would be expected. A glance at the shaded diagram representing the heavy month for this station gives a nice illustration of the effect of the high load factor, which is fifty-one, as against thirty-three for the year. It is to be noticed that the coal is practically the same, the reduction coming in the other two items. This brings the total cost for the month below standard. In the light month, with a low load factor of 28 per cent, the labor increase is very apparent.

I shall now present the costs of operation of a large station. Its equipment consists of six 1200-k.w. generators direct connected to triple condensing engines, two 1500-k.w. generators direct connected to compound condensing engines, and an auxiliary plant of forty 62-k.w. generators belted to compound non-condensing engines, and only used in case of emergency. Economizers, heaters and electric feed pumps complete the important part of the equipment.

Group No. 4 indicates the cost for this station. The yearly average shows that we are approaching standard figures in labor. This item is not much less, as the units are only slightly greater capacity. Load factor, rate of pay and men per 1000 k.w. correspond very closely with standard. The general expense and coal bring the total somewhat higher. General expense is high on account of the heavy repair account. The station is about eight years old, and repairs are heavy, due to replacing of worn out parts. The decrease in efficiency, as shown by pounds of coal per k.w. hour, might be shown by a test to be due to old boilers.

The plants just considered have all been direct connected. Station No. 5 is a belted plant a little more than one-half the capacity of the standard, equipped with seven 340-k.w. generators belted to a countershaft, to which are belted three triple condensing engines. The auxiliary apparatus affecting the economy of the station, being economizers and feed water heaters. Diagram No. 5 represents the costs of a year, and also for the heavy and light months. During the three periods the coal expense remains about the same, but there is considerable variation in the other items, due principally to the change of load factor.

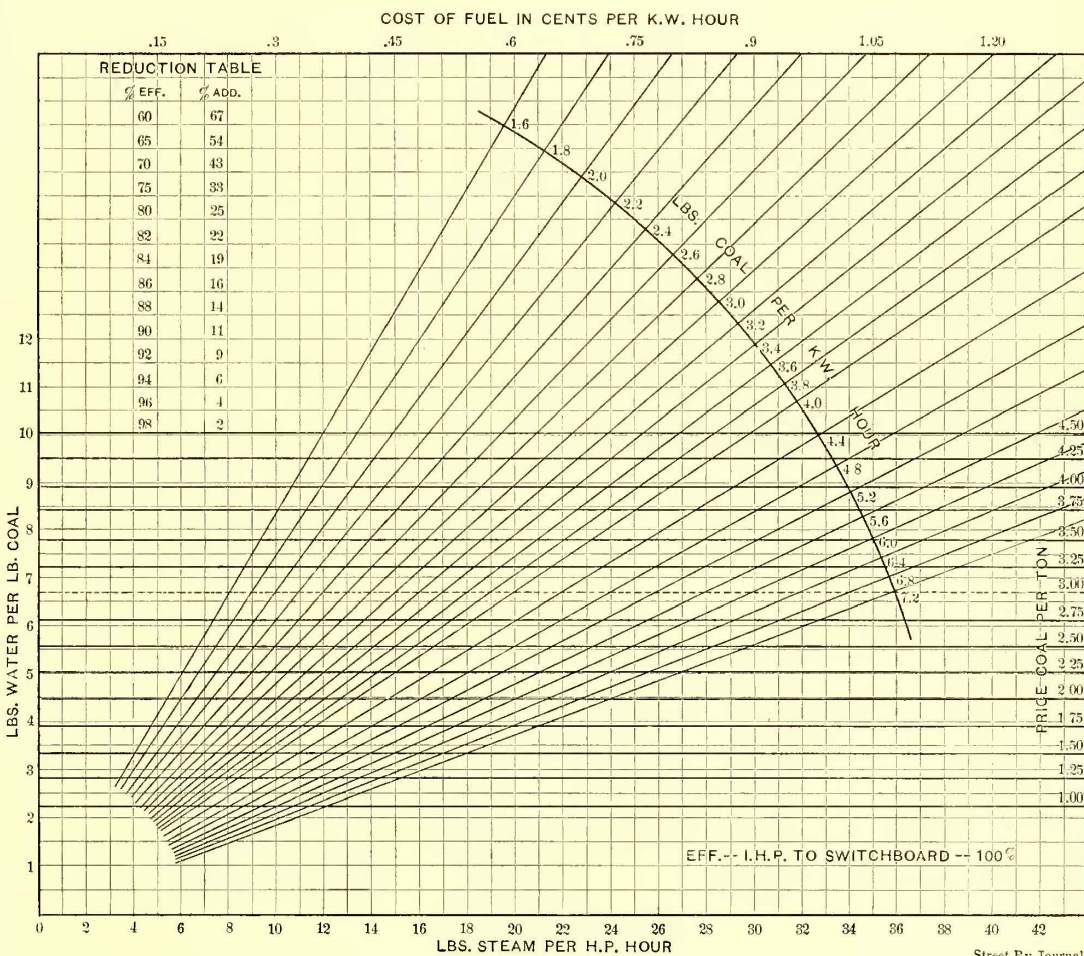
Notwithstanding the high load factor, 52 per cent of the labor for the year is still above standard. This would be expected from the multiplicity of parts to look after in a belted countershaft station. The reduction of general expense and labor in the heavy month is due to the load factor of 64 per cent.

Diagram No. 6 represents the costs for a belted plant of about one-fifth the capacity of standard. Its equipment is twelve generators belted to four simple high-speed non-condensing engines. There are feed water heaters, but no economizer. High coal consumption is the feature of this diagram, the cost of fuel alone for the year being equal to the total operating expenses for standard. Labor is also high, and the total cost of power per k.w. hour is nearly double the operating expense of standard. This station furnishes a good illustration of the effect on the cost of power

of a simple non-condensing belted equipment. It is to be remarked also that this plant has the benefit of a high load factor.

It will now be interesting to turn our attention to a small direct connected station, which is numbered 1. This operates about thirty cars. It is equipped with three 200-k.w. generators, has compound condensing engines, heaters, but no economizers. It does not feed in with other stations, as do those which have been previously mentioned, and has a very fluctuating load, as may be imagined in the operation of so small a number of cars. This station is just one-sixth the size of the standard, and it will be noticed that the column representing its operating expenses is about twice as high. The great increase is in the labor, although the station is operated by a corporation which has had a vast amount of experience in railroad work. Can we account for this increase in labor? By referring to the table we find the rate of pay of men is practically the same as standard, the load factor is low, 22 per cent, as against 33.

Referring to the heavy month for this station, which has the benefit of a 30 per cent load factor, we find that the labor is reduced, but it is still a long way from bedrock figures. The ex-



amination of the table discloses the fact that the increase comes in the men per 1000 k.w., being about 2.5 times the standard figure. The station records show the following men operating: On the first shift, two engineers and one fireman; second shift, one engineer, one oiler and one fireman; third shift, one engineer and one fireman. Can this number of men be reduced? In a station whose equipment requires that the boilers be hand fired it is, to say the least, difficult to imagine that the boilers could be operated with less than one fireman per shift. The secret then for the large number of men per 1000 k.w. lies in the small number of k.w. capacity. These same men could look after a station of greater capacity.

I shall next give the costs on plant No. 12, whose figures are presented in table No. 2. This plant is about one-third the size of standard. It does not feed in with other stations. Its generators are belted to three tandem compound condensing engines, which operate under steam pressure of 110 lbs. It has water tube boilers averaging four years of service, heaters, but no economizers. A good quality of bituminous coal is used, which costs \$2.93 per ton. By reference to the table it will be seen that this station produced power to the extent of 23 per cent of its capacity during the past year at \$.00149 per k.w. hour, including fixed charges, the

operating expenses alone amounting to a little over one cent. The total cost of operation for the year was \$23,000, of which \$13,610 was for coal. Water costs this station nothing, and the labor was about one-half the coal bill. By referring to the diagram No. 12 it will be seen that the coal and labor are both much higher than the standard, and if standard performance had been reached a saving of \$10,000 would have been made in the operating expenses for the year. An analysis of the items is given in column No. 12 of the table, and by comparing with standard the differences may be readily seen. I do not wish to be understood in making these comparisons that it would necessarily pay to make the changes required to effect this saving, my present idea being to bring clearly before you the differences.

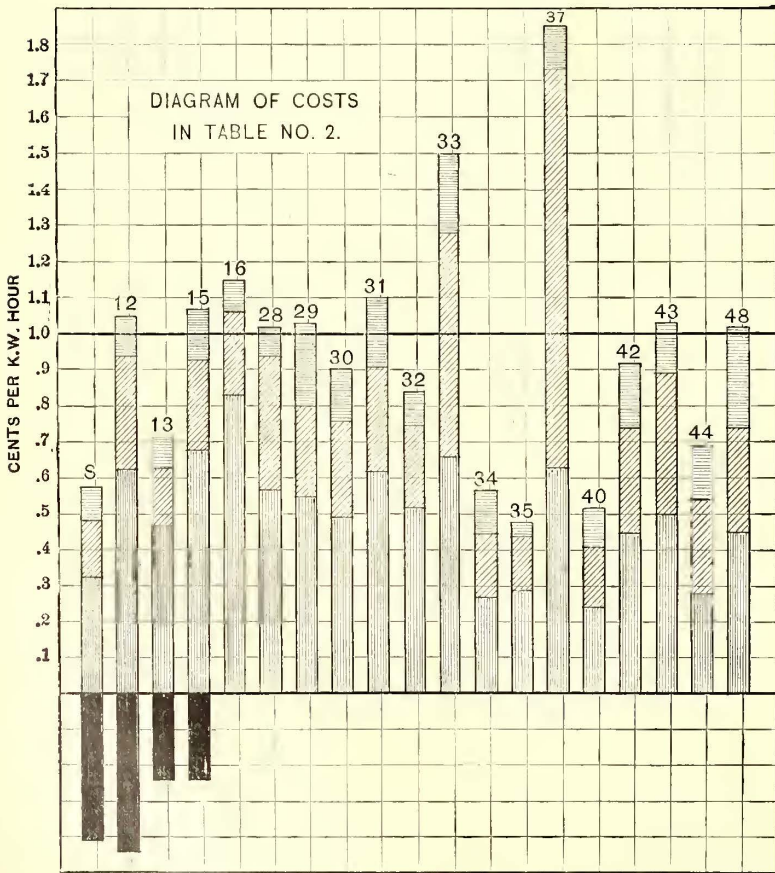
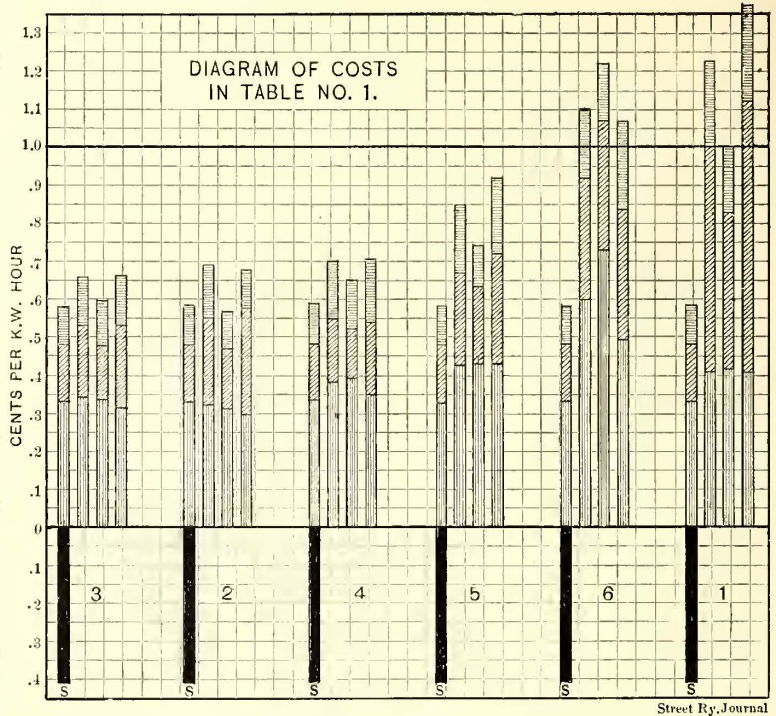
Station No. 13 is an interesting combination of cheap coal, simple non-condensing engines direct connected to the generators, together with a high load factor. Its capacity is 70 per cent of the standard, major part being three 800-k.w. generators; the smaller unit is 200 k.w. It produced power to the extent of 42 per cent of its capacity at \$ .0096 per k.w. hour, inclusive of depreciation and fixed charges. The depreciation is charged in at 5 per cent on a capital expenditure of about \$60 per k.w. The total expense for the year was \$92,617.28, which is made up of—

Labor .....	\$15,453.25
Repairs and renewal of steam plant.....	1,839.69
Repairs and renewal of electrical plant.....	56.71
Fuel .....	44,780.94
Water .....	4,405.40
Oil, waste and lubricants .....	1,881.53
Tools, appliances and supplies.....	634.23
Taxes .....	1,945.65
Insurance .....	2,146.94
Interest .....	11,472.94
Depreciation, 5 per cent on \$160,000.....	8,000.00
<b>Total.....</b>	<b>\$92,617.28</b>

The analysis of these items is given for comparison with

this mileage being trail cars. There is other interesting data about this road which time will not permit me to review.

Plant No. 15 is an interesting example of what a multiplicity of units will do for labor, the figure being 6.3 men per 1000 k.w. The effect of this would be much more apparent on the diagram were it not for the high load factor and low rate of pay.



standard in column No. 13 of table No. 2. The diagram shows labor for this station to be equal to standard, principally on account of high load factor, the other differences are also apparent. It is interesting to note that the road operated by this power station used on an average about 1.3 k.w. hours per car-mile. The total car-miles for the year were 7,207,308, about 10 per cent of

Plant No. 16 is of 1600-k.w. capacity. The cost for power for past year was \$53,000. Load factor is the same as standard. Standard operates to produce about double the output for the same figure.

Station No. 28 is 1400-k.w. capacity, has slow speed condensing engines, heaters and economizers. The feed water leaves economizer at the high temperature of 258 degs. The engines are simple belted to the generators, and coal costs but \$1.63 per ton.

Plant No. 29 is a compound, condensing slow speed belted station of 1900-k.w. capacity, and feeds in with another station. The coal costs \$3.86. Plants Nos. 30 and 31 are operated by the same corporation as No. 29.

No. 32 is a combination of two power houses feeding into the same system. These stations are interesting, because these costs are for the past year, and since then these two stations, as well as smaller ones operated by the same company, have been consolidated into a large water-power plant, from which power is transmitted at 13,000 volts. The two steam stations shown in column thirty-two have five triple expansion condensing engines. This road is operated on about 1.4 k.w. hours per car-mile. The coal costs \$3 per ton. The water-power plant which replaced the steam has not been in operation long enough to enable its costs to be given.

Station No. 33 has rather a tall column, due principally to its low load factor of 16 per cent.

Station No. 34 operated at a lower cost than standard on account of the high load factor, 57 per cent, reducing the cost of labor and low price of coal, \$1 per ton.

No. 35 is a plant of 1200-k.w. capacity, interesting on account of the fact that it has but one unit. It operates with 2.1 men per 1000 k.w. a load factor of 3 per cent coal, costing \$1.24 per ton. Its costs are quite a little lower than standard.

No. 37 is a record breaker in the opposite sense. It is of slightly greater capacity than No. 35, but has three engines and eleven generators, which require eight men per 1000-k.w. capacity. It has a load factor of but 11 per cent during 151 days from Jan. 1 to May 31, 1898. The effect of this on the cost of labor is very apparent.

No. 40 has a capacity of 9200 k.w. It is direct connected, has economizers and compound condensing engines. Anthracite coal is burned, costing \$1.60 per ton. This plant operates at less than standard figures.

No. 42 is a belted plant, compound non-condensing engines,

heaters, but no economizers. It has a good load factor, but the effect of the belted and small units shows in all three items.

No. 43 is a combination of alternating and direct current apparatus. It has a low load factor of 15 per cent, the effect of which is noticed on the labor.

No. 44 is a 6000 k.w. station, and, although belted, has large compound condensing engines and economizers, which, with coal at \$1.60, brings the cost of fuel below standard figures.

It will now be instructive to take a general survey of the shaded diagram for all stations in table No. 2. No. 37 towers above all the rest. Standard is at the extreme left. Coal in No. 37 is greater than the total operating expense for standard. This station pays but \$1.75 per ton, but it uses 7.3 lbs. per k.w. hour. Compare this with No. 35, about the same size plant, paying \$1.24 for coal, and using but 4.7 lbs. per k.w. hour.

I can hardly ask you to compare the labor, but it is easily seven times as large in No. 37 as in No. 35. The load factor of 11 per cent, as against 37 per cent, would make this item three times as great, and men per 1000 k.w., 8 per cent, as against 2.1, would again increase the cost of labor three times. The higher rate of pay in plant No. 35 prevents the discrepancy being greater.

Let us look along the line for high coal cost. No. 16 seems to bear off the palm in this respect; \$3.30 per ton and 5 lbs. per k.w. hour accounts for this. For strikingly low costs we have Nos. 34, 35 and 40.

But I am afraid that I hear somebody remark that I am making comparisons that may result in unfavorable criticism, and that I promised not to do, and therefore I will let the diagrams and tables speak for themselves, and assure you that they will reward careful study.

### Comparative Earnings and Economy of Operation Between Single and Double-Truck Cars for City Use

BY RICHARD M'ULLOCH

Before beginning a discussion of this subject, it would be well to define what is meant by single and double-truck cars, as these terms are often very loosely used. In this paper a single-truck car will mean one in which the body rests upon a truck, the axles of which are parallel with one another, and at all times perpendicular to the center line of the car. In a double-truck car the body is pivoted upon two independent trucks, each of which swings underneath the body with perfect freedom.

Double trucks for electric cars are of comparatively recent adoption. All of the early electric cars were equipped with single trucks, and in this, horse car and cable car practice was followed. As the single truck was first on the ground, and at present largely has possession of the field, it will be assumed that in this case of the double truck versus the single truck, the double truck is the plaintiff and must submit the weight of the evidence.

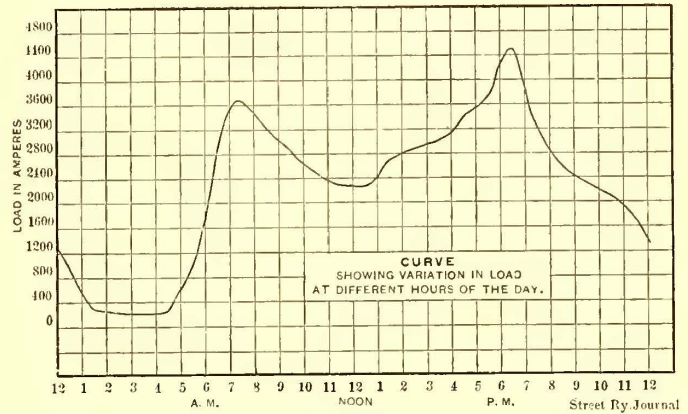
Double trucks were first applied to cars in the desire to use longer bodies than has been customary. In the use of a single truck the best practice has been to limit the wheel base to about 7 ft., as a greater distance than this would cause the wheels to bind in curves. Assuming that the body of the car is 20 ft. long and that the platforms project 4 ft. beyond the body, the end of the platform would overhang the axle 10.5 ft. This is as great an overhanging as is customary, although single-truck cars have been built with bodies longer than 20 ft. In this case it is necessary to provide extension springs on the trucks to check the oscillation of the car body. With a very long car body, however, the oscillation is not entirely overcome by this device, and the rocking becomes very disagreeable to passengers and very disastrous to the car and track. Twenty-two feet may be arbitrarily established as the limiting length of the body of a single-truck car, and if we wish to use car bodies longer than this, we must adopt some truck which will avoid oscillation, and which will pass around curves without undue use of power. The double truck accomplishes this, and it was to enable longer bodies to be used that it first came into use.

The truck which was first used for long street railway cars was an adaptation of that used by the steam railroads. This truck contains four wheels of equal size and is pivoted over the center. It was soon discovered that for street railway uses, this form of truck had two very objectionable features, first, that the floor of the car must be high enough above the rail to allow the wheels to swing freely under the car, and secondly, the motor being geared to one axle of the truck, only 50 per cent of the weight of the car was available for traction. The latter is a serious objection on roads having grades.

From what has been said it will appear that the single truck is

the truck for short cars, and the double truck is the truck for long cars. Therefore, a discussion of the relative merits of these two types of trucks will involve a discussion as to the relative merits of short and long cars. Also, as it is customary to supply long cars with cross seats and short cars with longitudinal seats, we have instead of the comparatively simple subject of single trucks versus double trucks, which has been assigned to your committee, the more complicated struggle between the short car with single trucks and longitudinal seats, and the long car with double trucks and cross seats.

It will be assumed in the discussion which follows that the road possesses the characteristic city travel, a load curve of which is shown below. It will be noted that two very pronounced peaks occur in this load curve, one in the morning from six to nine and the other in the evening from five to seven. It is at these times that the capacity of everything is tried. While the load



LOAD DIAGRAM

curves of all city roads resemble each other, it is evident that local conditions will to a large extent determine the kind of car which the railroad company will operate. Some of these local conditions are the class of people who constitute the passengers, the location of the road with reference to the established lines of travel, the amount of pleasure travel received by the road, and the keenness of competition with other roads. The last is an important condition, because a road is sometimes forced to adopt certain measures for its protection which it would not adopt under any other consideration. In this discussion we will assume that it is to the interest of the road, even if no immediate competition exists, to use all reasonable endeavors to please its patrons, because this policy will render the road more ready to meet competition when it arrives.

Before the advent of the electric car, the horse car had become such an established institution in this country that certain standards as to track and rolling stock had become fixed. In the matter of rolling stock, the size of the car had always been limited by the ability of two horses to draw it. When a mechanical motive power replaced the horses this limit disappeared, and almost the first improvement made in rolling stock was to increase the size of car bodies. Instead of bodies 16 ft. long, electric cars were built with bodies 20 ft. long, and now this length is being increased to 28 ft. and 30 ft.

The expense of the average city road may be divided up as follows:

Maintenance of way and structures.....	4 per cent
Maintenance of equipment.....	7 per cent
Conducting transportation .....	52 per cent
General expense .....	8 per cent
Fixed charges .....	29 per cent

It will be noticed that the item "conducting transportation" is more than one-half of the total. This is largely made up of the wages of conductors and motormen, and is proportional to the number of cars operated. Hence, it follows that if we may by the operation of larger cars cut down the number of cars, this account may be reduced in nearly the same ratio as the size of the car is increased. There are many other reasons why the size of cars has been increased, such as the increased volume of traffic due to the higher speed and enlarged territory of the street railroads, the greater comfort demanded by the traveling public, the increased power available for the operation of cars, etc., but it is probable that the present tendency toward the increased size of car bodies is with a view of operating larger units and fewer of them.

A line operating small cars seating twenty-eight persons on a headway of 3 1/2 minutes, would give the same service from a

standpoint of seating capacity if it operated large cars seating forty persons on a headway of five minutes. Manifestly, this latter service would be preferable from the railroad standpoint for the reason just given, and the question is, would the service be equally acceptable to the passenger? In this comparison we are assuming that the larger car is the more desirable vehicle in which to ride. Would the pleasure of the ride compensate the passenger for the greater length of time which he would have to wait? This is a question which must be solved by each manager for his particular road, as its correct solution depends largely upon local conditions over which he has no control. The scrutiny with which a passenger chooses a street car varies with the length of his proposed ride. If the ride is to be short, he takes the nearest car without reference to comfort; but if he is to ride a long distance, he will walk past several lines in order to choose that one on which he will have the most pleasant ride. The car question then becomes a more serious one with long roads and with roads catering to a pleasure traffic. It has usually been accepted that on those having a purely business traffic, the proper car is the short one operated on short headway. The author, however, is of the opinion that even in this case, the long car operated upon somewhat longer intervals would be desirable. It has often been observed that where a line operates two sets of cars a passenger will allow several cars to pass him in order to patronize that type of car which suits him best. This has been observed even in the busy hours of night and morning when it would be fair to assume that passengers would be hurried and likely to take the first car which passes.

One of the most serious questions occurring in street railway practice is the problem of how to take care of the rush of travel which comes morning and evening. With our present methods there are only two ways of taking care of this travel: the first, by increasing the number of cars or units in service; and the second, by increasing the capacity of each unit. The latter method consists of attaching a trailer to the motor car, and where this is done it is usual, also, to increase the number of units in service. On first thought there would seem to be no better method of increasing the capacity of the road than by the use of trail cars. They are easily attached and detached; they are in service only when necessary, and they do not require the assistance of additional trainmen. An examination of the trailer system, however, will reveal the fact that it possesses serious defects. The trailer is not automobile, and requires the services of men and horses to attach it to the cars and to move it between the car sheds and the motor cars. The opening between the motor and the trail car increases the danger of accident to both passengers and conductors. The number of entrances and exits is increased, and this augments the work of the conductor in keeping track of his fares and increases the danger of his missing some of them. If an extra conductor is placed on the trailer to collect fares, a great portion of the gain due to the trailer system is lost. The use of trailers throws an additional strain on the motors, as a heavy weight is added to the train which is not available for traction. The trouble is intensified as the load on the trailer increases; it makes the train more unwieldy in handling, and is largely responsible for the difficulty in starting and stopping quickly and in making schedule time.

To obviate the necessity of using trailers, a large car equal in seating capacity to the combined capacity of the motor and trail car may be operated. This system, however, introduces the disadvantage of the operation at all times of the day of a seating capacity needed only during a few hours of the day. It also increases the size and weight of the cars and the average power required to operate them.

In order to compare the relative economies of single and double-truck cars, their advantages and disadvantages will be discussed with reference to the following points:

1. Wear and tear on trucks.
2. Wear and tear on motors.
3. Power required.
4. Wear and tear on track.
5. The use of trailers.
6. The seating arrangements and convenience of exit and entrance.
7. The preferences of passengers.

These relations will, as far as possible, be reduced to a money basis, and in order to do so a comparison will be instituted between a road which operates double-truck cars and one operating single-truck cars using trailers 26 per cent of the time to take care of the heavy night and morning travel.

The bodies of the double-truck cars are 26 ft. in length and contain eighteen cross seats, seating thirty-six passengers. The trucks are of the maximum traction type; the empty car weighs 23,500 lbs., and the motors are G.E. 800.

The single-truck car has a body 20 ft. in length; it is equipped with longitudinal seats, and the entire car weighs 16,000 lbs. It will seat twenty-eight passengers. During the period of heavy travel, which amounts to 26 per cent of the time, trailers are attached to these motor cars. Open trailers are operated in the summer months and closed trailers during the winter. The average seating capacity of the unit, estimating the trailer as a part of the car during the time that it is operated, is thirty-five seats, which approximates the seating capacity of the double-truck car very closely. The motors in use on the single-truck cars are W. P. 50

The number of cars operated is obtained by dividing the daily car mileage by 115. It is necessary to do this because the average mileage per car on the two roads is different. The comparison is thus between seventy single-truck cars and forty-seven double-truck cars, each car making 115 miles per day. The road operating the double-truck cars has the greater density of traffic.

#### WEAR AND TEAR ON TRUCKS

It is evident that since a car equipped with double trucks has eight wheels and one equipped with single trucks has four, the former will be the more expensive to supply with wheels. Table I. shows the comparative replacement and cost of wheels and brake shoes on the two roads for one year. Table II. shows the comparative cost of maintenance and repairs of trucks and motors for two years. It will be noted that while the cost per car is much greater on the road using double trucks, the cost per passenger is almost the same. It would not be fair to assume from these figures that the cost of maintenance of trucks and motors per passenger is always the same, no matter what sort of truck is used, because these figures result largely from the fact that in this particular case the double-truck car carries the greater number of passengers, but an inspection of the table will emphasize the advantage of the large unit as compared with the small one. It will be seen by a reference to table I. that the greater part of the increased expense of maintaining the double truck is due to the renewals of wheels and brake shoes.

In examining the relative strength of the various parts of trucks the side pieces may be compared to a beam supported at two points and carrying a concentrated load. The deflection of such a beam is proportional to the third power of the span; and in the analogy, the span corresponds to the wheel base of the truck. Therefore, the shorter the wheel base, the stiffer the truck side, and in view of its long wheel bases, it is evident that the single truck is at a disadvantage in this respect. For instance, a truck side where the wheel base is 4 ft. 6 ins., is 3.76 times stiffer than a truck side of equal section where the wheel base is 7 ft.

#### WEAR AND TEAR ON MOTORS

Table II., to which reference has already been made, gives the comparative expense of inspecting, repairing and maintaining the motors of double and single-truck cars. As in the case of the trucks, it will be noted that while the expense per car is much greater in the case of the double-truck car, the expense per passenger is nearly the same.

Table IV. gives the relative weights carried by the different cars, when empty, seats full and car crowded. It will be noted that while the percentage of weight available for traction in the case of the maximum traction truck remains constant, in the case of the motor and trailer it falls off as the number of passengers increase, and is especially small if the trailer is proportionately more heavily loaded than the motor car.

#### POWER REQUIRED

Table III. gives the power required to operate the different cars, and is the average of a long series of wattmeter tests. In making these tests the wattmeter was placed on a car in actual service and allowed to remain through the entire day. An examination of the tables will reveal the fact that the power required for the propulsion of the car and the care and repairs which the motors demand are much greater in the case of the double-truck car. But if the number of passengers be taken into account, it is seen that the power and the cost of maintenance are roughly proportional to the number of passengers carried with either style of truck.

#### WEAR AND TEAR ON TRACK

The wear of the rails of a street railway track is due to the grinding action of the wheel on the rail, and this is proportional to the weight on the wheel, but is intensified by the dirt on the rail, which causes the wheel to slip and acts as an abrasive agent after the slipping has begun. The weak point of a street railway track, however, consists of the joints and the opening in the special work. The energy of the blow which the wheel strikes as it passes a low joint or a crossing is equal to the product of the weight on the wheel and the height of the drop. Therefore, on any given track both the wearing action of the wheel and the

destructive action of the wheel are proportional to the weight which rests upon it. If the number of wheels under a car be increased, the number of blows which a low joint receives is also increased, but the intensity of each blow is diminished. Double

small amount of weight which was placed on the small wheels. It is now customary to place 30 per cent of the weight on the small wheels, and with track in fairly good condition, no difficulty is encountered in keeping cars on the track.

TABLE I.

Comparison of the cost of wheels and brake shoes on Double and Single-Truck Cars for the year 1897.

	Average No. of Wheels Used per Car per Year.			Cost per Car per Year.				Total Cost per Car per Year per 1000 Passengers.	Whe-l Mileage.	
	33"	30" Trailer.	24"	Wheels.	Labor in Replacing	Brake Shoes.	Total.		33"	24"
Double Truck Cars (47)....	8.72	---	7.06	\$ 77.92	\$ 17.36	\$ 11.70	\$ 106.98	0.47	17260	20916
Single Truck Cars (70)....	6.26	1.00	---	40 93	7.99	4.30	53.22	0.38	25329	---

The Double-Truck Car has four 33-in. wheels, four 24-in. wheels, and eight brake shoes.  
The Single-Truck Car has four 33-in. wheels and four brake shoes.  
Average daily car mileage—115.

TABLE II.

Comparison of the cost of repairs and maintenance of trucks and motors on Double and Single-Truck Cars for the years 1896 and 1897.

	Average Passengers per Car per Year.	Truck Repairs.		Motor Repairs.		Total.	
		Per Car per Year.	Per Car per Year per 1000 Passengers.	Per Car per Year.	Per Car per Year per 1000 Passengers.	Per Car per Year.	Per Car per Year per 1000 Passengers.
Double Truck Cars (47)	226000	\$181 00	\$0.80	\$319.00	\$1.41	\$500.00	\$3.21
Single Truck Cars (70).	141000	110.00	0.78	196.00	1.39	306.00	2.17

G.E. 800 motors on Double-Truck Cars.  
W.B. 50 motors on Single-Truck Cars.

TABLE III.

Comparison of the power required by Double-Truck and Single-Truck Cars.

	Average Watts.	Average Wait-Hours per Car Mile.	Average Speed, Miles per Hour.	Average Watts per Seat-Capacity.	Average Watts per Ton (Car (F imp.)).	Average Wait-Hours per Car Mile per 1000 Passengers.
Double Truck Car. Seats 36—Weight 11.75 tons. Average for the heaviest trip.	13080	1412	9.25	335	1025	---
Single Truck Car—no Trailer. Seats 28—Weight 8 tons.....	8471	921	9.20	303	1060	---
Single Truck Car. Trailer, operated 26 per cent of the time. Average for the entire day....	9400	1110	8.42	254	1088	7.9
Single Truck Motor and Open Trailer. Seats 68—Weight 10.5 tons. Average for the heaviest trip.	12680	1440	8.84	201	1208	---

TABLE IV.

Comparison of weights carried by Single and Double-Truck Cars.

	No. of Seats.	Total Crowded Capacity.	Weight Empty.			Percentage of Weight on Driving Wheels.			Pounds Weight Per Cent.			Pounds Weight per Unit of Total Capacity.		
			Car Empty.	Seats Full.	Car Crowded.	Car Empty.	Seats Full.	Car Crowded.	Car Empty.	Seats Full.	Car Crowded.	Car Empty.	Seats Full.	Car Crowded.
Single Truck Motor Car	28	80	16000	100	100	100	572	702	943	200	246	330		
Single Truck Motor Car with open trailer.....	63	140	21000	76	67	67	334	463	622	150	210	280		
Single Truck Motor Car with closed trailer.....	48	125	21000	76	72	71	438	568	776	168	218	298		
Double Truck Car.....	36	110	23500	70	70	70	653	782	1,050	214	258	344		

Note—Each passenger is estimated at 130 pounds.

trucks are at no disadvantage as compared with single trucks in this respect, unless the weight of the car be increased. Due to the shorter wheel base, double trucks go around sharper curves and go around the same curve with less output of power and less wear on the rail than single trucks. The double truck fell into disrepute when the maximum traction truck was first exploited, on account of its liability to leave the track. This was due to the

THE USE OF TRAILERS

In the case of the two roads under discussion, the road operating single-truck cars attaches trail cars to the motor car for two trips in the morning and two trips in the afternoon. For the entire year trailers were operated on 26 per cent of the trips. Allusion has already been made to the use of trailers. The advantage of the trailer on this particular road arises from the fact that the load peaks are unusually sharp. The use of the trailer increases the capacity of each unit during the heavy hours of morning and evening travel and during rush travel, due to baseball games and races. On this particular road the motormen and conductors are paid ten cents per trip extra for all trips where a trailer is attached to the motor car. This expense largely offsets the value of this arrangement. There is no question but that the use of the trail car increases the number of accidents for two reasons; first, because the trailer is another car, and second, because the opening between the motor and trail car is a dangerous one for a passenger boarding or alighting from the car. It is impossible to estimate the money value of this accident liability, because in the case of many accidents it is difficult to determine what proportion of the damage was due to the trailer. Trailers must be switched at the ends of the roads, and at the car sheds, and require men and horses for this purpose. The use of trailers also entails other expenses, such as car heating, cleaning, repairing and car license, which should be charged against the trail car system. To counterbalance all these disadvantages, the only advantage which the trail car system possesses is its flexibility.

THE SEATING ARRANGEMENTS, EXIT AND ENTRANCES

As has already been stated, the cross-seat is used so almost universally in connection with the double-truck car, that it is fair to consider the economy and efficiency of cross-seats and longitudinal seats in connection with the discussion. There is no doubt that the cross-seat is preferable from the passenger's standpoint, and the reasons for this preference are not difficult to analyze. Passengers often travel in pairs, and the cross-seat gives a privacy to their conversation which is not possible with the longitudinal seat, the jerks due to the stopping and starting of the car are less disturbing to the passenger when he is seated facing the direction of motion, and the cross-seat renders it easier to look out of the windows.

If two car bodies of the same size are taken and cross-seats installed in one and longitudinal seats in the other, the car body equipped with the cross-seats will have the narrower aisle. This induces two disadvantages in the cross-seat car; one, that the crowded capacity of the car is less, and the other, that when the car is crowded, the time consumed in loading and unloading is increased. The latter difficulty will be the more serious, the shorter the haul and the greater the number of stops.

In the early days of the double-track car, it was customary to mount the body high enough so that the wheels would swing under it. This gave the car a very unsightly appearance and made it difficult of access. Three steps were necessary to reach the platform, and as these steps were steep, this form of car was particularly objectionable to ladies. By the use of the maximum traction truck with 33-in. wheels, however, it is possible to lower the floor to within 37 ins. of the rail. By dropping the platform 8 ins. below the floor of the car, it is possible to reach the platform by the use of a single step 14 ins. above the rail. This renders the car as easy of access as the single-truck car. In the opinion of the writer, the fact that the car floor may be made so low in double-truck cars is the chief advantage of the maximum traction truck.

It has been attempted to facilitate the loading and unloading of large cars by providing exits and entrances other than the rear door. This practice, however, brings about what is perhaps a more serious disadvantage as it gives the conductor more than one door to watch, renders it difficult for him to keep track of his fares, and increases the liability of his starting the car before a passenger is on or off.

THE PREFERENCE OF PASSENGERS

The preference of passengers to which allusion has already been made, is undoubtedly in favor of the double-truck car. In cities where the entire street railroad system is controlled by one company, this point may not be considered of value, because passengers are obliged to ride in whatever conveyance the company chooses to furnish. However, the experience of roads which have changed their rolling stock from small, single-truck cars to large, comfortable double-truck cars, is that the travel has shown an immediate increase. Part of this increase has been drawn from parallel roads, but part has been a created traffic. As the

accommodations increase, more people ride, and the regular patrons ride oftener. The street car ride instead of being regarded as a necessary evil, comes to be looked upon as a pleasant part of the shopping expedition, the visit, or the picnic. How great this created traffic will be depends upon the class of patrons served by the road and upon the terminal facilities of the line. The extremes of society, the very rich and the very poor are not good riders, and it is probable that a road serving either of these classes entirely would get very little return for additional accommodations. The greatest increase would come from those who are now the best patrons of the street railroads, the fairly well-to-do middle class.

In this paper the writer has not attempted to prove that either the single truck or the double-truck car is the better type. He has merely attempted to discuss the subject to bring out the strong points and the weak points of each type in such a way that the results may be applied to special and local conditions. Outside of the question of economy of operation, there are few roads on which the use of attractive, easy-riding, double-truck cars would not create a pleasure travel, especially in the summer season. In a general way it may be stated that the single-truck car is more suitable for short hauls, dense traffic, many stops and low speed. On the other hand, the double-truck car is more suitable for long hauls, high speed, few stops, and pleasure travel. In the existence of either extreme condition, it would not be difficult to decide which car to use. It is in dealing with intermediate conditions that the manager must use his judgment.

### Inspection and Testing of Motors and Car Equipments by Street Railway Companies

BY F. B. PERKINS

In discussing this subject I have decided to speak of inspection and testing separately. The work of inspection is to be attended to principally in the car houses, with a small amount of attention while cars are in service. The testing is to be done in the repair shop. In no direction can a railway company save money or increase dividends more rapidly than by having its equipments thoroughly inspected by competent men, working systematically under intelligent direction. After a car has been through the repair shop and is again placed in service it is naturally supposed to be in first-class condition. It comes then under the immediate supervision of one or more men, presumably the day and night foreman, whose duty it is to keep that car in good condition for so long a time with as little expense as is possible. These men should be thoroughly acquainted with every detail of that car. Instead of examining cars once in thirty or sixty days a daily inspection is necessary. I have thought it expedient for the purpose of setting forth my views on inspection to describe the work as being carried on in a modern car house containing fifty equipments, and arranged for the easy handling of the cars, so that no extra help will be required for that purpose.

In dealing with the inspection of cars in this car house we believe better results can be obtained by giving to each man some particular branch of the work, rather than assigning to him a certain number of cars and expecting him to do all the work required thereon. For instance, it is safe to assume that the controllers will be kept in better condition if the responsibility of a good repair be placed with one man only than would be the case were this branch of the work made a part of the duties of several workmen in conjunction with all other repairs found necessary. If this be true in regard to controllers it will be found equally pertinent to all other items of car inspection. There is also this advantage—the men will carry the tools and material for one particular kind of work only, whereas if they had a multiplicity of duties to perform it would necessitate their having a large assortment of tools and material or wasting considerable time in going back and forth to the stock room.

In this modern car house five men will be required. This estimate includes only the repair men proper, and not the foreman of the car house, whose duties in connection with handling of motormen and conductors, sending out cars and similar work, would require so much of his time that he could only have a general knowledge of the work of inspection in the car house. Two of this number would be required to grease and inspect the motors; one to keep the controllers in repair, one to take care of the trolleys and to assist in the care of trucks and car bodies, one to have charge of the trucks and car bodies.

The most vital parts of the equipments are the different parts of the motor, viz.: armatures, fields, bearings, brushes and brush holders. The care of this part of the equipments should come un-

der the head of greasing, and on the manner in which this part of the work is done depends to a large extent the frequency with which the cars will break down while in service, and also the amount of repair necessary to keep them in operation. Oftentimes the most ignorant and cheapest men are given the place of greaser. On the contrary it is a position where intelligence and thoroughness are imperative. In order that he may have sufficient time for thoroughness in detail, he should not be expected to ring alarms or attend to other matters of a miscellaneous nature, but should be held responsible for his own particular work.

The car should pass into the greaser's hands the first day after it is on the road and every second day thereafter. He should examine thoroughly brushes, brush holders, gears, pinions, bearings and commutator. Of these parts, the care of the bearings and commutator is the most important, and should therefore receive the greatest amount of attention. The manner of caring for the bearings is very simple. They must be well supplied with grease or oil, and care must be taken that they are kept free from dust and grit, and also that the grease feeds properly.

In the matter of the care of commutators, electricians seem divided in their opinion as to whether they should be sand papered or not; personally, I am not in favor of it. Instead of temporizing the commutator by sand papering it, and thereby simply putting it in shape for one more day's work, I would get at the bottom of the trouble, and either make a commutator, by some preparation of mica and copper, which will not spark, or if the trouble lies deeper, remedy it by remodeling the entire motor. This may seem to be a heroic measure, but the end will justify the means. I think, however, that usually the trouble is not in the commutator, nor with the motor, but in either the brushes or brush holder, or both, and it is probable that with proper adjustment and with proper care and treatment we should find the trouble obviated and sand papering of commutators unnecessary. When speaking of the treatment of brushes we refer to a treatment of oil or something similar.

The writer has personal knowledge of a large road where common brushes were used without any treatment or care except to replace them as needed, and it seemed as if the man who used the most brushes was given the credit of taking the best care of his motor. The average life of brushes on this road and the above conditions with the commutator sand papered every day was six days. Subsequently the sand papering was stopped entirely, and the brushes were removed every six days and properly treated in oil. The life of brushes under this treatment was increased from six days to from forty to sixty days. The trouble with commutators, which before had been great, was reduced to a minimum, in fact, almost entirely averted. It is possible that under some heavy conditions the practice of sand papering must be kept up, but it must be accomplished in a different manner, and, instead of indiscriminate sand paper, it must be applied sparingly.

Not later than every fourth day every controller and switch comes under the notice of the man who has charge of those parts. The main point is to clean thoroughly, using a little vaseline on the contacts. The parts that are worn should be touched up with a file, or should be sand papered, and if badly worn should be replaced, so that at least every fourth day the controllers will be sent out in first-class condition. This man can also examine the car wiring, lamp fixtures, headlight and all similar parts.

The fourth man will have the care of the trolley poles and wheels. These should be carefully looked over each night and oiled if necessary. The man who attends to this part of the equipment will also have considerable time to devote to general inspection of the car bodies and trucks under the direction of the general inspector. Under the scrutiny of these two men should come all the details of the car body, such as grab handles, window catchers, curtain fixtures and similar parts. These should be carefully attended to each day, inasmuch as the reputation of the road will suffer in direct proportion as the attention to these small details is neglected. For the public is exceedingly exacting as regards the manner in which its comforts are catered to in these minor details, and the degree of excellence which characterizes this part of the work will be largely instrumental in moulding and fashioning its opinion of the road and of its servants in management.

The matter of car cleaning will not be considered in this paper, as it is not directly connected with the subject in hand.

After having touched upon the subject of the matter of inspection in the car house we have to deal with outside inspection, that is, inspection on the road by inspectors, motormen and conductors. It may be a good plan to have outside inspection, and it is often advantageous if not carried too far, but I do not believe it is desirable to have a large force, for this reason, but very little of the time devoted to this line of inspection is really used in looking over the equipments, but must necessarily be consumed in getting from one car to another and in waiting for opportunities,



and most of the trouble located by these inspectors is not of such a nature as to require immediate attention. If it were the inspector could not make the necessary repairs without taking the car to the car house.

Troubles of a serious nature, such as would require immediate attention and taking the car out of service, should be easily detected by the motorman or conductor, and reported at once to the proper official. It may not be entirely irrelevant to speak here of the relation of motormen and conductors to the inspection of cars. It has been proven that it is usually a waste of time, and very little has been accomplished by attempting to instruct motormen and conductors in other than the simplest ideas of electrical problems; for while on some roads there may be a number of old motormen who have a fair idea of electrical equipments, and whom it would probably be safe to allow to locate existing trouble, it would be difficult to draw the line between the men competent in this direction and those wholly lacking in such knowledge. I know of nothing more distasteful to passengers unwillingly detained than sitting in a car impatiently waiting while a motorman works over some part of the equipment in a vain endeavor to locate some trouble, the very nature of which he has not the faintest idea; and quite likely, at the same time, interfering with the movement of several other cars.

Of course, contingencies might arise where men would be justified in attempting to locate trouble on their cars, but as a rule they should not be allowed to do so, as the practice is wrong. If they clearly understand the brake mechanism, the right manner in which to apply the power to the motors, how to use the cut-out switch in the controller, and have a clear conception of the general rules as promulgated by the company, this will be about as far as it is profitable to teach them.

But while we may not allow them to make repairs or experiment with the equipment we must educate them to the necessity of being able to immediately detect any unusual or threatened condition, and to at once report the same. In fact, they must be made to feel that it is their first duty to report everything that is working to the possible detriment of the company, and if we properly impress them with the importance of these details as outlined above we shall have established a means of quickly locating trouble on the road, and that without the aid of special inspectors.

Next comes the matter of testing. The service which we will obtain from our equipments depends largely upon the manner in which the repairs are made. If the repair work be rushed through with the idea of going over as many cars as possible in a short space of time and with little or no regard for the thoroughness of the work we must expect the necessity for repairs to increase to an alarming extent. If, on the other hand, we make our repairs with the idea that work thoroughly done will have a tendency to greatly decrease the liability to breakdowns while the cars are in service, and correspondingly reduce the amount of work to be done in the repair shops, we shall naturally consider the best means not only of doing the work, but of definitely determining its condition when finished. To do this properly we must resort to our testing, and we use the word "testing" in a broader sense than it usually signifies. For example, all material furnished, such as tape, mica, paper, etc., must be kept up to the standard, and to accomplish this everything used should be carefully examined, or, under our classification, tested.

We must begin testing in the purchasing department. In the purchasing of supplies a great deal of trouble is often occasioned by changing the kind of material furnished. This is probably more noticeable in the case of small roads. Now, while there may be no great difference in the quality of goods furnished, or if any one of the many different kinds were used exclusively, it would give satisfaction, yet the very fact that many different kinds are used has a tendency to produce a lack of carefulness in the details of the work which will almost invariably show in the general result. This will be noticeable in several ways. The workmen will take one of the following views of the matter: He will either think the management is careless in the matter, and, as a consequence, he will immediately commence to drop from the former high standard of work, or he will think that there is nothing essential about the quality of the material used, and acquire the pernicious habit of utilizing anything which may happen to be handy.

When a workman once detects what seems to him to be a lack of thoroughness in any part of the work which has to do with his department, you have at that moment allowed to enter that department a spirit of carelessness which will develop very rapidly, and unless quickly suppressed will produce disastrous results in a short time.

To attain to a condition of thoroughness in any line of work, may have called for the performance of a great deal of hard labor, the expenditure of much time and money and the exercise of patience, skill and forethought, but how slight a relaxation of vig-

ilance on the part of some official trusted with the maintenance of the good condition acquired can undo in an incredibly short space of time the good work accomplished, and cause a retrograde movement along lines which had promised so favorably.

If, however, we have to allow only one kind of material in the repair shop the question naturally arises as to how we can avoid being behind the times in the matter of different kinds of supplies, and also in the manner of their use. The answer is we must have an experimental room, and here must be tested samples of all supplies and material before being contracted for by the purchasing agent. I do not mean to say that this room must necessarily be entirely separate from the repair shop, as this would naturally require a large amount of machinery which we already possess, and would not care to duplicate. But this room must be considered by the employees as one in which they are not directly interested other than as they are required to work on some portion of that which is being tested, but the special testing and all the instruments for the same must be in a separate department, and if it is not possible to have a separate room, at least a part of the repair shop should be partitioned off for this work, as the amount of time wasted by the employees of the shop attracted from their regular duties by the testing of some part of equipment or material on the floor of the repair shop proper would, if saved, more than compensate for the expense incurred in the creation and maintenance of such a room.

Having thus arranged this separate apartment for practically all testing purposes, and having impressed upon employees and workmen that herein will be settled all questions relating to work done and material used, we have accomplished one of the results aimed at, in that we have prepared ourselves to impress upon the men that any material placed in their hands for use in repairs has previously been thoroughly tested, and this, we think, will tend to raise the standard of work, as any results of poor workmanship on their part cannot then be laid to faulty material. This will give them an incentive to conscientiously deal with established and known good material.

We are now able to take anything in the line of new material or any new ideas regarding the use of the same, or any electrical problems which may arise, and ascertain their value without interfering in any way with the regular work of the shop or of the employees.

It is neither necessary nor desirable that the workmen should know the merits or defects of whatever comes to the testing room. On the contrary, there are some of the employees who should be allowed to become familiar with a great deal of the work of this room. They will not only be more valuable for the knowledge thus obtained, but some of the work must of necessity be delegated to some other person than the electrical engineer. But at all times it must be made plain to them that the room is distinctly a separate department, having no connection with their ordinary work.

Having now provided for our testing department and established its relation to the purchasing of supplies and to the employees of the repair shop what machines and instruments shall we need in its equipment?

A high and low reading direct-current voltmeter, one having a double scale reading from 1 to 750 and from 1 to 15.

A direct-current ammeter reading from 1 to 100.

A low reading ammeter would be very convenient many times, but is not absolutely necessary.

A 50,000-ohm magneto bell.

An alternating current volt meter and some handy testing set will make an outfit of instruments with which we can do all the testing required.

If the alternating current is not within reach of the car house we must procure a small dynamo, and produce it ourselves. A very small machine, say 2 h.p., would be sufficient for all the needs of the testing department. If this machine is designed for about 100 volts it would be most convenient for our use. With a few small transformers wound for 2000 volts primary and for either 50 or 100 volts secondary, we are prepared to furnish any voltage within a range of from 5 volts to 10,000 volts.

The man who has this part of the work in charge can very easily and cheaply arrange the details of installation of the wiring, etc. He can also make some resistance coils and many other pieces of apparatus which will greatly facilitate the quick testing of whatever may be sent to this department.

What shall we test? First, everything that goes into the repair shop. By doing this we shall be sure of keeping all material up to the standard, which means an absolute guarantee against breakdowns caused by poor material. In this way we raise the standard of workmanship.

Second, all supplies which go to the foreman of the car houses. In connection with this matter we are of the opinion that in the testing room should be decided the manner of treating brushes,

the length of time they should be used before being removed from the motor, the manner in which they should then be cared for, their final disposition, the proper attention to be given the trolley poles, the length of time they ought to remain in service, their condition when removed, and many other similar questions should not be left to work out their own solution or dependent upon the feelings or judgment of the various employees and workmen, but should be definitely determined and decided in our testing department.

Many may be of the opinion that we are carrying system beyond necessary limits in thus definitely and positively arranging these details, but why should we allow several different men to use material in whatever manner they may individually see fit, to treat brushes as their fancy may dictate, to regulate the tension of trolley poles in accordance with their own feeling at the time rather than by any fixed standard, and various other matters which might be mentioned along these lines.

Third, all finished material, such as armature coils, insulation for controllers, commutators and brush holders. We do not necessarily need to test every piece, but enough to satisfy ourselves that the general order of work is kept up to the standard.

Fourth, all armatures, fields, commutators and controllers, as they are being made or repaired. One illustration will be sufficient to show how the testing may be carried on in this branch of work.

An armature is wound and ready to be connected to the commutator. With a small wire we connect all of the top leads together. With the bottom leads, each separate from the other. With a magneto or testing set we find the insulation of the complete armature is not right. First, we cut the small connecting wire on the top leads in several places, then by testing each of these parts we locate that portion of the armature which is bad; then, by removing the wire we will test each coil separately until we find the weak one. Next, by the use of our transformers we obtain 3000 or 4000 volts, which we apply to this one coil. If it stands the test we may allow it to go through, and if not, it can be replaced. If we should find that the trouble extended to a large portion of the armature and indicated moisture in the coils, we may, by the use of this same transformer, obtain 25 or 30 volts, and by connecting the armature to the commutator with the exception of one end of one coil, then connecting one side of the 25-volt circuit to this end, and the other side of the circuit to the commutator or bar left vacant, we may apply the current for the purpose of drying the armature. With this advantage the heat will be generated in the core, and the armature will dry from the inside instead of from the outside.

With similar tests on all finished parts sent out from our repair shop we have almost wholly removed the chances of failure in service, and have unquestionably added to the length of life which may reasonably be expected from our equipment.

By running a few wires from our testing room to that part of the shop where the cars are brought in for repairs we are able to reach every part of the equipment in a quick and thorough manner, and it is probable that if a few tests are made on every car that comes to the shop many troubles will be located before they have sufficiently developed to become serious. Hence, the time required to make tests will add nothing to the pay roll, while the benefits derived may be many. All cars should be brought to the repair shop, thoroughly overhauled and inspected at least twice a year.

In determining what shall be the standard of the work in the different branches of the shop, or finished material, and of cars in service, I do not believe there can be any fixed scale. But that, as we proceed with our testing and inspection, we shall gradually raise the standard of our work, and it will only be a short time after adopting a thorough method of doing the work that many of the daily perplexities will have been eliminated.

### Report of Committee on Standardization of Accounts

The following is the classification of accounts for overhead, underground, third-rail, storage-battery and surface-contact electric railways, recommended by the committee on standardization of accounts of the Street Railway Accountants' Association of America, and adopted by the association:

#### CONSTRUCTION AND EQUIPMENT ACCOUNTS

In the following classification "Labor" should be understood to mean not only the manual work of laborers, but also superintendence, supervision, clerical work, engineering and inspection, so far as they are chargeable to the account referred to.

"Material" should be understood to mean not only finished or

unfinished products, appliances or parts, but such smaller articles as are usually termed "supplies."

"Tools" should be understood to mean hand-tools, of mechanics and other tools, used in the work chargeable to the account referred to.

"Expenses" should be understood to mean all expenses chargeable to the account referred to that are not labor, material or tools.

#### CONSTRUCTION AND EQUIPMENT ACCOUNTS

- A. Organization.
- B. Engineering and Superintendence.
- C. Right of Way.
- D. Track and Roadway Construction.
- E. Electric Line Construction.
- F. Real Estate Used in Operation of Road.
- G. Buildings and Fixtures Used in Operation of Road.
- H. Investment Real Estate.
- I. Power Plant Equipment.
- J. Shop Tools and Machinery.
- K. Cars.
- L. Electric Equipment of Cars.
- M. Miscellaneous Equipment.
- N. Interest and Discount.
- O. Miscellaneous.

##### ACCOUNT A.—ORGANIZATION

Charge to this account all expenses incurred in effecting organization, including legal expenses.

##### ACCOUNT B.—ENGINEERING AND SUPERINTENDENCE

Charge to this account all expenditures for services of engineers, draftsmen and superintendents employed on preliminary and construction work, and all expenses incident to the work

##### ACCOUNT C.—RIGHT-OF-WAY

Charge to this account all expenditures in connection with securing or paying for right-of-way, including cost of real estate for right-of-way.

##### ACCOUNT D.—TRACK AND ROADWAY CONSTRUCTION

Charge to this account all expenditures for track and roadway construction, including labor, material, tools, freight, hauling, distribution of material, and all other expenses incident to the work: cost of grading, excavating, track laying, ties, yokes, slot-rails, manhole frames and covers, rails, rail fastenings, welded joints, special work (such as crossings, cross-overs, curves, frogs, guard-rails, run-offs, switches, switch-mates, turn-outs), ballasting, paving, fences (right-of-way), bridges and culverts, trestles, sub-ways and tunnels.

The cost of tracks in yards, terminals, car-houses or other buildings should be charged to this account.

The cost of punching and drilling rails for track wiring should be charged to account E.

##### ACCOUNT E.—ELECTRIC LINE CONSTRUCTION

Charge to this account all expenditures for overhead, underground, third-rail, or surface-contact electric line construction, including labor, material, tools, freight, hauling, distribution of material, and all other expenses incident to the work.

Cost of punching and drilling rails for track-wiring, rail-bonds, poles (iron and wood), labor and material for setting and painting poles; feed-wire, guard-wire, span-wire, strain-wire, supplementary wire, trolley-wire, ground-feeders, underground-feeders, pole fixtures, hangers or suspensions, insulators (overhead), lightning arresters and appliances, signals and signaling apparatus, overhead crossings and switches, ground terminals, and all labor in connection with putting same in position; conduits and conduit appliances for underground trolley construction, including conductors, insulators, sewer connections, sewer traps and underground feeders; third rails, and insulators for third-rail construction; surface-contact appliances for surface-contact roads, including magnets, contact-boxes, manhole-frames and covers.

##### ACCOUNT F.—REAL ESTATE USED IN OPERATION OF ROAD

Charge to this account all expenditures for real estate used in operation of road, except real estate used for right-of-way, charged in account C.

##### ACCOUNT G.—BUILDINGS AND FIXTURES USED IN OPERATION OF ROAD

Charge to this account all expenditures for buildings and fixtures used in operation of road, including labor, material, tools, freight, hauling of material, and all other expenses incident to the work.

The term "Buildings and Fixtures" includes power house, car houses, shops, office buildings (when owned by the company), waiting-rooms, sheds, out-houses, coal-bins, sand-houses, stables, store-houses, switch-tenders' houses, fences (except park and right-of-way), docks, wharves, and all other buildings and enclosures, and their stationary fixtures, including pipes for gas, water, sewage and drainage, apparatus for heating, lighting and

ventilating, sidewalks and paving in streets in front of and adjacent to the company's buildings (except in tracks), and inspection and repair pits in car houses, shops, or other buildings.

The cost of tracks in yards, terminals, car houses and other buildings should be charged to account D.

The cost of electric line in yards, terminals, car houses and other buildings should be charged to account E.

ACCOUNT H.—INVESTMENT REAL ESTATE

Charge to this account all expenditures for land and buildings not used in operation of road.

ACCOUNT I.—POWER-PLANT EQUIPMENT

Charge to this account all expenditures for steam and electric equipment of power plant, including foundations and installation.

The equipment of sub-stations (if used) should be charged to this account.

All expenditures for water-power machinery (if used) should be charged to this account.

The cost of buildings used for main power houses or sub-stations should be charged to account G.

ACCOUNT J.—SHOP TOOLS AND MACHINERY

Charge to this account all expenditures for shop tools and machinery for general repair shops, car houses, etc., including foundations and installation.

ACCOUNT K.—CARS

Charge to this account all expenditures for passenger, baggage, express, freight, mail and other cars from the operation of which revenue is derived.

The term "cars" includes car bodies and trucks, and all fixtures or appliances inside of or attached to the car body or truck (except the electric equipment of the car).

ACCOUNT L.—ELECTRIC EQUIPMENT OF CARS

Charge to this account all expenditures for electric equipment and wiring of all cars, whether revenue cars or work cars, including labor, material, tools, freight, hauling of material, and all other expenses incident to the work.

ACCOUNT M.—MISCELLANEOUS EQUIPMENT

Charge to this account all expenditures for water cars, sprinkling cars, sand cars, salt cars, supply cars, and other work cars, snow plows, sweepers, scrapers, and miscellaneous snow equipment; horses, harness, wagons and vehicles; tools and appliances necessary in the use of work cars or snow equipment.

ACCOUNT N.—INTEREST AND DISCOUNT

All interest paid or received in connection with funds for construction, and all discounts or premiums resulting from the negotiation of securities for construction, should be charged or credited to this account.

ACCOUNT O.—MISCELLANEOUS

Charge to this account all expenditures for printing and stationery, office supplies and expenses, damage claims, wages of clerks, and all other expenses incident to construction not otherwise provided for.

OPERATING EXPENSE ACCOUNTS

In the following classification, "labor" should be understood to mean, not only the manual work of laborers, but also superintendence, supervision, clerical work, engineering and inspection, so far as they are chargeable to the account referred to.

"Material" should be understood to mean, not only finished or unfinished products, appliances or parts, but such smaller articles as are usually termed "supplies."

"Tools" should be understood to mean hand-tools of mechanics, and other tools, used in the work chargeable to the account referred to. These tools should not be confounded with the tools used in shops, for which a separate account (No. 9) is provided.

"Expenses" should be understood to mean all expenses chargeable to the account referred to that are not labor, material or tools.

The cost of replacement, renewal or repair of property destroyed or injured by fire, worn out, or otherwise unfitted for use, should be charged to the appropriate maintenance account, which should be credited with the amount received for insurance or realized from the sale of the property so unfitted for use. But if the property substituted is of greater value than the original property, the excess should be charged to the capital or construction account to which the original property was charged; if of less value, the difference between the value of the property as repaired, renewed or replaced and its original cost or value should be credited to the capital or construction account to which the first cost was charged. So proceeds from the sale of scrap material should be credited to the account to which the cost of replacement of that

material is charged, or, if not replaced, to the original cost account.

The cost of experiments should be charged in operating expenses to the account most affected.

In making up monthly reports charge to accounts Nos. 36, 37, 38 and 39, respectively, the month's proportion of the total annual charge for rent of land and buildings used in the operation of the road, rent of tracks and terminals, insurance and taxes, as nearly as the same can be ascertained, and not the amount which may have been actually paid in the month.

OPERATING EXPENSE ACCOUNTS

MAINTENANCE

WAY AND STRUCTURES

1. Maintenance of Track and Roadway.
2. Maintenance of Electric Line.
3. Maintenance of Buildings and Fixtures.

EQUIPMENT

4. Maintenance of Steam Plant.
5. Maintenance of Electric Plant.
6. Maintenance of Cars.
7. Maintenance of Electric Equipment of Cars.
8. Maintenance of Miscellaneous Equipment.
9. Miscellaneous Shop Expenses.

TRANSPORTATION

OPERATION OF POWER PLANT

10. Power Plant Wages.
11. Fuel for Power.
12. Water for Power.
13. Lubricants and Waste for Power Plant.
14. Miscellaneous Supplies and Expenses of Power Plant.
15. Hired Power.

CAR SERVICE

16. Superintendence of Transportation.
17. Wages of Conductors.
18. Wages of Motormen.
19. Wages of Other Car Service Employees.
20. Wages of Car House Employees.
21. Car Service Supplies.
22. Miscellaneous Car Service Expenses.
23. Cleaning and Sanding Track.
24. Removal of Snow and Ice.

GENERAL

25. Salaries of General Officers.
26. Salaries of Clerks.
27. Printing and Stationery.
28. Miscellaneous Office Expenses.
29. Store Room Expenses.
30. Stable Expenses.
31. Advertising and Attractions.
32. Miscellaneous General Expenses.
33. Damages.
34. Legal Expenses in connection with Damages.
35. Other Legal Expenses.
36. Rent of Land and Buildings.
37. Rent of Tracks and Terminals.
38. Insurance.
39. Taxes.

MAINTENANCE.—WAY AND STRUCTURES

ACCOUNT NO. 1.—MAINTENANCE OF TRACK AND ROADWAY

Charge to this account all expenditures for repairs and renewals of track and roadway, of culverts and subways, of tracks in yards, terminals, car houses or other buildings, including labor, material, tools, fuel, light, water, ice, freight, hauling and distribution of material, and all other expenses incident to the work.

The cost of taking up track, whether new track is laid in its place or not, should be charged to this account.

The cost of punching and drilling rails for repairs or renewals of track-wiring, and of removing and relaying pavement, ballast, etc., when necessary for repairs or renewals of the electric line, should be charged to account No. 2.

The feed and keep of horses used in connection with this work should be charged to account No. 30.

The cost of repairs and renewals of harness and wagons used in connection with this work should be charged to account No. 8.

Following is a list of some of the items chargeable to this account:

- |                             |   |
|-----------------------------|---|
| Ballast.                    | Lumber.                                 |
| Bolts.                      | Manhole covers for underground trolley. |
| Braces, rail.               | Manhole frames for underground trolley. |
| Brick.                      | Molds for welded joints.                |
| Bridges.                    | Nails.                                  |
| Cement.                     | Nuts.                                   |
| Chairs for rails.           | Nut-locks.                              |
| Cinders for ballast.        | Paving materials.                       |
| Cinders for welding joints. | Pig-iron for welded joints.             |
| Coke for welded joints.     | Pipes, drain.                           |
| Crossings.                  | Rails.                                  |
| Cross-overs.                | Run-offs.                               |
| Culverts.                   | Sand.                                   |
| Curves.                     | Screws.                                 |
| Drains.                     | Slot-rails for underground trolley.     |
| Fences, right-of-way.       | Spikes.                                 |
| Fish-plates.                | Steel.                                  |
| Freight.                    | Stone.                                  |
| Frogs.                      | Sub-ways.                               |
| Fuel.                       | Switches.                               |
| Guard-rails.                | Switch mates.                           |
| Gravel.                     | Ties.                                   |
| Hauling.                    |   |
| Ice for ice water.          |   |

Iron.	Tie-plates.
Joints, welded.	Tie-rods.
Joints, not welded.	Tools.
Labor.	Trestles.
Light (lanterns and fixtures, oil, lamp-wick, torches, candles, incandescent lamps and fixtures, arc lights and fixtures, globes and carbons).	Tunnels.
	Turn-outs.
	Washers.
	Water.
	Yokes for underground trolley.

## ACCOUNT NO. 2.—MAINTENANCE OF ELECTRIC LINE

Charge to this account all expenditures for repairs and renewals of overhead, underground, third-rail, or surface-contact electric line, including labor, material and tools employed or used in taking up, resetting and painting or repainting poles, taking down trolley, feed, guard and supplementary wires and substituting new, repairing and renewing conduits for wires, repairing and renewing bond wires, punching and drilling rails for track-wiring, removing and relaying pavement, ballast, etc., when necessary for repairs or renewals of the electric line, freight, hauling and distribution of material, fuel, light, water and ice, and all other expenses incident to the work.

The cost of repairs and renewals of electric line in yards, terminals, car houses or other buildings should be charged to this account.

The feed and keep of horses used in connection with this work should be charged to account No. 30.

The cost of repairs and renewals of harness and wagons used in connection with this work should be charged to account No. 8.

Following is a list of some of the items chargeable to this account:

Bolts.	Manhole frames for surface contact roads.
Boxes for lightning arresters.	Nuts.
Cement.	Painting material for poles.
Charcoal.	Pins, iron, for cross-arms.
Clamps for poles.	Pins, wood, for cross-arms.
Conductors for underground trolley.	Poles, iron.
Conduits.	Poles, wood.
Contacts for surface contact roads.	Pole-tops for iron poles.
Contact boxes for surface contact roads.	Rail-bonds.
Cord.	Screws.
Cross-arms, iron.	Sewer connections for underground trolley.
Cross-arms, wood.	Sewer traps for underground trolley.
Crossings.	Signals and signaling apparatus.
Feeders, ground.	Solder.
Feeders, overhead.	Soldering salts.
Feeders, underground.	Steel.
Freight.	Stone.
Fuel.	Suspensions.
Gasoline.	Sand.
Hangers.	Switches.
Hauling.	Tape, insulating.
Ice for ice water.	Terminals.
Insulators, overhead.	Third rails.
Insulators, underground.	Tools.
Insulators, for third rail.	Washers.
Iron.	Water.
Labor.	Wire, feed.
Light (lanterns and fixtures, oil, lamp-wick, torches, candles, incandescent lamps and fixtures, arc lights and fixtures, globes and carbons).	Wire, guard.
Lightning arresters and parts.	Wire, span.
Magnets for surface-contact roads.	Wire, strain.
	Wire, supplementary.
	Wire, trolley.

## ACCOUNT NO. 3.—MAINTENANCE OF BUILDINGS AND FIXTURES

Charge to this account all expenditures for repairs and renewals of buildings and fixtures used in the operation of the road, including labor, material, tools, freight, hauling of material, and all other expenses incident to the work.

The term "buildings and fixtures" includes power houses, car houses, shops, office buildings (when owned by the company), waiting rooms, sheds, out-houses, coal bins, sand houses, stables, store-houses switch-tenders' houses, fences (except park and right-of-way fences), docks, wharves and all other buildings and enclosures, and their stationary fixtures, including pipes for gas, water, sewage and drainage, apparatus for heating, lighting and ventilating, sidewalks and pavements in front of and adjacent to the company's buildings (except in tracks), and inspection and repair pits in car houses, shops or other buildings.

The cost of repairs and renewals of tracks in yards, terminals, car houses or other buildings should be charged to account No. 1.

The cost of repairs and renewals of electric line in yards, terminals, car houses or other buildings should be charged to account No. 2.

Following is a list of some of the items chargeable to this account:

Awnings.	Plaster.
Bolts.	Pipes, drain.
Bolt ends.	Pipes, gas.
Brick.	Pipes, sewer.
Builders' hardware.	Pipes, water.
Building material.	Pits in car houses and shops.
Building permits.	Plumbing.
Cement.	Rivets.
Cisterns.	Roofing material.
Drains.	Sand.
Excavations.	Sash cord.
Fences (except park and right-of-way).	Sash weights.
Foundations.	Scales, platform.
	Screws.

Freight.
Grading.
Heating.
Heating apparatus and fixtures.
I beams.
Iron.
Labor.
Laths.
Lighting apparatus and fixtures.
Lime.
Lumber.
Nails.
Nuts.
Painting materials (oil, turpentine, varnish, lead, painters' supplies).
Paving in streets (except in connection with tracks).

Sewering.
Shelving and other fixtures.
Shingles.
Sidewalks.
Slate.
Spikes.
Steel.
Stone.
Tools.
Tile.
Turn-buckles.
Ventilating apparatus and fixtures.
Washers.
Water.
Water connections.
Water meters.
Wells.
Wire.

## MAINTENANCE—EQUIPMENT

## ACCOUNT NO. 4.—MAINTENANCE OF STEAM PLANT

Charge to this account all expenditures for labor, material, tools, freight, hauling of material and all other expenses incident to repairs and renewals of steam plant or water-power plant, including engines and engine parts, appliances and fixtures, belts, belt tighteners and fixtures, receivers, lubricators and oiling devices; shafting, clutches, cranes, hoists and other engine room appliances; boilers, boiler fittings and appliances; furnaces, economizers, stacks, mechanical-draft machinery, pumps, feedwater heaters, purifiers, tanks, condensers, coal and ash conveying machinery, mechanical stokers, and other boiler-room appliances; piping and steam fitting, including valves, separators, water and sewer connections and water meters.

Following is a list of some of the items chargeable to this account:

Ash-conveying machinery.	Hoists.
Belts.	Injectors.
Belt fixtures.	Iron.
Belt tighteners.	Labor.
Boilers.	Lubricators.
Boiler appliances.	Oiling devices.
Boiler fittings.	Piping.
Bolts.	Pipe covering.
Cement.	Pipe fittings.
Clutches.	Pulleys.
Coal-conveying machinery.	Pumps.
Condensers.	Purifiers.
Cranes.	Receivers.
Draft machinery.	Screws.
Economizers.	Separators.
Engines.	Sewer connections.
Engine appliances.	Shafting.
Engine fixtures.	Stacks.
Engine parts.	Steam fittings.
Fire brick.	Steel.
Fire clay.	Stokers, mechanical.
Freight.	Tanks.
Furnaces.	Tools.
Grate bars.	Water connections.
Hauling.	Water meters.
Heaters, feedwater.	Water-power machinery.

## ACCOUNT NO. 5.—MAINTENANCE OF ELECTRIC PLANT

Charge to this account all expenditures for labor, materials, tools, freight, hauling of material and all other expenses incident to repairs and renewals of electric plant, including generators and generator parts, switchboards, cables and feeder terminals and wiring in connection with same, storage batteries, transformers boosters, rheostats, circuit breakers, ammeters and other electric equipment.

Commutator brushes for generators should be charged to account No. 14.

Following is a list of some of the items chargeable to this account:

Ammeters.	Labor.
Boosters.	Lightning arresters and parts.
Cables.	Rheostats.
Circuit breakers.	Storage batteries.
Feeder terminals.	Switchboards.
Freight.	Switches.
Generators.	Tools.
Generator parts.	Transformers.
Hauling.	

## ACCOUNT NO. 6.—MAINTENANCE OF CARS

Charge to this account all expenditures for repairs and renewals of passenger, baggage, express, freight, mail and other cars from the operation of which revenue is derived, including labor, material, tools, freight, hauling of material, and all other expenses incident to the work.

The term "cars" includes car bodies and trucks and all fixtures or appliances inside of or attached to the car body or truck, except the electric equipment of the car.

The cost of cars purchased to keep good the original number of cars should be charged to this account.

Bell and register cord, trolley rope, incandescent lamps, commutator brushes and other supplies for cars should be charged to account No. 21.

Following is a list of some of the items chargeable to this account:

- |                                   |                                  |
|-----------------------------------|----------------------------------|
| Axles.                            | Labor.                           |
| Bells.                            | Life guards.                     |
| Bell cord fixtures.               | Lumber.                          |
| Bolts.                            | Mirrors.                         |
| Brakes (hand or power).           | Nails.                           |
| Brake appliances (hand or power). | Nuts.                            |
| Brake shoes.                      | Oil boxes.                       |
| Brasses.                          | Painting material.               |
| Brass fixtures.                   | Pedestals.                       |
| Brass trimmings.                  | Pilots.                          |
| Bumpers.                          | Sand boxes, attached to cars.    |
| Canvas.                           | Sciwes.                          |
| Cotters.                          | Seats.                           |
| Curtains.                         | Seat coverings.                  |
| Curtain fixtures.                 | Seat fixtures.                   |
| Dashes and parts.                 | Signs.                           |
| Draw bars.                        | Sign fixtures.                   |
| Electric heaters.                 | Snow scrapers, attached to cars. |
| Electroliers.                     | Springs.                         |
| Fare registers.                   | Steel.                           |
| Fenders and parts.                | Steps.                           |
| Floor mats.                       | Stoves.                          |
| Freight.                          | Stove fixtures.                  |
| Gates.                            | Tools.                           |
| Glass.                            | Trucks.                          |
| Gongs.                            | Truck frames and parts.          |
| Grab handles.                     | Washers.                         |
| Hauling.                          | Wheels.                          |
| Headlights and parts.             | Woodwork.                        |
| Iron.                             |                                  |

ACCOUNT NO. 7.—MAINTENANCE OF ELECTRIC EQUIPMENT OF CARS

Charge to this account all expenditures for repairs and renewals of the electric equipment and wiring of cars, whether revenue cars or work cars, including labor, material, tools, freight, hauling of material, and other expenses incident to the work.

The cost of commutator brushes, incandescent lamps, oil and other supplies for electric equipment of cars should be charged to account No. 21.

Following is a list of some of the items chargeable to this account:

- |   |  |
|---|--|
| Armatures and parts.                    | Light circuits.                              |
| Bearings.                               | Lightning arresters and parts.               |
| Bolts.                                  | Motor frames.                                |
| Brasses—armature, axle, gear—case.      | Nuts.  |
| Brush holders and parts.                | Pinions.                                     |
| Canvas.                                 | Plows, for underground trolley cars.         |
| Circuits for heat, light, power.        | Power circuits.                              |
| Circuit breakers, automatic.            | Rheostats.                                   |
| Commutators and parts.                  | Screws.                                      |
| Contact shoes for surface contact cars. | Shafts.                                      |
| Contact shoes for third-rail cars.      | Springs.                                     |
| Controllers and parts.                  | Steel.                                       |
| Cotters.                                | Shifting summer and winter equipment.        |
| Cut-out boxes and parts.                | Storage batteries, for storage battery cars. |
| Fields and parts.                       | Tape.  |
| Frames for motors.                      | Terminals.                                   |
| Freight.                                | Tools.                                       |
| Gears.                                  | Trolley bases.                               |
| Gear cases and parts.                   | Trolley forks.                               |
| Hauling.                                | Trolley poles.                               |
| Heat circuits.                          | Trolley wheels and parts.                    |
| Insulating material.                    | Washers.                                     |
| Iron.                                   | Wiring.                                      |
| Labor.                                  |  |

ACCOUNT NO. 8.—MAINTENANCE OF MISCELLANEOUS EQUIPMENT

Charge to this account all expenditures for repairs and renewals of water cars, sprinkling cars, sand cars, salt cars, supply cars, other work cars, snow plows, sweepers, scrapers, miscellaneous snow equipment, wagons, and all other vehicles not operated for the purpose of revenue, including labor, material, tools, freight hauling of material, and all other expenses incident to the work.

Repairs and renewals of all harness should be charged to this account.

Repairs and renewals of the electric equipment of all work cars, snow plows, sweepers, etc., should be charged to account No. 7.

Following is a list of some of the items chargeable to this account:

- |                                  |                                       |
|----------------------------------|---------------------------------------|
| Axles.                           | Life guards.                          |
| Bolts.                           | Lumber.                               |
| Brakes, hand or power.           | Nails.                                |
| Brake appliances, hand or power. | Nuts.                                 |
| Brake shoes.                     | Oil boxes.                            |
| Brasses.                         | Painting material.                    |
| Brass fixtures.                  | Pedestals.                            |
| Bumpers.                         | Pilots.                               |
| Canvas.                          | Rattan for sweepers.                  |
| Cotters.                         | Sand boxes, attached to work cars.    |
| Dashes and parts.                | Screws.                               |
| Draw bars.                       | Snow scrapers, attached to work cars. |
| Electroliers.                    | Springs.                              |
| Fenders and parts.               | Steel.                                |
| Freight.                         | Tools.                                |
| Glass.                           | Trucks.                               |
| Gongs.                           | Truck frames and parts.               |
| Grab handles.                    | Washers.                              |
| Hauling.                         | Wheels.                               |
| Headlights and parts.            | Woodwork.                             |
| Iron.                            |                                       |
| Labor.                           |                                       |

ACCOUNT NO. 9.—MISCELLANEOUS SHOP EXPENSES

Charge to this account all expenditures for repairs and renewals of shop tools, machinery and appliances, such as engines, boilers,

shafting, motors, etc., used in general repair work, including labor, tools, coal, coke, lubricants, waste and other material, fuel, light, water and ice, wages of master mechanic, shop foreman, engineers, firemen and other employees engaged in operating shop engine, and all other expenses incident to the general repair shops.

Hand tools of mechanics or laborers used exclusively in connection with work chargeable to accounts Nos. 1 to 8, 14, 21 and 22, should not be charged to this account, but to the account benefited by their use.

Following is a list of some of the items chargeable to this account:

- |                                 |   |
|---------------------------------|---|
| Belts and belt fixtures.        | Light (lanterns and fixtures, oil, lampwick, torches, candles, incandescent lamps, arc light globes and carbons). |
| Boiler and boiler fixtures.     | Lubricants.   |
| Bolts.                          | Lumber.   |
| Brooms.                         | Motors and parts (for shop use only).   |
| Charcoal.                       | Nails.  |
| Clutches.                       | Nuts.   |
| Coal.                           | Piping.   |
| Coke.                           | Pipe covering.  |
| Cotters.                        | Pipe fittings.  |
| Cranes.                         | Pulleys.  |
| Draft machinery.                | Pumps.  |
| Engines and parts.              | Screws.   |
| Engine appliances and fixtures. | Shafting.   |
| Fire brick.                     | Stacks.   |
| Fire clay.                      | Steam fittings.   |
| Forges.                         | Steel.  |
| Freight.                        | Tools, machinc.   |
| Fuel.                           | Tools, hand.  |
| Furnaces and parts.             | Washers.  |
| Hauling.                        | Waste.  |
| Heaters, feed water.            | Water.  |
| Hoists.                         | Welding compounds.  |
| Ice, for ice water.             |   |
| Iron.                           |   |
| Labor.                          |   |

TRANSPORTATION.—OPERATION OF POWER PLANT\*

ACCOUNT NO. 10.—POWER PLANT WAGES

Charge to this account all expenditures for labor in the power plant, except labor employed in making repairs or renewals.

This includes the wages of the following employees:

- |                  |                            |
|------------------|----------------------------|
| Boiler cleaners. | Generator tenders.         |
| Chief engineer.  | Other labor (boiler room). |
| Engineers.       | Other labor (engine room). |
| Firemen.         | Switchboard tenders.       |
| Coal passers.    | Water tenders.             |
| Oilers.          |                            |

ACCOUNT NO. 11.—FUEL FOR POWER

Charge to this account all expenditures for coal, oil or gas used as fuel, or other fuel used at power plant, including freight and hauling.

ACCOUNT NO. 12.—WATER FOR POWER

Charge to this account all expenditures for water used to produce steam or to operate a water-power plant.

ACCOUNT NO. 13.—LUBRICANTS AND WASTE FOR POWER PLANT

Charge to this account all expenditures for lubrication of power plant, including oil, grease, waste, rags, etc.

ACCOUNT NO. 14.—MISCELLANEOUS SUPPLIES AND EXPENSES OF POWER PLANT

Charge to this account all expenditures for operation of power plant not otherwise provided for.

Following is a list of some of the items chargeable to this account:

- |   |   |
|---|---|
| Boiler compound.  | descent lamps, arc light globes and carbons).   |
| Boiler inspection.  | Matches.  |
| Brooms.   | Mops.   |
| Brushes, flue.  | Oil cans.                                       |
| Brushes, for generators.  | Packing.  |
| Brushes, for scrubbing.   | Polish.   |
| Buckets.  | Sand paper.                                     |
| Chamois skins.  | Soap.   |
| Dusters.  | Sponges.  |
| Emery cloth.  | Sprinkling cans.                                |
| Fire buckets.   | Tools.  |
| Fire extinguishers.   | Water (except water charged in account No. 12). |
| Garnet paper.   | Water gage glasses.                             |
| Hose.   | Waste cans.                                     |
| Ice, for ice water.   |   |
| Light (lanterns and fixtures, oil, lampwick, torches, candles, incan- |   |

ACCOUNT NO. 15.—HIRED POWER

Charge to this account all expenditures for power purchased from other companies or power plants.

TRANSPORTATION—CAR SERVICE

ACCOUNT NO. 16.—SUPERINTENDENCE OF TRANSPORTATION

Charge to this account wages of division superintendents, their assistants and aids, road officers, inspectors, and others employed in superintending transportation.

\*Income from the sale of power, to the extent only of the cost of producing the power sold, should be credited to operation of power plant. Profit or loss resulting from the sale of power should be carried directly to income account, as "income from other sources," or as a "deduction from income."

## ACCOUNT NO. 17.—WAGES OF CONDUCTORS

Charge to this account wages of conductors engaged in operating revenue cars.

## ACCOUNT NO. 18.—WAGES OF MOTORMEN

Charge to this account wages of motormen engaged in operating revenue cars.

## ACCOUNT NO. 19.—WAGES OF OTHER CAR-SERVICE EMPLOYEES

Charge to this account wages of starters, transfer agents, switch tenders, trolley men, trail-car couplers and other car-service employees.

## ACCOUNT NO. 20.—WAGES OF CAR-HOUSE EMPLOYEES

Charge to this account wages of car-house foremen, watchmen, car placers, car shifters, car and motor inspectors, car cleaners, lamp and headlight tenders, car oilers, car-stove firemen, trolley oilers and other car-house employees not engaged in making repairs or renewals.

The cost of shifting cars for the purpose of repairs or renewals should be charged to account No. 6 or 7.

## ACCOUNT NO. 21.—CAR-SERVICE SUPPLIES

Charge to this account all expenditures for lubricants and waste for cars and electric equipment of cars, incandescent lamps, oil and other supplies for lighting cars, water and other supplies for cleaning cars, fuel for heating cars, bell and register card, trolley rope, commutator brushes, tools and other materials and supplies, except such as are used for repairs or renewals of cars or electric equipment of cars.

Following is a list of some of the items chargeable to this account:

Batteries, dry, for electric bells in cars.	Lamp wicks.
Bell cord.	Lubricants.
Brooms, for cars.	Matches.
Brushes, for car washing.	Mops.
Brushes, for motors.	Oil cans.
Buckets, for car washing.	Pokers.
Candles.	Polish.
Chamois skins.	Rags.
Chimneys for headlights.	Register cord.
Coal hods for cars.	Shakers.
Dusters.	Shovels.
Fuel for cars.	Soap.
Fuses.	Sponges.
Hose, for car washing.	Stove blacking.
Illuminating oil.	Tools.
Incandescent lamps.	Trolley rope.
Kindling.	Waste.
	Water, for car washing.

## ACCOUNT NO. 22.—MISCELLANEOUS CAR-SERVICE EXPENSES

Charge to this account all expenditures for secret inspection, transfers and tickets, conductors' books, punches, portable registers, tools for motormen, employees' badges and uniforms; cost of getting derailed cars on track and removing obstructions and wreckage; miscellaneous expenses of car houses, including fuel, light, water (except water used for car washing) and ice, and all other car-service expenses not otherwise provided for.

Water used for car washing should be charged to account No. 21.

Following is a list of some of the items chargeable to this account:

Badges for employees.	descent lamps, arc light globes and carbons).
Buckets for car houses.	Portable registers.
Brooms for car houses.	Secret inspection expenses.
Conductors' books.	Sprinkling cans.
Conductors' fare boxes.	Tickets.
Conductors' punches.	Tools.
Fire buckets.	Tools for motormen.
Fuel for car houses.	Transfers.
Fire extinguishers.	Uniforms.
Hose for car houses.	Water (except water for car washing).
Ice for ice water.	Wrecking expenses.
Light (lanterns and fixtures, oil lampwicks, torches, candles, incan-	

## ACCOUNT NO. 23.—CLEANING AND SANDING TRACK

Charge to this account all expenditures for cleaning, greasing, watering, sprinkling and removing dirt from track, sanding track, including wages of men engaged in the work, cost of sand and of hauling, drying and distributing same, cost of track brooms and other tools, curve grease, water for sprinkling and watering track, and all other supplies and expenses incident to the work.

The feed and keep of horses used in connection with this work should be charged to account No. 30.

The cost of repairs and renewals of harness and wagons, water, sprinkling and sand cars used in connection with this work should be charged to account No. 8.

This account should not include cost of sprinkling rendered necessary by repairs or construction of track or paving.

The cost of sprinkling street (except tracks) in front of or adjacent to company's property should be charged to account No. 32

Following is a list of some of the items chargeable to this account:

Curve grease.	Shovels.
Fuel for sand dryer.	Track brooms.
Sand.	Track brushes.
Sand dryer and parts.	Water.

## ACCOUNT NO. 24.—REMOVAL OF SNOW AND ICE

Charge to this account all expenditures for removal of snow and ice from tracks, whether done by the company or otherwise, including labor, material, tools and expenses, cost of salt and delivering same in car houses or bins, and the wages of men engaged in salting the track and operating snow plows, sweepers, scrapers, etc.

The feed and keep of horses used in connection with this work should be charged to account No. 30.

The cost of repairs and renewals of harness, wagons, salt cars, snow plows, sweepers, scrapers and miscellaneous snow equipment used in connection with this work should be charged to account No. 8.

## GENERAL

## ACCOUNT NO. 25.—SALARIES OF GENERAL OFFICERS

Charge to this account salaries of president, vice-president, secretary, treasurer, auditor, general manager, assistant general manager, chief engineer, general superintendent, purchasing agent and all other officers whose jurisdiction extends over the entire system.

## ACCOUNT NO. 26.—SALARIES OF CLERKS

Charge to this account the salaries of bookkeepers, cashiers, receivers, paymasters, stenographers, clerks employed in counting cash, tickets and transfers, and all other clerks employed in the general office or elsewhere.

## ACCOUNT NO. 27.—PRINTING AND STATIONERY

Charge to this account all expenditures for printing, stationery and stationery supplies, except as hereinafter provided.

The cost of printing transfers and tickets should be charged to account No. 22.

The cost of printing briefs and other legal papers should be charged to account No. 34 or 35.

The cost of printing signs, posters and other advertising matter should be charged to account No. 31.

The following is a list of some of the items chargeable to this account:

Arm rests.	Paper cutters.
Binders.	Paper fasteners.
Blanks.	Paper files.
Blank books.	Paper weights.
Blotters.	Pencils.
Plotting paper.	Pencil erasers.
Carbon paper.	Pens.
Coin bags.	Penholders.
Copy (impression) books.	Pen racks.
Copying brushes.	Pins.
Dating stamps.	Printing (except printing charged to accounts Nos. 22, 31, 34, 35).
Envelopes.	Rubber bands.
Eyclets.	Rubber stamps.
Eyelet punches.	Rulers.
Erasers.	Scrap books.
Hektographs.	Sealing wax.
Indexes.	Seals.
Ink.	Shears.
Ink stands.	Shipping tags.
Ink erasers.	Shipping tickets.
Letter presses.	Short-hand books.
Mechanical calculators.	Sponges.
Mimeographs.	Sponge cups.
Money tags.	Tissue (impression) paper.
Money wrappers.	Typewriters.
Mucilage and brushes.	Typewriter supplies.
Numbering stamps.	Twine.
Oil paper.	Waste baskets.
Paper (all kinds).	Wrapping paper.
Paper baskets.	
Paper clips.	

## ACCOUNT NO. 28.—MISCELLANEOUS OFFICE EXPENSES

Charge to this account the cost of office supplies, repairs and renewals of office furniture, wages of janitors, porters and messengers, and all other office expenses.

The cost of printing, stationery and stationery supplies should be charged to account No. 27, except as otherwise provided.

Following is a list of some of the items chargeable to this account:

Brooms.	Newspapers.
Brushes.	Periodicals.
Buckets.	Postage.
Chamois skins.	Soap.
Dusters.	Sponges.
Fuel.	Sprinkling cans.
Ice.	Towels.
Internal revenue stamps.	Towel service.
Light.	Water.
Mops.	

## ACCOUNT NO. 29.—STORE-ROOM EXPENSES

Charge to this account all salaries and expenses in connection with store rooms, including cost of sending material and supplies

from general store room to branch store rooms, and the collecting of scrap material.

ACCOUNT NO. 30.—STABLE EXPENSES

Charge to this account the cost of feed, keep and shoeing of horses, replacing horses lost by death or worn out in service, depreciation in value of horses, and all other stable expenses.

This account should include the stable expenses of all horses, regardless of where they are used.

Repairs and renewals of harness and vehicles should be charged to account No. 8.

Following is a list of some of the items chargeable to this account:

Bedding.	Horseshoeing supplies.
Blankets.	Horseshoeing (by contract).
Brooms.	Hose.
Brushes.	Hostlers, wages of.
Buckets.	Ice.
Chamois skins.	Light.
Curry combs.	Medicine.
Dusters.	Salt.
Feed.	Sponges.
Fire buckets.	Sprinkling cans.
Fire extinguishers.	Stablemen, wages of.
Fuel.	Veterinarian (salary or fees).
Horseshoers, wages of.	Water.

ACCOUNT NO. 31.—ADVERTISING AND ATTRACTIONS

Charge to this account the cost of advertising of every description, including printing handbills, dodgers, posters, folders, etc.; net expense of music, parks, park properties and resorts (after deducting all income from admittance fees, sale of privileges, etc.), and all donations made and other expenses incurred for the purpose of attracting travel.

ACCOUNT NO. 32.—MISCELLANEOUS GENERAL EXPENSES

Charge to this account the cost of public telephone service, maintaining and operating private telephone system, telegrams, subscriptions and donations (except those provided for in account No. 31), traveling expenses of general officers and others connected with general office, and contingent expenses connected with the general management not otherwise provided for.

ACCOUNT NO. 33.—DAMAGES

Charge to this account all expenditures on account of property damaged and persons killed or injured, salaries and expenses of claim agents, investigators, adjusters and others engaged in the investigation of accidents and adjustment of claims, salaries, fees and expenses of surgeons and doctors, nursing, hospital attendance, medical and surgical supplies, fees and expenses of coroners and undertakers, fees of witnesses and others, except lawyers' fees and court costs and expenses.

Following is a list of some of the items chargeable to this account:

Accident insurance premiums.	Doctors' fees or salaries.
Adjusters' expenses.	Funeral expenses.
Adjusters' salaries.	Hospital expenses.
Claim agents' expenses.	Investigators' expenses.
Claim agents' salaries.	Investigators' salaries.
Coroners' fees and expenses.	Medical supplies.
Damage claims for ejection from cars.	Nurses' expenses.
Damage claims for electrolysis.	Nurses' fees.
Damage claims for horses killed or injured.	Premiums for accident insurance.
Damage claims for persons killed or injured.	Surgeons' expenses.
Damage claims for property damaged.	Surgeons' fees.
Damage claims for wagons or vehicles damaged.	Surgeons' salaries.
Doctors' expenses.	Surgical supplies.
	Undertakers' expenses.
	Undertakers' fees.
	Witnesses' expenses.
	Witnesses' fees.

ACCOUNT NO. 34.—LEGAL EXPENSES IN CONNECTION WITH DAMAGES

Charge to this account all legal expenses incurred in connection with the defense or settlement of damage claims.

The compensation of the general solicitor or counsel and other attorneys engaged partly in the defense and settlement of damage suits and partly in other legal work should be apportioned between this account and account No. 35.

The term "legal expenses" should be understood to include the salary of general solicitor or counsel, salaries, fees and expenses of attorneys, fees of court stenographers, unless included in court costs, cost of law books, printing of briefs, court records and other papers, court costs, expenses connected with taking depositions, and all other court expenses.

ACCOUNT NO. 35.—OTHER LEGAL EXPENSES

Charge to this account all legal expenses except those incurred in connection with the defense or settlement of damage claims.

The compensation of the general solicitor or counsel and other attorneys engaged partly in the defense and settlement of damage suits and partly in other legal work should be apportioned between this account and account No. 34.

ACCOUNT NO. 36.—RENT OF LAND AND BUILDINGS

Charge to this account all rents paid for land and buildings used in the operation of the road.

ACCOUNT NO. 37.—RENT OF TRACKS AND TERMINALS

Charge to this account all rents paid for tracks and terminals, bridge rentals and tolls.

The word "terminals" is not meant to refer to depots, car houses or other buildings at the terminus of the road. Rents for these should be charged to account No. 36.

ACCOUNT NO. 38.—INSURANCE

Charge to this account the cost of fire and boiler insurance.

ACCOUNT NO. 39.—TAXES

Charge to this account taxes on real and personal property used in the operation of the road, track taxes, franchise taxes, taxes upon capital stock, taxes upon gross earnings, car licenses, and other vehicle licenses.

FORMS OF MONTHLY AND ANNUAL REPORTS

MONTHLY REPORT.—EARNINGS FROM OPERATION

Passenger receipts .....	.....
Chartered cars .....	.....
Freight .....	.....
Mail .....	.....
Express .....	.....
Gross earnings from operation.....	.....
Operating expenses .....	.....
Net earnings from operation.....	.....

INCOME FROM OTHER SOURCES

Advertising .....	.....
Rent of land and buildings .....	.....
Rent of tracks and terminals.....	.....
Interest and dividends on securities owned....	.....
Interest on deposits .....	.....
Miscellaneous .....	.....
Total income from other sources.....	.....
Gross income .....	.....

DEDUCTIONS FROM INCOME

Interest on funded debt.....	.....
Interest on real estate mortgages.....	.....
Interest on floating debt.....	.....
Rentals of leased lines.....	.....
Miscellaneous .....	.....
Total deductions from income.....	.....
Net income .....	.....

DEDUCTIONS FROM NET INCOME

Preferred stock dividends.....	.....
Common stock dividends.....	.....
Additions and betterments.....	.....
Sinking fund .....	.....
Total deductions from net income.....	.....
Surplus for month .....	.....
Surplus carried forward from last month, as per balance sheet .....	.....
Surplus at end of month, as per general balance sheet .....	.....

ANNUAL REPORT.—EARNINGS FROM OPERATION

Passenger receipts .....	.....
Chartered cars .....	.....
Freight .....	.....
Mail .....	.....
Express .....	.....
Gross earnings from operation.....	.....
Operating expenses .....	.....
Net earnings from operation .....	.....

INCOME FROM OTHER SOURCES

Advertising .....	.....
Rent of land and buildings .....	.....
Rent of tracks and terminals .....	.....
Interest and dividends on securities owned....	.....
Interest on deposits .....	.....
Miscellaneous .....	.....
Total income from other sources.....	.....
Gross income .....	.....

DEDUCTIONS FROM INCOME

Interest on funded debt.....	.....
Interest on real estate mortgages.....	.....
Interest on floating debt .....	.....
Rentals of leased lines .....	.....
Miscellaneous .....	.....
Total deductions from income .....	.....
Net income .....	.....

## DEDUCTIONS FROM NET INCOME

Preferred stock dividends .....	.....
Common stock dividends .....	.....
Additions and betterments .....	.....
Sinking fund .....	.....
Total deductions from net income.....	.....
Surplus for year .....	.....
Surplus carried forward from beginning of fiscal year, as per balance sheet.....	.....
Surplus at close of fiscal year, as per general balance sheet .....	.....

## REMARKS

If deficit be shown in monthly or annual report, substitute the word "deficit" for "surplus."

In monthly reports, the month's proportion of each item under "Income from Other Sources," "Deductions from Income," and "Deductions from Net Income," should be debited or credited, currently, each month. If the exact amount is not known, it should be estimated.

In monthly reports, charge to accounts Nos. 36, 37, 38 and 39, respectively, the month's proportion of the total annual charge for rent of land and buildings used in the operation of the road, rent of tracks and terminals, insurance and taxes, as nearly as the same can be ascertained, and not the amount which may have been actually paid in the month.

If a company conducts the business of selling or renting advertising space in its cars, instead of leasing the privilege so to do to someone else, the amount shown as "Income from Advertising" should be the net income from this source after deducting all expenses of conducting the business.

"Income from Rent of Land and Buildings" refers to rents received from real estate not used in the operation of the road, and the amount shown in the report should be the net amount received after deducting all taxes, insurance, water rents or rates, cost of repairs, and other expenses connected with such real estate.

Under "Miscellaneous Income" should be shown the income from sale of power in excess of the actual cost of producing the power sold.

Income from the operation of parks, park resorts, or similar property, should appear under "Miscellaneous Income," and the amount shown should be the net amount received after deducting all expenses connected with such operation.

If advertising results in a loss, if power is sold at less than the cost of producing it, or if the expenses in connection with real estate not used in the operation of the road exceed the income from that source, the loss or deficit should appear under "Miscellaneous Deductions from Income."

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### Statistics—Their Use and Abuse

BY E. D. HIBBS

In discussing any phase of accounts it is necessary to bear in mind that the duties of the railway auditor are to see that all moneys due to the company are promptly turned over to the officer appointed as custodian of the company's funds, and that the source from whence this money is received should be plainly indicated; that the disbursements of the company's moneys, upon proper authority, be so charged upon the books of the company that each department of the company's service should bear its proper proportion of the expense; that the statements taken from the books of the company show to the stockholders and bondholders, through their board of directors, the financial condition of the company, the source from which its revenue is received and the manner in which it is expended; and that the manager or superintendent be furnished details of expense and revenue that will enable him to operate the road economically. With these points borne in mind, it will be readily seen that the compilation and proper arrangement of figures, commonly termed statistics, so as to convey to the mind of the party interested information necessary for the proper management of the company's interests, must enter very largely into the auditor's daily labor.

A bald statement of facts, such as are only too frequently the only information given out from the accounting department, if not supplemented by statistical information, will never reveal the weak points in a company's management. I have never known statistics to prove other than valuable information, and frequently they have been the means of starting investigations leading to economies that have contributed largely to a company's financial success. It is not necessary, however, to incorporate into a report for the benefit of stockholders and others outside of the

direct management of affairs a mass of statistical information that only tends to mystify those not initiated into the technical details of management and divert the mind from the actual financial and physical condition of the property which it is the purpose of the report to expose. But for the guidance and information of the superintendent and others directly in charge of operations, etc., and who are responsible for the result of the management or mismanagement of the company's various interests, statistical information cannot be given in too great detail.

Without opening the question of which is most desirable as a basis for comparison "per passenger carried," or "per car-mile run," I cannot conceive how a superintendent in charge of a division can possibly be in possession of the necessary information to intelligently operate his lines without the knowledge conveyed to him by this means. In addition to this, the general superintendent or manager should have for his information in making comparisons with other lines as to cost of operating, the physical characteristics of the different lines comprising the system of which he is in charge—curves, grades, congestion of street through which they run, etc. The engineer in charge of power houses should know the number of pounds of coal necessary to convert a pound of water into steam, and so on through all the ramifications of the system.

No accounting department is fulfilling the purpose for which it was created that does not furnish information of this nature, and it should be furnished in the shape of statistics that will enable each man interested to comprehend thoroughly the part he is bearing in the success of the company to which he is attached.

That the value of statistics may not be detracted from by indiscriminate distribution, care should be taken to place before each party in charge of a certain line of work the figures referring to that line of work only. Power-house statistics would have no value when placed in the hands of a division superintendent whose duties have no connection with the operation of the power house, and platform or car house expenses convey no information when given to an engineer in charge of power houses. But on the other hand, wattmeter readings and expense statistics of one power station properly tabulated and compared with those of another station bring forcibly to the mind of the man in charge that one station is producing power at a higher cost than the other in some particular, and he naturally seeks to remedy it to the manifest better interest of the company.

Statistical information enters largely into an intelligent understanding of the earnings of lines on which transfers are issued and received. Very few roads give credit to the line receiving a transfer issued by a connecting or intersecting line of the same company. To points where summer travel is very heavy—reached by a particular line of cars receiving transfers from feeder lines and on return trip passengers have the option of returning home from the transfer point by more than one line of cars, unless the line receiving the transfer is given a proportion of the original fare, entailing a more detailed audit of transfer business than is practical with most roads—a statistical report of the transfer business is absolutely necessary to explain the difference in earnings. I have in mind a line on which several summer resorts are located that is intersected by two belt lines, one of which carries most of the passengers to the point of intersection, while in returning passengers almost invariably use the other belt line. The earnings of the belt line carrying the passengers to the intersection and receiving the original fare shows earnings of 35 cents per car-mile, while the belt line carrying passengers from the intersecting point and receiving the transfer shows earnings of 26 cents and 27 cents per car-mile. The adjustment of the transfers so as to give a part of the value to the accepting line is no doubt the most desirable way to cover the point, but a statement showing the number of transfers carried on each line by car and by trip, and the percentage of total passengers carried on transfers, would reveal the cause of discrepancy in earnings.

The opinion is frequently expressed by persons connected with large systems of street railways that the cost of placing statistical information in the hands of the parties to whom such information is of value, is greater than would be warranted by any benefit accruing to the company from their use. Steam roads have long ago recognized the fact that the compilation of statistics is a necessary expense connected with a well-organized accounting department, and while it bears all the odium attached to a non-revenue producing department, the discontinuance of such information is never contemplated. Street railway systems have the prejudices and traditions of years to combat. Horse railroads, as a rule, paid dividends to the stockholders and no questions are usually asked in such cases. But to-day the capital invested in street railways is so greatly increased that the earning capacity of almost all systems have been taxed to their fullest extent to pay fixed charges while dividends are not yet in sight. Any agency that contributes to the economical operation of a



road is of great importance, and street railway systems must treat their accounting department with liberality to enable the parties in charge to aid in producing the results for which all are laboring.

Let me say in conclusion that, while statistics are not of sufficient value to occupy the first place in the mind of the auditor, they are of such vast importance that much more attention could be very safely given them than is now generally the case.

### Car Mileage, How Arrived at, and Its Use

BY A. H. FORD

The subject assigned to me is somewhat limited in its scope, being statistical in its nature (as has probably been shown by Mr. Hibbs in his paper) and for that reason interest in its discussion is limited to the accounting department, to whose lot generally falls the preparation of statistics, and the operating department, which makes use of the same in determining the actual status of affairs in its control, or in suggesting needed economies or improvements, which alone are demonstrated by this means.

Executive officers and directors as a rule do not take the interest they should in the statistical information we place in their hands daily, weekly, monthly and annually, at the expense of careful forethought, great labor and comprehensive thoroughness. This information is worthy of careful study, which, if bestowed, would locate in many instances the difficulties which are hindering the financial success of some of our systems. It is true these gentlemen have other and weightier matters to occupy their time and attention, and our statements, therefore, in most cases find slight appreciation and little study from them, but the general manager or the head of the transportation department, who carefully considers them, gets help and many suggestions which assist him in the discharge of his responsible duties.

The "car-mile" with many roads has become the unit of calculation. This should be the case with all, as from the showing made from this unit figures can be made which will unerringly determine many vexing questions of management.

#### HOW ARRIVED AT

On our system the figures are arrived at in a simple and satisfactory manner.

Our engineer, who has accurately measured each route, makes of it a blue print diagram, which shows distances between termini, crossovers and connecting points, and which is framed and hung over the desk in the conductors' room at the station.

The conductor is required to note on trip sheet the points from and to for first half of first trip and last half of last trip, so that the exact movement of his car can be determined. To note the number of full trips made and calculate the mileage for his day's run. They are generally correct in their figures, and with the attention given them by the accounting department soon become accurate in their calculations. This mileage is carefully checked by a clerk familiar with runs, distances, etc., and becomes a part of the statistical record of the company's business. The station foreman also enters the total mileage daily for each car upon a monthly statement, which, when completed, is sent to the superintendent.

#### ITS USE

We probably make a more extended use of our mileage than most roads, and, therefore, every effort is made to insure correctness. A statement is made weekly and monthly for the general manager, showing among other things the earnings per car-mile of each line in the system, and the average total, from which he can see at a glance what lines are not up to the standard, and changes in schedules effecting headway and running time, are suggested to overcome the loss. The monthly earnings and statistics statement shows the earnings and operating expenses (in detail) per car-mile, comparison being made with previous year. The monthly statement of mileage of cars prepared by station foremen is used in making up the record showing the life of wheels which are contracted for under a guaranteed mileage, of trolley wheels, motors, motor bearings, gears, pinions and other parts of the equipment, which record is made the test of the efficiency and economy of the particular kind or design used. Our power is rented, and the basis of compensation is a rate per car-mile. Our advertising contract is upon basis of per car-day so many miles.

### The Carrying of United States Mail Matter on Inter-urban and Street Railways

BY W. S. DIMMOCK

During the meeting of this honorable body at Niagara Falls last year I had the honor of making a few remarks with a view of

bringing about a discussion upon the subject of electric railways carrying United States mails, and while the discussion was brief for the want of time, it was at least the means of getting the subject before you during this convention. The only error the executive committee has made is in not giving this paper to some one with a wider experience and more competent to lay the subject before you than I. However, I consider it an honor for anyone to be called upon to address this convention, and a duty which no one can afford to shirk so long as he is a member of the association. Therefore, if in my attempt to lay a few brief statistics before you I am able to bring forth some good discussions from the more experienced members, I feel the result will be a benefit to the association and electric railway earnings in general.

There is probably nothing, or one might say, no one thing which is of more importance to the perfection of an absolutely satisfactory mail service than the saving of time; the electric canceling machine and the numerous contrivances of the manufacturers' craft employed in the handling of mail matter, all aim at the one end—economy of time. This is probably the most potent argument in favor of the electric car service for the transmittal of mail matter to and from depots, sub and suburban stations, to the main post offices. As a general proposition the schedule time of the electric cars is absolutely to be depended on; experience has demonstrated that the list of casualties likely to interfere with the progress of a car upon its designated route is smaller than that which often hinders the wagon service. In the case of the Omaha office, where I have had the best opportunity for observation, a noticeable gain is made in the service between Omaha and Council Bluffs, a distance of 5 miles, and Omaha and South Omaha, of the same distance. Here the advantage is not confined to the saving of time, but in the increased number of dispatches it is possible to make. The frequency and regularity of time on the electric car lines makes it possible to dispatch mail matter from one office to another, or from main office to sub-stations, to the best possible advantage, since the time can be regulated by the dispatching office at will in order to make certain outgoing trips of carriers, whom it might be impossible to reach if the regular running time of the regular mail trains must be considered, or the possibility of using the wagon service. Before the use of the car service for this purpose, and when the railroad had to be depended on for the transmittal of mail between Omaha and Council Bluffs, Omaha business men frequently asserted that it was easier and more satisfactory to transact business by letter with Chicago than with Council Bluffs; almost as broad a statement might be made in regard to South Omaha. As an example of the difference between the two modes of service, the Denver fast mail, which reaches the Omaha office via the electric cars at 4:18 P. M., gets into the hands of the city distributors from ten to fifteen minutes sooner than when the wagons are depended on. This means the handling of an immense number of letters which reach the carriers in time to be taken out on their last afternoon trip, thereby being delivered to the patrons of that office on the afternoon of the same day, instead of the following morning, and preventing a delay of something like seventeen hours. This great advantage, of course, relates to letter mail, which is the first to be considered. The advantage is obvious if you happen to be in a position to observe the difference in time when the letters are conveyed by the cars, as contrasted with that at which the wagons deliver the papers brought by the same train. In the interim between the two deliveries the letters have been tossed on the table, back stamped, and have found their way into the deft hands of the distributors and are being rapidly thrown to their ultimate destination.

One can only realize the vast importance of ten or fifteen minutes under certain conditions when he has missed a train by five minutes, or realize what can be accomplished in the same time after he has watched the distributing of a fast mail; what hours and days are to man, moments are to letters. A clerk in the Omaha office said to me recently: "The return to wagon service from the electric car system would be a plunge backward into the dark ages, which I trust we will never experience." Mailing clerks and distributors alike are unanimous and even enthusiastic in their commendation of the electric cars as a means of transit for mail matters, so far as I am advised. Where sub-stations are supplied from a main office, the advantage of the cars admits of no question; the time saved in the actual transmission of the mail to and from is about one-half, so that where carrier service enters in as a means to be considered the patrons of the outlying districts are given an immeasurably better and more satisfactory service. When this great system shall be utilized everywhere for the collection of mails over the cities, when the actual labor of "working" and routing of the mail shall be performed on the postal electric cars as they thread their way through the very heart of commerce, and a letter finds its way yet warm from the hands of the writer to the depths of the mail pouch, then it will seem as if

system could reach no higher pinnacle of development, unless, indeed, we learn to transmit mail sacks by the very lightnings of Jove.

Again I wish to make another comparison of time saved by using the electric railways to carry mails. Before the electric line between Omaha and Council Bluffs undertook to handle the mails between these cities the mails left the main post office by wagon, and were conveyed to the depot of the Union Pacific Railway, which is a distance of one mile in Omaha and 1.8 miles in Council Bluffs, where they were then conveyed by train across the river, a distance of 5 miles. The Union Pacific at this time had about eleven trains in twenty-four hours, and part of these trains at night, after business hours were over for the day, thereby making the mail service so very unsatisfactory that the public began to clamor for the mail to be carried by the electric railway from the time the road was open. We finally made a contract with the Government to carry the mails between the two cities, and the public discovered at once that we were transporting these same mails from Council Bluffs to Omaha in the same time that it formerly took to deliver the mail by wagon from the Council Bluffs' post office to the Council Bluffs' depot, thus saving the time consumed by the Union Pacific train between the cities and time consumed by wagon from depot to post office in Omaha. In fact, the mail was probably in the hands of its owners and answered in some cases long before it had crossed the river by the old route. Or a man could mail his letter in Council Bluffs, walk to Omaha and wait for its delivery under the old system, while the new route makes it possible for him to mail a letter when he goes to his office in the morning and get his answer by noon. No doubt an investigation would prove the same conditions exist in nearly every State in the Union at hundreds of places. This being true, we have shown the value of the service.

Now let us investigate the compensation. After it was discovered that the electric railways could handle the mails with so much satisfaction to all concerned the managers of the railways thought they saw a great protection during strikes, etc., in the Government, and were ready to carry the mails at most any price, but I believe experience has taught us, through some of the strikes in the East, that they did not find the protection anticipated. The electric railway managers were figuring on the basis of what the Government had done for the steam roads during such troubles, and, while seemingly the comparison was a good one, it was erroneous from the fact that a mail car could be attached to an engine hauling ten or fifteen coaches of passengers, and this one train would perhaps clear up the traffic for hours, while with the electric roads, where the headway is anywhere from two to five minutes in large cities, where strikes are liable to occur, one train carrying the mail, which the Government would protect, would make no more impression upon a congested travel than would one drop of water in the ocean. It can be shown, therefore, that the only benefit received by the companies for carrying the mails on street and interurban railways is the compensation allowed by the Government for the same; hence the railways should work with an end in view to make this compensation enough to justify them in looking upon the carrying of mails as a profitable earning, and one which should receive their careful attention. It is true the Government has made some effort to arrive at the cost of carrying the mails, but in doing so, if you will read the report of the committee to the Postmaster General under date of June 25, 1896, which the Government of Washington will furnish you upon request, and which contains a great deal of valuable information, you will see the report treats mostly upon finding out what expense the railways are put to in handling the mail, and not upon how much the value of the same is to the public. This report makes an allowance of three cents per mile for carrying pouches upon electric trains, while in the same report they state: "the closed pouches upon the street cars should be compared with the Star Service, which it replaces," and in the same breath the Government states: "the Star Route service costs 4.94 cents per mile." Thus they recommend three cents per mile only for the electric service with its increased speed and more prompt and reliable handling, in fact, a superior service in every sense of the word. Following this statement they also say: "it is gratifying to report the improved service will not materially increase the expenditures of the Post Office Department." Why? Because we, the managers, have allowed them to dictate to us what we should have dictated to them, and they offer us for a better service less than they have paid for the same service by wagon, simply on the grounds that said service costs us but little, if anything; yet in figuring what it costs us they do not take into consideration, as a rule, any expenses for damages, general expenses and especially fixed charges.

Where the regulation wagon service in various cities is costing the Government 15.7 cents per mile traveled they only offer the electric companies 16 cents per mile for a 16-ft. car, and at the

same time claim the service should be far superior, and that the car will take care of the natural increase for years to come. Does it not look unreasonable for them to dictate to the railway companies such terms when the service is so much superior to the wagon service? Why, in Council Bluffs, they pay more for the wagon service to haul the mails to and from the depot, a distance of 1 8-10 miles, than they pay the steam road for hauling it from Council Bluffs to Omaha. Why? Simply because the steam roads are post roads and compelled to carry the mails as the Government dictates, while in the wagon route they are dealing with an individual, and it is impossible for them to make a contract for any such unreasonable terms.

When the Omaha & Council Bluffs Railway & Bridge Company first closed the contract with the Government for carrying mails between Omaha and Council Bluffs the Government allowed this company one hundred dollars per month, and was satisfied it was getting value received until other electric roads commenced to carry the mails more for protection than revenue. The Government then immediately took advantage of the time and opportunity to make an investigation, of which the report of June, 1896, was the result, which reduced our compensation to fifty dollars for nearly the same service. Had the American Street Railway Association handled this matter in the past, as general managers and passenger agents of steam roads handle their affairs, the result of the Government committee's investigation would have been different.

No doubt the companies spoken of in the committee's report to Postmaster-General Wilson, under date of June 25, 1896, as giving information as to the cost of carrying mails and operating mail cars, have since learned through experience that their estimates were entirely too low, although given in good faith at the time. The Chicago City Railway states that the revenue derived for running mail cars barely pays the expenses. Nearly every manager with whom I have communicated is dissatisfied with the remuneration. And here allow me to add that the running of mail cars in large cities like New York and Chicago is of vastly more importance to the Government than they are willing to admit. On the other hand, to run these cars on regular trains is annoying to the passengers, from the fact that where they are supposed to stop at sub-stations, connecting points, etc., the passengers are annoyed by the wait of a minute or so. The result is the car is run as a special exclusively for mail, making it more costly to operate, and yet the Government is basing the compensation upon the same basis as postal cars for steam roads, and we, as managers of electric roads, are allowing it to be done with all statistics before us to prove that the steam roads are not securing the remuneration they should. To prove this I respectfully refer you to some excellent articles in detail upon this particular subject in the "Railway Age," published at Chicago, Dec. 31, 1897, and March 11, May 20 and 27, 1898. It would be worth the time of any member of this association to procure and digest the articles referred to, as time would not permit of repeating them in full here. Congress has already appointed two commissions, known as the Gardner-Hubbard commission, of 1877, and the Elmer commission, of 1884, to investigate this subject. These commissions made elaborate reports, advocating increased pay based upon speed and space. The recommendations were not acted upon for the reason that the railroad companies themselves, without extra pay, have been found to increase their speed and enlarge their space, and thus the Government has actually received these advantages under the operation of the law as it stands. The steam roads had done more than their part, while the Government took advantage of it and refused to act. The Government has always been in the position of a beggar regarding facilities demanded of the steam roads for handling the mail.

In December, 1897, a great cry went up from Washington as to how the steam railways were swindling the Government. This led to an investigation, and had I time I would like to quote the results of that investigation in detail. Suffice it to say that this charge was ably answered by E. P. Ripley, president of the Santa Fe Railway, and the charge denied by the Chicago "Times-Herald," and the sum and substance was that the Government was making thousands of dollars off of the railways through the arrangements of only weighing mails every four years and obtaining car space unpaid for. For illustration, in these statements sent out from Washington it was claimed that the amount paid by the Government to the Erie Road for the transportation of mails had been sufficient to pay a dividend of 6 per cent per annum upon all the stock of the road. The stock of that road is \$150,000,000; 6 per cent per annum would be \$9,000,000; the total mail pay of the Erie Road is less than \$500,000. Such statements as these place this matter in a false light, and if, after years of experience, the steam roads are not in a position to obtain proper rates for handling of mails, what will be the condition of affairs between the electric railways and the Government if no effort whatever is made

upon the part of the management of electric railways to look after this matter now? I realize that it is a hard matter for the Government to make a flat rate to cover all roads and the local conditions pertaining to each road, but, as they have attempted to do this, I claim that they should have made the rate flattering enough to the electric railroads to make them become at least interested in the subject, and that three cents per mile for pouch service, and sixteen cents per mile for 16-ft. cars, which are fast becoming obsolete and replaced by cars from one-third to twice as large, is not enough. The Government will naturally take advantage of the larger cars, as they did where advancement compelled the steam roads to increase size of cars, speed, etc., but I doubt if they will increase the compensation for electric roads or take this question into consideration when figuring on cost of operation.

It is not for me to say how much we should receive, but for the members of the association to take up the subject by discussion and work it out. This class of service is in its infancy; it will grow from year to year, and after a while be worth thousands of dollars to us annually, and what we do to-day and what we neglect is laying the foundation for the Government to work upon in the future. Then it behooves us to be on the alert, and lay the foundation of the compensation so well that the Government cannot tear it down when the time comes for them to declare the electric railroads to be post roads, etc.

For the present we are compelled to abide by the appropriation of Congress and the rates made by them, but the question before us is how can matters be improved upon to benefit the electric railways in the future. This association represents as many millions of dollars of investment, I believe, as any other body of men coming together each year in this country. They are men whose power can be felt in every community. In unison there is strength, and if you gentlemen will take up this subject, discuss it thoroughly, and when you have reached an understanding go home and lay the matter before the Congressmen from your district, convincing them of the good the electric railways can be to the public in carrying the mails, as well as themselves, to their very door, with promptness, frequency and dispatch, even though these homes may be in the rural districts surrounding our cities and towns, it will only be a question of time when the influence of these efforts is felt at Washington and something more substantial than glory and patriotism will be our reward for carrying the United States mails.

### To What Extent Should Street Railways Engage in the Amusement Business

BY WALTON H. HOLMES

When I consented to prepare a paper for this convention on the subject selected for me by the executive committee, namely, "To What Extent Should Street Railways Engage in the Amusement Business," I did so with great reluctance, knowing full well that the conditions to be met in the numerous cities where street railways are an important public agency are so widely different as to present a different problem in almost every instance, and, except from a very broad view of the subject, to render comparisons altogether impossible. But in spite of these inherent difficulties of the subject, I feel that some general principles may be extracted from street railway experience which may be advantageously employed in correctly solving a problem which must arise in nearly every locality where street railways exist. I have not hesitated to ask for the experience of others, and I beg to acknowledge, in the outset, the many valuable responses which I have received from street railway managers for whose judgment I entertain the highest respect.

Street railways are peculiarly an urban agency. They were born of the wants and convenience of a city population, and the development and growth of travel are so closely associated with the growth and prosperity of the municipality that street railway managers can never be too zealous and active in every public enterprise which is designed and well calculated to stimulate municipal expansion and civic pride among its citizens. This is notably an age of progress in every line and in all directions. The ideal city of a few years ago is no longer considered adequate in its appointments for the welfare of its inhabitants. Every up-to-date city in the land has come to acknowledge that it owes a larger duty to those who live within its boundaries than merely to afford police and fire protection. The comfort and pleasure of its inhabitants must now also be considered and looked after, and this tendency and demand of the age have crystallized and taken form in providing parks and squares for the comfort, pleasure and entertainment of the great body of the people and drives and boulevards for those who are more favored in the distribution of worldly goods. These public pleasure resorts are an important factor in

the question under discussion. Wherever established, they are preferred by the people, who justly regard themselves as proprietors, and hence it is that many street railway companies which undertook to supply an obvious public want in this direction a few years ago, have found this particular occupation gone and only a small number of the important systems of the country any longer maintain these parks. The demand has regulated the supply.

But the street railways have a great and peculiar interest in these public parks. It is our mission, as a public agency, to render them as accessible and useful to the people as possible; and to this end it must be apparent that by a reasonable expenditure of money toward the amusement and entertainment of the people in their own resorts, street railway travel can be stimulated and the health and welfare of the community greatly promoted at the same time. Results are more easily obtained by encouraging a natural tendency of the kind referred to than by efforts to entirely create business through independent and artificial means. With rare exceptions, commissioners of these public parks look upon them as the inheritance of the people, and regard it as a solemn duty to encourage the efforts of the street railways to render them as accessible and pleasant for the inhabitants as possible, and are only too glad to have their own endeavors in the same direction supplemented by the street railways.

Public parks are usually numerous and scattered in different localities, and in this lies a great advantage to the street railway over the maintenance of a private resort of its own. In the one case travel becomes congested with the increased danger of accidents, and maintenance of a surplus amount of idle equipment for a large portion of the year, while in the other, public patronage is more generally distributed where it naturally belongs, and serves to keep better employed the standard equipment of the line without much additional expense or risk.

With reference to parks and similar resorts, I therefore think it may fairly be deduced that street railways have generally found their maintenance on private account to be ill-advised and unprofitable, except in a few localities where locations are such as to warrant more than the ordinary five-cent fare, and that the best results are to be secured by intelligent aid of the public municipal authorities in their efforts to render their own resorts attractive, pleasant and entertaining to the great body of the people. The same thing is obviously true with reference to large buildings of a quasi public character intended to afford accommodations and facilities for conventions, entertainments and exhibitions on a large scale. In my judgment, such enterprises when judiciously conceived and undertaken, may well receive substantial encouragement from street railways to an extent which would warrant representation being accorded to them on the board of managers. I consider such representation important in the interest of the public as well as of the street railway, because both have an apparent and common interest in keeping the price of admission to such buildings down to a figure which will keep them always popular in fact as well as in name, and so a stimulant of travel on the street railroad.

Street railways have seldom undertaken to foster other than out-of-door amusements, and these are always attended by the risk of bad or unseasonable weather and the like, which frequently entails heavy loss. Cars must be accumulated in large numbers where such attractions are being presented in order to take the people away at the proper time, thus greatly increasing the cost of car service, and some times necessarily retarding the tide of regular travel at other places with the attendant loss. Such enterprises frequently engross much valuable time of the chief managing officers which would otherwise be expended in other directions. These and kindred considerations which will readily occur to the experienced railway manager are very potent reasons why the companies should not themselves engage in the amusement business. Many of these things are impossible to estimate in dollars and cents, and so it is that street railways are every day coming to realize more and more forcibly that the business to be relied on for profits is that which follows the natural channels, and can be handled in the usual and ordinary way.

I need hardly say that some of our large cities have reached a point where the ideas advanced in this paper have no practical application. With some of them, the problem is not how to create or stimulate travel, but rather how to best handle and take care of the patronage which is already at hand. Then again, there are many small cities which have not yet attained to that important rank which justifies the public authorities in undertaking to provide for the pleasure and amusement of the people at large. Street railways thus located have frequently found it profitable in a degree to supply this want on their own account, and to them the views here presented are likewise of little practical importance. I have considered more particularly that large class of cities which occupy the middle ground between these two extremes, and where it has seemed to me there is opportunity for the profitable

and practical application of sound principles of street railway management in the particular case under consideration.

Where amusements are to be provided or encouraged at all, general experience shows that there is little or no difference of opinion as to the character of entertainment which ought to be furnished. The view entertained is well nigh universal that expenditures in this behalf should be moderate in amount. The best and most satisfactory results have generally been obtained from such attractions as novelties in the way of music, like noted bands or other musical combinations, vaudeville, athletic sports, baseball where the city is large enough to have membership in an important league and to support a first-class club, football and other similar out-of-door entertainments.

In many of the Southern and Western cities visitors are few and business comparatively dull in the summer season, with much of the resident population sojourning at the seaside or in the mountains; and half-holidays with business houses generally closed are by no means infrequent. This condition means light travel on street railways unless some inducement outside of the ordinary is offered to those who have remained at home. Amusements and entertainments of the kind to which I have referred have been found to be well adapted to this purpose, and in many instances have proved to be undoubtedly profitable to the street railway.

It has occurred to me that perhaps I may be expected to say something of my personal experience extending over a period of many years, leaving my intelligent hearers to make such application of the same to their own conditions and environment as to them may seem advisable. During my service as a street railroad man, Kansas City, where I have always operated, has grown from a city of 30,000 to upwards of 200,000 inhabitants, and consequently opportunities have been afforded me of viewing the business in a number of varying stages of its evolution.

In the early days we began in a modest way by providing a small natural park with music and attractions which were not very expensive. As the city grew and lines were extended, both urban and suburban, we established and maintained for a number of years two high-class and well-improved parks, one being located within the city boundaries where it could be reached for a fare of five cents; and the other on a suburban connecting line where the round trip fare was fifteen cents in addition to the street car fare. At both of these parks flowers were extensively cultivated and displayed, and amusements of many kinds were furnished, such as bathing beach, boating, dancing, vaudeville, music, light opera, balloon ascensions, and the like. No charge was ever made for any of these except for the use of bathing suits and boats, and a small admission fee to the light opera. In the way of music, we have furnished some of the most famous bands which have visited this country, and have frequently played so distinguished an artist and soloist as Signor Liberati and his band for weeks at a time. We have found the public taste in such matters capricious, demanding a frequent change of programme, and, as time has passed, a higher order of entertainment. On the whole, our efforts have been appreciated, and the patronage has been generous, but it is difficult to say whether the profits have been sufficient to justify the immense amount of energy exerted in this direction, and we have finally altogether abandoned the maintenance of any such places by the company. Two parks, one city and the other suburban, are still maintained by independent corporations, at which, outside of boating, bathing, etc., music has been the only attraction furnished the present season, except a summer opera for entrance to which a small admission was charged. We pay these park corporations a stipulated sum for furnishing our patrons with the free privileges of the parks. Meantime Kansas City has begun establishing its own public parks, and as they become sufficiently improved to be generally used, it will be the policy of our company to encourage their use by the people in every reasonable and legitimate way.

We have always given liberal financial support and encouragement to the maintenance of a professional baseball club, and have always found the returns from this source satisfactory and I believe profitable.

Our company has given liberal financial aid and encouragement to the fall festivities which are of annual occurrence at Kansas City. They consist of a night parade by a local organization known as the "Priests of Pallas," representing, by a series of fantastic floats, scenes from history or mythology and a flower parade; and grotesque carnival parade in the daytime on successive days, under the auspices of the "Kansas City Carnival Krewe." In these parades, many brass bands from the section of country tributary to Kansas City are employed to take part. The festivities extend over a period of several days, and are the means of assembling a large concourse of strangers in Kansas City. They are universally regarded as bringing much trade and business to the city, and I am confident our company makes no investment

in the way of amusement and entertainment to the public which brings better returns.

A noted military chieftain (General Hancock) spoke of the tariff question as a local issue, and such, in a large measure, I have found the subject assigned me for this paper; and I can only hope that something of what I have said may prove to be of local use to many of you.

## Equipment and Maintenance of Electric Cars

BY M. S. HOPKINS

An ancient king of fable offered a rich reward to the courtier that could tell a story that would last forever. To him that undertook it and failed the price was his head. Were this merry monarch living to-day he might gratify his wish by asking, "how shall I best manage my street railway?" and all his newspaper editors, councilmen and other subjects would at once undertake the task, for it is a matter of common knowledge that everybody can manage a street railway much better than it has ever been managed.

The modern king of finance is daily asking this question of his hired subjects, and unless the answer is expressed in dividends the story is at an end and the head of the manager is the penalty of failure. To attempt to discuss all of the various elements entering into the composition of a successful street railway, would be a continued story, and not within the province of this paper. What is the best electric equipment to purchase and how can it be made to render the best service at the least cost, is the question which daily confronts the street railway manager, and one on which he is constantly seeking advice. There can be no answer which is applicable to all street railways, and no especial merit is claimed for the views set forth other than that they are the result of experience and born of repeated failures and successes.

### CAR EQUIPMENT

No fixed rule can be laid down for the selection of equipment, as climatic conditions, character of traffic, frequency of headway, conditions of roadway, municipal regulations and grades are all elements which determine what the equipment may or should be.

### CAR BODIES

For years car builders have attempted to devise a car body which would be equally durable in both summer and winter, but judging from the character of equipment now in use on the majority of roads, such a car has not yet been produced. The combination car with movable parts is not satisfactory for winter use, is troublesome, noisy and cold, and is lacking in many of the essential features of the open car for summer service. The open cross-seat car of the barge type, with running boards on the side, seems by far the most desirable type of car for summer service, affording the largest seating capacity and the best facilities for receiving and discharging passengers, which is a great advantage in city service. Considering all features, the box car with side seats, large windows, wide end door to the side of center, roomy platform and vestibules closed on one side, seems best adapted to the average condition of winter service. While the vestibule types closed on one side is not so convenient for the handling of large crowds, yet the additional safety afforded on double-track roads should receive full consideration even at the expense of convenience. In localities where winters are accompanied with snow fall and freezing weather, the vestibule affords protection to passengers, and motormen and conductors are able to render very much more efficient service.

The long car body seems to be growing in favor with the railway manager, due to the comparatively small increase in operation, in comparison to increased carrying capacity, and its allowing of the increase of headway or decrease in number of cars run, resulting in a large decrease in operating expense per passenger carried.

The purchaser of car bodies should have a clear conception of the details of car construction, and specifications should clearly set forth the essential feature—minor details of interior finish and decoration being left to the manufacturer.

In the construction of box-car bodies, the trusses should be as deep as possible and great care taken to secure a perfectly rigid fastening at end of sill, as the slightest deflection throws an undue strain on joints and framing of car body.

Where side sills are plated on outside with steel plates, all season cracks should be thoroughly filled with a thick mixture of lead and oil, and entire surface given a heavy coat of oil paint before plate is put on. It is hardly necessary to say that all joints should be well leaded and protected from moisture. A heavy steel roof rafter in one piece should be put in at every post, and a saving in maintenance will be made by having platform floors of oak or

maple. The trolley stand should be mounted on a trussed support, which will distribute the strain to the ends of car as much as possible.

Ash seems to be almost universally used in post and light framing of cars. This is probably due to the difficulty in securing the grade of oak necessary, the lighter weight of the ash and the greater ease with which it is worked. In spite of these difficulties, oak is far preferable, being stronger and more elastic, and will give a far longer life.

#### TRUCKS

Under the average conditions 22-ft. closed car or eight reversible seat open-car body should be the limit for a single truck. Although there are single trucks which will carry a longer body fairly well, yet the increase in maintenance will in most cases warrant the use of double trucks. The local conditions should govern the type of double truck used, the bolster type in most cases being preferable for long cars on high speed, suburban service, while for city service, where heavy grades and quick starts demand maximum traction, and short curves make it necessary for the wheel to turn under sill, the bicycle type must necessarily be used. This type of truck is no longer an experiment, and while they possibly require more careful inspection and adjustment, very efficient service can be secured from trucks of this type.

Trucks should be made up of a small number of parts, cast and malleable pieces should be the lightest consistent with strength. The springs should be so arranged as to prevent oscillation, and give an easy riding car under all conditions from no load to full load, and when the style of truck is of such design as to prevent the use of an under truss, the spring base must be exceptionally long and the end springs so arranged as to relieve the strain on the car sills.

The brake mechanism should be so designed that the strains will be equally distributed on all parts throughout its range of movement. The pins should be of ample size to provide for wear. The slider method of support for brake beam will be found more satisfactory than the loop support. The minimum amount of friction should exist between brake staff and shoe and release springs as light as possible.

#### ELECTRICAL EQUIPMENT

In the selection of the electrical equipment the main point is to secure equipment of ample capacity and proper design for the service required. In a railway motor, the mechanical and electrical features which influence its maintenance should receive very careful consideration. The bearings should be large and lubricated by oil from below and cup grease from above, and so designed that the drip from the bearings will fall outside of frame. The armature should be so constructed as to permit the shaft being pushed out without disturbing the commutator and winding.

I am glad to note that the importance of light weight and slow peripheral speed of armature has been recognized in the recent design of railway motors. The inertia or flywheel capacity of the armature should be the smallest possible, consistent with the work required. Engineers differ as to the best method of suspension. From a theoretical standpoint, the cradle or side bar suspension has the lead. The dead weight is largely removed from axle, thereby eliminating to some extent the hammer blow on rail-joints, decreasing the wear on axle brasses and securing the better alignment of gears; yet, in practice, the nose suspension is still preferred by the writer, as the car starts more smoothly—the weight of motor on spring supports overcoming the jerk and quiver so common in other methods of support. The specifications for railway motors, as drawn up by leading manufacturers of to-day, amount to practically nothing, and would suggest that the purchaser of motors in his specifications clearly define the rating heat limit and efficiency.

The series parallel controller is in most respects a satisfactory device, the chief objection being the narrow range of speed on running notches. Specifications for resistance should provide that the last two points of resistance be of sufficient capacity to allow of their continued use as running notches, especially where cars are operated in city service.

There are several types of magazine fuse boxes or cutouts and single cutouts using a special fuse, which possesses a number of points of merit. Without going into detail, it is the opinion of the writer that under average conditions the standard magnetic blowout fuse box, using a link fuse, is preferable.

Each car should be equipped with a thoroughly reliable lightning arrester. The points to be noted in selecting this device are as follows: The kicking coil should always be installed; the air gap should be as small as possible; there should be a positive and quick device for interrupting the current after discharge, and one which will not be injured by discharge; there should be a non-inductive resistance in the main circuit which will limit the flow of

current and thereby prevent the opening of the circuit breaker at the station when several arresters operate at the same time.

One of the most puzzling problems brought before the manager to-day is the amount which should be expended in the maintenance of old equipment before it should be replaced by new. To the average master mechanic this would seem a simple problem of making a careful estimate of the difference in cost of maintenance of the old and new equipment, due consideration being given to the interest on money invested in new equipment and its increased efficiency. Still, after the master mechanic has conclusively shown that by putting in new equipment a marked saving can be made in cost of operation, the manager has to consider the financial condition of the property, the advisability of increasing the investment, the possibility of doing so, and whether there are not other departments of the road where a greater saving can be made by increasing the investment. One should go slow in putting in new equipment, as new apparatus may at first seem to be void of the main defects inherent in old equipment, yet when put in operation, other defects occur which under the varying conditions may prove even more disastrous than the old.

#### MAINTENANCE OF EQUIPMENT

The cost of maintaining equipment depends on various complex conditions, some of which are beyond control of the manager, and others for which he should be directly responsible. Heavy grades, numerous railway crossings, sharp curves, dirty and unpaved streets, imperfect and poorly constructed equipment, long and severe winters, all affect cost of maintenance unfavorably and are beyond control of the manager. But the character of men who operate the cars, the manner of operation, the way in which repairs are made, the character of men engaged in repairs, and the material used, are the controllable elements, and in most instances the chief features affecting maintenance.

#### CARE OF EQUIPMENT IN CAR HOUSES

Generally one of the following three methods are used for daily inspection of car equipment, namely: inspection of cars for each trip, inspection of equipment at night by motor inspectors, inspection of equipment during the day by motor inspectors and repair men.

In regard to the first case, that of the trip inspection, I would say that in the present degree of perfection attained by manufacturers of railway equipment, trip inspection should not be necessary, and, excepting on interurban lines operating at high speed over long runs, is of doubtful value. It is expensive, requiring the services of an inspector who is necessarily a man of some ability for each line of cars. The period of time for making this inspection is necessarily very short, and the entire time is taken up in mere inspection—little or no opportunity being afforded in which to make repairs.

In regard to night inspection, the experience of the writer has been such as to absolutely condemn such a method as expensive, slovenly and unsatisfactory. It is impossible to make a thorough inspection of cars at night, no matter how well lighted the car house may be, and the efficiency of the work done by the men is very far below that of the work during the day. Therefore, when local conditions will admit, inspection of cars during the day seems by far the most advantageous.

We will assume a car-house station, from which twenty-five or more cars are operated. There is usually one general foreman in charge of this station. His duties are chiefly those of the transportation department, but he should be a man thoroughly conversant with the usual trouble which may occur in the operation of the equipment, and know how to direct minor repairs. It would be better, of course, if he were able to personally superintend the actual work of repairs, but it is usually very difficult to find men who are good mechanics and likewise efficient in the transportation department.

For making inspection and running repairs such as should be made in car houses, it is a safe rule to have one man to seven cars. It is important, however, to have in all car stations a man known as chief inspector of that division, who is thoroughly conversant with practical electrical and mechanical matters. This chief inspector should have under his care for inspection and repairs seven cars, and also have direction and supervision of the other two repair men who care for the remaining eighteen cars.

It is important that the responsibility for the proper repair of cars be definitely located, as nothing is so demoralizing to the force of motor inspectors as to have a case of trouble arise and not be able to trace the responsibility at once to the proper source.

The duties of these men should be to make a daily inspection of every car assigned to them, starting first with their motors, examining the grease cups, the brushes, cleaning the motors, examining connections, etc. They should remove the covers from their controllers about once in three days and oil the cams very lightly with vaseline or grease, remove any blisters which may

have appeared on the contact points and carefully examine the adjustment of contact fingers. Too much emphasis cannot be given to the inspection of all brake rigging, and very thorough inspection should be made daily from the brake-handle to the brake-shoe, and the brakes tried by inspectors before the car is placed in service. A broken brake-chain or worn out shoe, a broken brake-clutch or a broken brake-pin are things that should never occur through neglect, and if an accident of this kind does occur, the cause should be immediately traced and the responsibility located. Economy in maintenance should never be exercised at the expense of absolute safety, and brake-chains, pins and shoes should be discarded long before the danger point is reached.

The general public forms its opinion of maintenance of equipment by the little things on the interior of the car, such as a screw loose in the back, a broken strip on the floor, loose register pulley, broken hand-strap, broken glass, rattling glass, and hundreds of other little things which make the fittings of a car body. Repairmen and inspectors should be so trained that in passing through the car on their inspection, they should note any little thing of this kind at once, and the rule should be that they stop and repair it at once, for if allowed to wait till some other time the repair is usually neglected entirely.

The actual repair work done by these inspectors should be all work possible to be done without the use of machine tools, or which, if done by them, will not require the loss of the car from service for a period of more than two hours.

If during this inspection the motor inspector discovers trouble which is beyond his ability to repair, he should fill out a repair slip and send the case with the slip at once to the repair shop, stating the nature of the required repair, assuming that the repair shop is run as a separate department from that of the car barn. If the nature of the trouble is such as not to immediately incapacitate the car for use, but which requires the services of the repair shop department, he should fill out the blank as above noted, and send same to the foreman of repair shop, but this notice to the repair shop foreman should in no way release the motor inspector from the responsibility of the successful operation of the car. If the repair shop foreman is unable to take the car off the road at once, owing to press of work, it is the duty of the motor inspector to watch continuously the development of this trouble, and if at any time he thinks it has so advanced that car is not safe for successful operation he should leave the car out of service, and so notify repair shop foreman. If the latter is still unable to receive the car at the shop he should then make a personal examination of car and assume responsibility for its further operation.

The question as to how often car equipment should be taken to the shops for a general inspection and overhauling, and to what tests the electric equipment should be given at the time of inspection, are subjects upon which electrical engineers widely differ. Considering the average conditions, and assuming that the equipment is in good condition, it is the opinion of the writer that the taking of cars to shops once every six months should maintain the equipment in good condition and assure its efficient operation.

#### MOTOR BEARINGS

Bearings should be run "close" at all times, and the time of their renewal should be determined by the effect of the wear on the gear and pinion, as the wear on these parts is largely affected by the wear of the bearings.

After a series of tests covering quite a period of time, as to the wear of various materials used in motor bearings, the writer feels warranted in making the statement that under the ordinary conditions either the best grade of babbitt or brass bearings should give a longer life than six months, and when a bronze bearing of the proper mixture is used and properly lubricated a life of twelve months can safely be expected. The method of lubrication largely affects the life of brasses. After long tests with various lubricants the writer has discontinued entirely the use of grease on armature brasses, and in most cases on axle brasses, a good grade of engine oil, supplied through wicks, being more satisfactory and economical.

In order to reduce the maintenance of brasses to a minimum the use of phosphor bronze is strongly recommended. Street railways operating twenty-five or more cars will find it economical to cast and machine their own brasses. This may be discouraging to the supply men, but it means money on the right side of the ledger when the expenses are footed up. A small brass furnace can be erected cheaply, and after suitable jigs, which can be attached to any lathe, have been provided for boring and turning, the cost of casting and boring is very little more than the cost of re-babbiting, especially where babbitted brasses are machined after boring, while the life of the bronze bearing is far in excess of that of any babbitt yet tried.

Rough and burnt commutators are too frequently the cause of expensive motor repairs, and usually indicate imperfect motor design or inexcusable neglect. Well designed motors in good condition, even under the hardest service, should not require turning oftener than once in eight months, provided, of course, the average work is within the rated capacity of the motor. There is nothing that so well indicates to the practical man the conditions of the motor as the condition of the commutator. Whenever the commutator shows signs of burning or blackening, steps should be taken at once to prevent it. It is not advisable to try to prevent this by the continual sanding of commutator by motor inspectors, though the occasional cleaning up of the commutator with sand paper is necessary with all motors. The causes of trouble of this character are so numerous that mention is made of only a few of the more important.

The kind of brush used is an important factor. Brushes should be of soft, close-grained carbon treated with a good lubricating compound—one which does not flow too freely from the heat from the motor, and which will not burn and carbonize on commutator. The price of the brush is not a material consideration, as a brush which is slightly superior to another will prove economical even at quite a large increase in first cost. As a rule the tension on the brushes of railway motors is too light. It is a common belief that heavy tension causes wear of the commutator, but experience has shown that the actual wear of commutators, due to the friction of the brush, is very small, and that in some cases increased tension will materially decrease the sparking, which causes the greatest wear. Improper alignment of brush-holders also frequently causes sparking. In recent practice the use of side contact springs on brushes has been generally abandoned. On motors carrying heavy currents this spring is quite essential, as the excessive heating of the brushes is caused by limited contact in the holder.

Commutator insulation should be made of what is known as the built-up mica segments of the very softest grade of amber mica. A hard, clear mica should never be used in the commutator, as this mica will not wear away as fast as the copper, and there is nothing so disastrous to the life of the commutator as high mica insulation.

In some motors it may be necessary to change the winding of the armature and field coils in order to avoid the burning of the commutator. First, determine by actual experiment what change in winding is necessary, and then equip with the new, winding every armature or field that comes in burned out. The change can thus be made without any great expense, as the greatest part will be borne by the maintenance charge.

#### THE ELECTRICAL TESTING OF RAILWAY EQUIPMENT

Elaborate systems for the periodical testing of insulation on railway equipment seem to be growing in favor with some electrical engineers, but the practical value of these elaborate tests is not fully demonstrated. Experience has shown that tests of this kind are very misleading and frequently causes the tearing down of equipment, which under ordinary conditions, and had no tests been made would have continued in service for a long time.

Judging from my own experience, it is neither necessary nor advisable to test periodically the insulation on the equipment, but to make such tests only in cases where the motors are not working properly. The proper training of motor inspectors as to the little points about railway equipment which clearly indicate trouble with motor, will locate in nearly all cases trouble due to weak insulation, so that it can be remedied before any serious damage has resulted to any other part of the equipment.

All armatures and field coils repaired should be carefully tested as to resistance and insulation to ground, and on all armatures having coils repaired, new commutator put on or commutator turned, the resistance between commutator bars should be very carefully measured. This should be done preferably with a portable wheatstone bridge testing-set, capable of showing clearly a variation in resistance of 0.001 ohm. This is one of the most important tests to be made in the care of railway equipment, as more burnouts of armatures are caused by the slight, short circuiting of coils, due to the bridging over of insulation between bars by solder, acid or copper turnings under the leads, than from any other cause. These defects can be located only by a test of this kind. A bad joint or any mistake in connecting up the leads will be detected at once before any damage has been done. For testing insulation to ground I consider a first-class magneto of 10,000 ohms resistance all that is necessary.

#### TRUCKS

As the design of trucks varies so widely, very little can be said in a paper of this kind as to the detail of truck maintenance other than to say that all joints should be kept perfectly tight, and where they do become loose the parts should be swedged out and refitted. All bolts should fit tight, and the nuts should be secured

by lock washers. In the opinion of the writer soft, gray iron, inset with plugs of soft steel, has never been equalled for shoe brakes. The material giving the greatest amount of friction against a chilled surface should always be used, regardless of cost.

Much has been written of late on the subject of car wheels, their wear and alignment, and still street railway managers are careless about their wheels. Too much care cannot be given to the sizing and alignment of wheels and the pressure with which they are forced on the axle. At least 50 per cent of the wheel removals throughout the country are caused by broken or sharp flanges or a broken wheel. The use of sand influences largely the life of wheels, but the conditions vary so widely that I would not be justified in saying that in no instance should a sand box be placed upon a car. I will say, however, that where it is possible to successfully operate without them sand boxes should be discarded and other means used for sanding the track. In most cases it is far more economical to fit up a special car capable of carrying a large amount of sand, and sand the track for, say 100 ft. before each point where a stop is likely to be made and on grades and in places where the track is exceptionally slippery, than to sand the rail for its entire length.

#### REPAINTING OF CARS

The experience of the writer has clearly demonstrated that it is satisfactory to repaint cars without removing all of the old paint. Patent varnish removers, sealers, etc., are a snare and a delusion. The writer has found the following system of repainting cars to be quite satisfactory: First remove all old paint by softening it with a blow-pot just enough to allow it to be scraped off with a broad putty knife, not allowing flame from the blow-torch to strike the bare wood at any time. Then sand off the surface well with block and sand paper. Where any new work has been put in it should be first primed with a coat of boiled oil and a little lead and allowed to stand for not less than four days. Dashes and all iron-work should be thoroughly cleaned with strong alkali and primed with a coat of linseed oil put on boiling hot and allowed to thoroughly harden, giving one coat of oil and lead before color. If the surface is rough, plaster with lead on this coat. Then allow it to thoroughly harden, and sand with block; then lay on two coats of flat lead, two coats of color, color varnish, stripe and ornament, finish with one coat of rubbing varnish and one coat of finishing varnish. The main object in the painting of cars should be to secure a hard, smooth surface which will hold out the varnish with the very smallest amount of material; the thinner this surface is the better. Care should always be taken where plaster is used to make it as thin as possible, and lead coats, color and varnish should all be carefully tempered, so as to set alike, as most cases of cracking of paint are due to the want of proper tempering of lead and color coats.

A car painted in this manner should not require repainting for from six to seven years if properly cleaned and varnished. Cars should come into the paint shop, even where the best grades of varnish are used, once every eight or ten months and be washed thoroughly with pumice and strong soap and given a coat of finishing varnish. The life of varnish depends largely on the care given to the cars in the cleaning department. Cars should be sponged off daily with clear water, and any accumulation of dirt removed as far as possible by the use of a chamois skin and sponge—care being taken to rinse off the grit before rubbing with sponge or chamois. Once every thirty days the car should be thoroughly washed down, using a good grade of soap. If it is impossible to remove dirt and stains from the surface of the cars with the finer grades of soap, strong soap may be used, it being found that the injury to varnish resulting from the use of this soap once every thirty days will be more than offset by the saving in cleaning and touching up when the cars are taken into the paint shop for revarnishing.

In the selection of designs for painting of cars, the plainest and neatest design should be selected as a rule. No lettering should be done on the panels, as this increases greatly the cost of maintenance in the paint shop department. In all cases the signs should be put upon sign boards made especially for the purpose.

The inside of the cars should be cleaned thoroughly and rubbed down with pumice stone every second time the car comes into the paint shop to be revarnished. There are a number of so called car cleaners on the market which are rather a detriment than an advantage to the outside surface of the cars, but which may be used to advantage on the interior of the cars, especially around the sash. Special observation of the interior of cars will show that the varnish commences to disappear first around the sash—moisture from the windows gathering around the moulding which holds the window sash, first discoloring it and gradually working into the sash itself. A car cleaner which is made up largely of oil and dryer, if used about once a week on the window sash and

moulding, will be found to be a great advantage. Three years ago four new cars were selected, and a car cleaner used weekly on the windows of these cars, and to-day not a stain is to be seen on sash or moulding, the cars having been revarnished twice during that time.

After a number of trials of various floor paints and paints mixed especially for the purpose the conclusion has been reached that there is nothing equal to pure white lead and linseed oil and suitable color for the floors of all cars. The majority of car floors are stripped, and it has been found impossible to find any material hard enough to stand on the top of the strips of a car floor, while almost any material will stand the wear, but not the moisture, between the slats. It is very evident, therefore, that the best paint for this purpose is one which will best preserve the wood in the floor of the car from the constant moisture to which it is subjected.

As to the car roofs, the main object is to put as little material as possible on the canvas of car roofs, and that material should be elastic, and yet withstand the action of the weather. Great care should be used in tempering of paints for roofs. Avoid painting the roof one time with one kind of paint and the next time with another, for in the long run this will invariably crack and require the renewal of the canvas on the roof. In a number of cases it is customary to use slush or any old thing which happens to be in the paint shop for painting roofs of cars. This is a great mistake, for no paint is too good for the car roof—the best white lead and oil giving the best results.

Unquestionably the truck of car should be painted with a good grade of lead paint, as it prevents rust, decreases renewal of bolts and adds greatly to the general appearance of the car. A handsomely painted car body mounted on a dingy, rusty-looking truck has a half-finished appearance, to say the least.

#### Rails—Their Construction from a Scientific Standpoint

BY A. J. MOXHAM.

Many years ago the London & North Western Railway Company, of England, reached the conclusion that what was known as a "soft" or low carbon rail gave the longest life, and its conclusions were honestly based upon what appeared to be clear-cut, practical experience. This was reinforced shortly afterwards by Professor Dudley, at that time acting for the Pennsylvania Railroad Company, who gave the result of tests that on the face of them were to be relied upon. His paper was an able contribution to the knowledge of the day. His general conclusions led to the "soft" rail, and he went further and endeavored to determine by comparison a factor for each special chemical ingredient. His conclusions created something akin to a sensation, and they were bitterly opposed by the steel experts of the time. Perhaps the fact that the steel manufacturer of that day was not sufficiently master of the situation to economically produce the ideal rail, according to Dr. Dudley's standard, may account for a good deal of the opposition. During the same period, however, notwithstanding these deductions, the tendency of the rail called for in actual practice was always to higher carbon. The writer himself during this interval was a supporter of the "soft" or ductile steel for rails; and even to this day, and in view of what is to follow, it is to the writer's mind a questionable thing whether a steel of great ductility and only of moderate hardness is not the steel for steam railroad purposes. It must be remembered, however, that the problem of wear upon a steam railroad is a very different thing from that of wear upon a street railroad. The rail in steam railroad use presents a clean head, because the rail is not buried. It has to oppose principally a rolling friction, for the number of times per mile that steam railroad trains are stopped is very few, taking a general average. The street rail, on the other hand, has not only to meet this rolling friction, but has to contend with the grit from the surrounding road-bed, and with stops every few feet. Not only are the stops incomparably more frequent, but they are again multiplied into a greater number of units, as many individual cars are the rule on street railroads as against the occasional train of the steam road.

Being unable to reach positive conclusions from the published authorities and from personal contact with the steel experts of the country, or even from our own experience, it was determined to conduct experiments to this end.

It was accepted to begin with, that it would be folly to try to finesse in the matter; that the best that could be done would be to try to find general, safe indications. When it is remembered that each chemical ingredient puts its own particular stamp upon the steel, and a different stamp in each particular combination with the other ingredients, and that the number of such combina-

tions may be infinite; when it is remembered that each different heat at which the steel is rolled affects the problem; that the amount of draft put upon each successive pass should not be ignored, the necessity of this conclusion becomes evident. Hence the present effort is not to pass upon the proportion of each particular thing, be it good or bad; it is not a search for the perfect steel; but only a prayer that light may be shown in the right direction.

The experiments have lasted for three years. The first endeavor was to take broadly a "soft" steel and a "hard" steel for the rails to be tested, securing the difference by carbon alone, leaving all other ingredients as nearly as possible the same. The experiment with these was started in October, '95, and has been continuous ever since. In June, 1896, additional rails were added to the experiment, supplied by the West End Street Railway Company, of Boston, who at that time had determined (with wisdom as will be seen subsequently) upon a steel both hard and ductile. The conclusions, therefore, are based upon what may be described as

- Soft steel,
- Hard steel, and
- Steel both hard and ductile.

The rails (some thirty-three in all) were laid in the South Eighth Street tracks of the Nassau Electric Railroad of Brooklyn. They were laid continuously, so that the same car is obliged to pass over every rail, and therefore each rail is subject to the same wear, and the wear on the head only is considered. Street traffic is ignored. The point was selected as one that would give great wear in a short time, in order to reach early conclusions, as the cars pass this point at extremely short intervals.

Every rail has been measured at two points, taken about 10 ft. from each end, in order to eliminate the special wear at the joints. Each rail has two cast iron boxes bolted to the outside, at the points to be measured, to permit access for purposes of measurement without disturbing the road-bed. Originally the wear was registered both by actual measurement and by taking an impression of the head of the rail by means of type-metal castings. Two slots were provided in the tram of the rail to guide the type-metal mould. Notwithstanding the great care that was exercised in taking the impressions, this method of measurement was quickly given up as the results were far from being as accurate as those taken by micrometer calipers. With these calipers, measurements of each rail were taken at three points across the head of the rail:

- Point number one being at a point near the gage line;
- Point number two being nearly in the centre of the head, and
- Point number three being nearer the outside of the head.

Speaking accurately, point number one is 2 in.; point number two is 1 3/8 in., and point number three is 7/8 in., all from the outside of a head 2 1/4 in. wide. Methods were adopted for accurately locating the same lines, so that the comparisons in the different measurements of wear could be relied upon.

There were seventeen rails of low carbon (viz: averaging .28); fourteen rails containing high carbon (viz: .59), and two were West End rails. The least wear shown was in the West End rail, the hard rail follows a good second, while the greatest wear is shown in the soft rail.

	Soft.	Hard.	West End.
Carbon .....	.280	.59	.570
Silicon .....	.026	.056	.234
Phosphorous .....	.106	.097	.050
Sulphur .....	.065	.059	.078
Manganese .....	.790	.83	.980
	1.268	1.632	1.912
Iron .....	98.732	98.368	98.088
	100.	100.	100.
Special grade .....	7.855	7.841	7.825
Based on iron only, ignoring the metalloids .....	7.956	7.971	7.977

The average monthly wear amounted to .0007 for the West End rail, .0012 for the hard rail, and .0017 for the soft rail. The results of the experiments are conclusive on this point. We will, therefore, in the subsequent analysis, start with this as a fact. We will refer first to the physical test, and take last the question of chemical compositions. In the physical tests we will take first:

A. *Specific Gravity.* (See table I.) It will be noted that the West End rails show a specific gravity of 7.825, the hard rails 7.841, and the soft rails of 7.855. But in considering specific gravity it had best be based upon the iron alone in the composition. It is well known that the other chemical ingredients affect the net result almost imperceptibly in the matter of weight, but very greatly affect density of the iron (which is the bulk of the composition) in the matter of its physical property. It will be found a law that where specific gravity is referred arbitrarily to the iron and the metalloids are ignored, or rather deducted, the

specific gravity will tally closely with what is to be expected from the actual use of the metal. For instance in this case ignoring the metalloids, the specific gravity of the iron in the different rails will stand as follows:

Soft rail .....	.7956
Hard rail .....	.7971
West End rail .....	.7977

It is interesting to note the very close relations of this arbitrary specific gravity to the relative wear as shown in the test. This is not a point to be ignored, because it is an exponent of the mechanical treatment, and it explains consistently in this, as in many other cases, why the material with apparently (but not really) the lightest specific gravity will show the best results in use. The analysis shows that what is needed, as may be expected, is the *densest steel.*

Taking now B., Tension and Compression Tests. In the tension tests the ultimate strength stood as follows:

Soft rail .....	75,860 lbs.
Hard rail .....	118,100 lbs.
West End rail .....	120,380 lbs.

Closely following the determined wear. In elastic limit the relation is:

Soft rail .....	45,730 lbs.
Hard rail .....	62,500 lbs.
West End rail .....	53,160 lbs.

This it will be noted does not follow the rule of wear, and in this is a lesson, the indication being that having secured a given amount of hardness, and consequently of strength, that the more ductile the rail the better the wear. In the compression tests the same lesson is learned. The elastic limit of compression standing at:

Soft rail .....	35,000
Hard rail .....	50,300
West End rail .....	47,100

At a glance it would appear that the rail compressed the least would wear the longest, but where difference in compression is indicative of greater elasticity without a sacrifice of ultimate strength, it is within reason to the good.

We will deal now with chemical composition, comparing first the soft and hard rails:

As stated before the only variation in chemical composition which we need look at in this comparison is the carbon, for while there is a slight variation between the two silicons in the given rails the total percentage of silicon in either is not a factor, and can therefore be ignored. The greater durability of the hard rail as compared with the soft rail speaks for the higher carbon, and it way here be noted, that so far as the higher carbon is concerned, it involves no higher cost to the street railway men.

On comparison the carbon of the West End rail is practically the same as that of the hard rail, silicon considerably higher; but the real point of difference between the hard rail and the West End rail lies in the lower phosphorous and higher manganese. It is well known that the low phosphorous accompanied by an increasing manganese conduces to greater ductility. On this point, however, a word of caution is necessary. Any decrease of phosphorous from what is known as standard in Bessemer steel, viz: .10, can only be achieved at a greatly increased cost of manufacture, and therefore, so far as the chemical constituents of the rail are concerned, the whole problem to the street railway man is how far it is economical to go in lower phosphorous, the other hardening elements remaining the same. A steel such as represented by the West End rail, or even a steel still lower in phosphorous it is possible to make—it is purely a question of cost. On to-day's basis an extra cost of \$1.50 per ton on the low phosphorous steel is a low estimate; it would be safer to take it at \$2.00. Taking the average price of girder rails at, we will say, \$25.00, the extra cost of the low phosphorous would be 8 per cent. What would be the increased wear of the rails?

The average monthly wear of the hard rail is .0012  
The average monthly wear of the West End rail is .0007

On the face of it it would appear, therefore, that those who could afford it were amply justified in demanding and purchasing the low phosphorous steel, but there is a hope for those who cannot afford it; and there is some doubt, after all, as to the advantages to be gained from so doing, which, to my mind, brings us to the real lesson of the whole experiment. Pay close attention to what follows:

We all know that we can use a street rail until at least one-half inch is worn away from the head, or .5 in. On this basis, and taking the average wear of the different rails as shown in the test, it would take

- 25 years to wear away 1/2 in. with the soft rail;
- 35 years to wear away 1/2 in. with the hard rail;
- 60 years to wear away 1/2 in. with the West End rail;



and this is the case of a road which represents not average, but excessive wear; the rails in question having borne the wear of heavily loaded cars running on an average of 580 per hour for 20 hours per day, during the time of the experiments, or a two-minute headway. This means during the busy part of the day less than one-half minute headway, and during the night hours a wider interval. Taking the ordinary line its average headway is less than this, consequently the theoretical wear would be greater. Now all of us who are interested in electric roads, and have used girder rails are aware of the fact that we do not get anything like this wear, and this being the case we have got to look to something else besides quality of steel. I think we all know what the cause is, and I am glad to again emphasize it because it discloses a great evil we are still suffering from without realizing it to the extent we should—the defect is in the joints.

Had these measurements of wear been taken at the joints instead of elsewhere, the lesson would have been different. Rails are taken out of the track to-day, not because the rail as a whole has reached the point of destruction, but because the joints have become too bad for further use. It must be remembered that the experiments in question have not been extended long enough to show the effects upon the rail of the degeneration of the joints. On the wear at the joints reaching a certain point, the wear of the rail increases rapidly. For instance, in the soft rail the average monthly wear being .0017 during the time of this experiment, in seven of eight years from this date the wear will have continued to go on at a constantly increasing ratio, starting from the point of defect at the joint.

In the early days of girder rails the joint question was before us all. It was self-evident, in that the earlier construction was so light that the joints quickly went to pieces. During later years, using a heavier rail and larger and better fitting splice bars, we have heard less of this joint question, for as compared with the earlier joints the track is comparatively smooth. Nevertheless, the evil still exists, and a few years from now those who to-day are deluding themselves in the belief that they have a long life for their existing tracks will awake to find out that even the construction of to-day is wasteful and extravagant in this respect. The joint which is accepted now as being passably fair is reducing the life of the rail to one-half or perhaps even one-third of what it should be.

The conclusions we are led to seem to me to be as follows:

First. That for street railway use, a hard rail will give the best results.

Second. That the most economical way to secure this hardness is by increase of carbon, accepting the manufacturers standard specifications for the other ingredients.

Third. That the next step should be towards an improvement of the joints.

As is well known to all present, the writer has pinned his faith to the electric welded joint as settling the question once for all, by making the union homogeneous with the rail and possessing an advantage from an electrical standpoint in the matter of conductivity. Nevertheless the cast-welded method also demands careful consideration. It is certainly preferable to anything in the nature of splice bars that we know of, provided one glaring fault can be overcome, viz: the softening of the steel that occurs from the large body of hot cast metal located at that point, and it would appear that some means could be devised to overcome this evil.

Fourth. After making the joints perfect, what we have termed the "West End rail" would certainly justify its extra cost. As the analysis of each rail is embodied in this paper I need not here refer to it.

It is unnecessary to give the analysis applicable to each of these classes. I would caution, however, against the use of carbon as high as .59, as that was purposely taken high in what we term the "hard" rail in this experiment, the object being to reach an extreme. Carbon should be limited to from .50 to .55, with the usual leeway to cover manufacturing contingencies. It also remains a question whether the reduction of phosphorous to .08 (which may be done within economical limits of cost) will not give results so closely approximating the .05 of the West End rail as to make that figure an economical one. Whether or no, the certainty exists that so far as the steel is concerned, a rail of the following analysis should give a theoretical wear, if the joint is perfected, of from forty or fifty years, viz:

Carbon, .55.

Silicon, .10 or under.

Phosphorous, .08 or under.

Sulphur, .06 or under.

Manganese, .83 or over, not to exceed 1.00

The great lesson I would once more emphasize is that until you get the joints perfect you need not worry about the quality of your

steel; anything in the shape of steel—the very cheapest you can buy will last longer than the joints will permit you to keep your rails in the track.

## Methods of Developing New Traffic on Street Railways

BY H. MILTON KENNEDY

If the extensive railroad and steamboat transportation companies have been successful all these years in inducing people to spend dollars, how much more easily can the finely developed street railway interests of the present day encourage them to spend nickels. The establishment of a "Special Traffic" or "General Passenger" department is the first essential feature to systematically encourage the increase of traffic. The head of this department, usually known as the General Passenger Agent, is directly responsible to the General Superintendent, with whose office he is connected.

After the selection of a competent clerk, who must be familiar with the territory covered by the lines represented, and also affable and diplomatic in his treatment of callers on various missions, from the solicitor in quest of an "ad." to the society girl who chartered a parlor car for an afternoon tea, and a stenographer, the Traffic Department is ready for business.

The personal acquaintance of all city editors and local railroad reporters is the first essential move. This preliminary call should be accompanied by an explanation that the management is desirous of catering to the public by giving a more efficient service with better equipments than has ever been offered before, and that he desires their good will and assistance rather than their enmity and antagonism. This establishes congenial relations between the management and the press with the result that "news items" sent in are generally given space. This attention with the paid advertisements that are inserted from time to time cement relations that are very valuable to railroad companies. Referring again to the trunk line railroads, they find this item so important as to maintain a "press agent" and staff, at considerable cost, to handle the press. They are on the staff of the General Passenger Agent, and, of course, assist him in handling the "ads.," etc.

Now, as to new business. This is the result of special trolley party traffic, pleasure riding to resorts especially established for the purpose and the generally increased traffic of shoppers and others resulting from the introduction of modern equipment which makes a trip in the cars a pleasure. By building special buffet parlor cars, handsomely upholstered and completely equipped, and arranging open excursion cars decorated with bunting and brilliantly illuminated, it became possible to go into the excursion field formerly monopolized by the railroads and steamboats. There are churches, clubs, lodges, societies, employees of large establishments and others who annually indulge in one or more outing events. It is only a question of soliciting to get at least a large share of this. With this equipment, street railroads have a decided advantage over their competitors, inasmuch as they are able to convey special parties from their very doors to any one of a number of picnic groves or pleasure resorts, traversing a picturesque country, and without change of cars. It also permits the excursion party to pass through its own particular neighborhood. On this detail they are at times so particular as to pay \$5 per car additional trackage to run over the lines of another company, sometimes only for a few blocks to appease this sentiment. This class of traffic encourages general riding, in that persons going on special trolley trips learn the various attractive routes of the system, with the amusement places, and afterward take trips individually or in groups, that they otherwise would possibly never have thought of. The efforts expended on behalf of special cars, as parlor and illuminated, also result in increased business in the chartering of "regular" cars for special service; or it causes Sunday-school picnic parties and others to select some grove or park on one of the company's lines, but not being able to pay for the more expensive special cars, are content to charter a "regular," which transport them over their special route.

As to pleasure routes, it is essential that some form of attraction for the amusement of patrons be established at terminal points. We personally visit the owners or proprietors of all the pleasure resorts on our lines at frequent intervals, and in this way learn their plans for attracting patronage, sometimes offering suggestions for our mutual advantage, and often inducing them to put out special advertising matter. The result of this is obvious. On several occasions where large colored poster work has been done our company has contributed a portion of the cost.

In addition to the co-operative advertising just mentioned, we keep the public well informed as to where and how to go, and how to keep cool for a nickel during hot weather. Cards displayed on

the dash as well as "flyers, snipes, hangers and cut outs" and other novelties are the most effective methods. Very large posters well done are decidedly the best medium for developing new traffic. To have for the general information of the traveling public an artistic booklet that will fit the pocket, containing sketches of the most attractive trips and places, as well as all routes, transfer points, chartered car rates, etc., will be found invaluable. The "ads." will pay most of the cost.

We have been dealing largely with summer traffic. Now, referring to winter, we have the theatrical, ice skating rink club and other special interests. Traffic can be developed by co-operation with these interests, such as by card-display on fenders (for which they are willing to pay), and by having them "post" territory accessible by your lines which have been overlooked by their agents, etc. We had a strong illustration of this last winter. The business of a large ice skating rink had been lagging when we induced them to display cards in the windows of every car on the system, for which they paid us a substantial sum per month, and furnish the stock. The management said the result was beyond their most sanguine expectations, and from the verge of failure came success.

But special cars, pleasure resorts, advertising and co-operation are not the only methods for developing new traffic. Clean, ample cars, through lines and generally efficient service are requisites to satisfy those who are induced to patronize the road and hold those who are already patrons, making it such a pleasure to travel as that they would rather be on the road than at home.

### Signal System for Single Track Roads

BY H. S. COOPER

The essentials of a good signal system are:

1. It must be reasonable in cost, both of installation and maintenance.
2. It must be simple in both construction, operation and maintenance.
3. It must be almost element-proof, nothing but outside human violence or extreme and violent action of storms, floods or fire should be able to disarrange it.
4. It must be proof against ordinary tampering, whether the same be curious or malicious, it being understood, of course, that nothing human made is proof against determined intelligent violence.
5. It must be absolutely incapable of giving wrong signals from any cause not directly human and malicious.
6. It must be "positive," i. e., it must be a signal only when it operates correctly, and when, for any reason, it fails to so operate correctly, it must be unable to give any signals, and must give unmistakable evidence of the fact of its being out of order.
7. It must be capable of being used as a signal between any two points at any time.
8. It must indicate both "danger" and "safety."
9. It should be recording or registering, i. e., it should record or register (or be the means of recording or registering) any and all uses of it, and if found necessary in practice, it should also register or record any non-use of it at a time when it should be used.

Your signal system must supplement your men, not supplant them; must simplify their duties, not multiply them; must decrease their responsibilities, not increase them. It must co-operate with the running and safety rules, not supersede them. It must be an auxiliary to both men and rules, subordinate to them, for the "personal element" should always be the principal element, and the rules must be an expression of and a guidance for it. But, alas, where is the "good and reliable system?" One that fulfills all the ten conditions previously noted. It certainly is not among those that are automatic and are worked by the contact of the trolley, or of some projecting part of the car, or by the weight or impact of the car itself, or by some mechanical or electrical thing attached to the car—they will not truly fulfill a single one of the ten conditions. It certainly is not among those which either the conductor and motorman "set" as they pass it, and which give visual signals over a circumscribed portion of the lines, for I have tried them in every possible combination and condition, and they fail in the most necessary particulars. Is there then such a system? I think there is, and I am pretty certain, moreover, that it will fulfill most of the ten conditions. It is simply a telephonic dispatching system.

### The Electric Railway as an Auxiliary to Coast Defence

BY W. J. CLARK

The rapid history making of the past few months has caused the mention of certain problems, which a year ago would have

seemed ridiculous, to be worthy now of the most serious consideration. While it is unwise to bring up for discussion here ordinary matters of State and National policy, it is conceded, I think, that no matter what differences of opinion exist among us on the question of National extension and aggrandizement, there is a unanimous feeling among all Americans that this is now a Nation begun with an exceedingly large "N." and that the true policy for its future is to strengthen it in every legitimate way, by displaying American intelligence, inventive ability and commercial shrewdness in such a manner as to make it the strongest of all earth's nations in peace, so to the better preserve such relationship for all times to come.

Warlike as the title of this paper sounds, its true object is most peaceful, it being simply to advocate the adoption of a broader policy in the granting of electric railway franchises to the end of harmonizing their construction both with other electrical lines, as well as with the general steam railway system of the country, all to the end of strengthening our country in peace that she may be better prepared for war in the future, and thus avoid it.

That improved methods of transportation are equally essential to the commercial development of the country, or to its defence against outside foes, if such country is well populated, is a fact which has been conceded for so long a time as modern civilization has existed. So originality cannot be claimed for the theories which are advanced herein, but the development of the electric railway and the weakness of our seacoast, in certain essentials to defence, so forcibly brought to our attention recently, makes it fitting to call attention here to the importance of the application of the theory in its broadest way to the future development of American electric railways. In this way the marvels which have been performed unconsciously in constituting an important auxiliary to our coast defences, may hereafter be made still more valuable by following some comprehensive plan dictated either by the National Government or by the executive authority of the various States, working in close harmony to the attainment of a specific end, better adapted to ordinary commercial requirements than the present system of making the procurement of franchises dependent upon the whim of local townships and municipalities. The latter often disregard everything outside their own immediate surroundings, and restrict railway companies from making what would be a natural form of development, which, as recited, would be of the greatest importance to the Nation in guarding its coasts, should it ever be necessary to do so again.

This application of the general theory is no more original than the writer than the theory itself, for certain of the continental powers of Europe have for several years been encouraging the construction of street railways for the avowed purpose of military expediency, going so far as to grant subsidies or extraordinary concessions where the construction of the line filled in some important link in transportation facilities. The great essential insisted upon has been that in their construction such railways should conform in gage, special work and curvature with the general steam railway system of the country so that in emergencies the rolling stock of the latter could be operated over the lines of the former. This would be more especially in the case of besieged cities, to afford a means of ready transportation to all points within the line of fortifications, without breaking bulk, also to make it possible hasten to transport bodies of troops to any points within such district in the quickest possible manner.

While but little has been said concerning this policy in the public press, the work of this character which has been done about some of the European cities is astounding, and is viewed by the military authorities of such countries as being one of the most important steps ever taken in the line of defensive military operations. This being true it requires no argument to demonstrate that a broader application of this plan to our extended seacoast would be of far greater importance than the application of it to Europe, where good roads exist almost everywhere, for, as is well known, much of our seacoast does not enjoy the possession of good wagon roads. On the other hand, the electric lines already reach nearer to very important points along the coast than do the steam lines, while, especially along the seashore of Massachusetts, the electric lines could deliver, if necessary, many more troops in the interior within a given time at such points than would be possible for the steam railways.

All over the United States information is readily obtainable concerning the steam railway systems with their trackage, routes and rolling stock, as well as in their inter-connections and the possibility of temporarily increasing the facilities of any particular road by combination with others. Such was not the condition, however, as regards electric railways when, a few months ago, we were all worrying for fear that landing parties from the then supposed powerful Spanish Navy might make it temporarily uncomfortable at certain exposed points along our Atlantic seaboard, beside destroying much valuable property. It was suggested, therefore, to the writer that he obtain maps of all the existing street railway lines along the Atlantic and Gulf coasts, show their connections

and intersections with the steam roads and other street railway lines, and, so far as possible, suggest how much could be done, should military necessity require it, to cause such street railway systems to become an important auxiliary to the steam lines for rapidly moving troops and supplies to any points required along the seacoast. This work involved examination of the possibilities of making connections with the steam lines, the utilizing of such track as would be possible from its type, and the form and character of special work, so that steam rolling stock could, if necessary, be operated over the street railway lines, while the possibilities of using the current of one electric railway to help out congestion upon some other, and all such similar matters, were most carefully gone into. The work was most interesting, hurriedly though it had to be done, and, to the credit of every street railway corporation along the coast, it should be said that each and all patriotically responded to requests with the fullest information that could be desired concerning their systems, and expensive maps were furnished freely without charge. In fact, the management of certain important systems were so enthusiastic that had the War Department requested it, it is probable that many miles of new track would have been built by them without waiting to question the possibilities of its future earning power, or waiting for local franchise rights. Of course, it would not be proper for the writer now to give to the world the entire results of the investigation, but to attain a most important object, and to strengthen our electric railway systems where they are weak, it should be said that stretching along the coast from Calais, Me., to Galveston, Tex., are ninety-two distinct street railway systems, any one of which might have been an important factor in transportation for military purposes should Spain have made a demonstration against our coast. The aggregate length of these systems is about 6,897 miles, and the capacity of some of these for handling traffic to several coast points is simply astounding, it being frequently two or three times that of the steam railways which approach the same localities.

### By-products of the Power House

BY M. M. FENNER

During the year 1891 the Dunkirk & Fredonia Railroad Company changed from horse to electric motive power. The road is  $3\frac{1}{2}$  miles long, with offices and power house situated centrally in the village of Fredonia.

Its capitalization while a horse road was \$57,000; through fare 15 cents, with no debts, and paying 8 per cent dividends. During the legislative session of 1894 the company secured an amendment to its charter which empowered it to produce and sell light, heat and power to the village of Fredonia, and also the corporations and citizens residing or doing business in the said village; also to rent such of its buildings as it did not require for its own use, and supply its tenants with light, heat and power.

In 1894 the railway company began a search to increase its income and commenced an investigation of the different heating systems. Hearing enthusiastic reports from Springfield, Ill.; Cedar Rapids, Ia.; Williamsport, Wilkesbarre, Scranton and Phillipsburg, Pa., and Lockport, N. Y., our company had the heating plant put in, and also an electric light and power plant, during the summer and early autumn of 1894. The light and power additions to our plant made more exhaust steam, which, added to that from running the street railroad proper, gave a quantity sufficient for all the heat consumers we were able to get that year, during the milder heating months, like September, October and a part of November; also a part of March and all of April and May. During the remainder of the season the exhaust steam had to be reinforced from the boilers.

From a capital stock of \$57,000 in 1891 our capital has increased to \$116,200, and from the no-debt of that period we have now a bonded 5 per cent debt of \$61,000. Also, although our through fare was reduced immediately on the installation of electric power, from 15 to 10 cents, we are able to pay our fixed charges and 6 per cent on our increased capital. The almost perfect system of insulation that we use enables us to market the by-product of exhaust steam, in competition with anthracite coal, with all its cleanliness, conveniences and advantages. We sell it on a basis of \$4.17 for best anthracite coal, and our consumers think it is fine and cheap. It is usually sold on the basis of \$5 for anthracite coal. We sell by meter.

Exhaust steam is no different from any other steam of equal pressure. The most economical pressure for heating purposes is understood to be from 4 lbs. to 6 lbs. When the exhaust steam is not in sufficient supply to give that pressure, it is easy to reinforce it direct from the boilers to such a limited extent as needed.

Some of the questions we stumbled over were as follows:

1. How can we make heat at a pressure of 4 lbs. to 6 lbs. circulate long distances, and through a network of pipes in large buildings? We had the State Normal School to heat, having nearly 1,000,000 cu. ft. of space; and other large buildings. In the Normal School they had been heating at a pressure of 40 lbs. to 60 lbs. of steam by means of radiators in one part (direct radiation) and a fan driven by an engine (indirect radiation) in another part. The answer is: Condensation is all the while occurring in the pipes, diminishing space as 1750 to 1, thereby creating a vacuum which draws the steam on to fill it from atmospheric pressure.

2. How do you dispose of the water from the condensed steam? Answer: By letting it return at proper grade through the steam pipes to a cooling coil from which indirect heat is secured, the cooled water finally escaping into the sewer. Or, if the building be too small for a cooling coil to be profitably employed, then it returns to the street mains and goes from them either directly into the sewer, or passes into some heated building further down the line, and through its cooling coil to the sewer, after parting with its indirect heat. A special trap is indispensable to prevent the steam escaping to the sewer.

3. What effect will the back pressure have on your engines? Answer: No serious effect. The 6 lbs. of pressure will neutralize 6 lbs. of the 80 lbs. of steam you run at. It will then require an additional pressure of steam equal to the back pressure in the pipe line less about 1 lb.—the amount of natural air pressure. If the back pressure was suddenly removed, the effective pressure for the engine would run up a number of pounds equal to the back pressure, less the 1 lb. for the natural air back pressure.

4. How much more coal will this back pressure consume? Answer: Not much, hardly noticeable in the coal pile. I experimented in 1896. Our large hotel, a consumer during winter, wanted hot water in the summer. What would it cost? I wrote the Springfield, Ill., company for its experience. Our business in summer can be done with a 150 h.p. boiler. Springfield replied I ought to have \$75 per month, but they would rather lose customers, and had lost them, rather than keep the steam in the pipes during the summer. I had the coal weighed at 1 lb., 2 lb., 3 lb. and 4 lb. back pressure, and compared with its weight when the exhaust went into the air. At 1 lb. I found no difference; at 2 lb. I found a small difference, and at 4 lb. it costs about \$15 per month, with soft pea slack at \$1.50 per ton. That was the price I fixed. But since that year we have metered it to the hotel with other consumers, and it costs only about \$6.50 to \$8.50 per month. They need a pressure of from 1 lb. to 2 lbs. in the main, 4 lbs. occasionally. We think it a benefit to the system to keep the steam in the pipes summer and winter. There is little oil in the exhaust steam the separator does not remove, and it keeps the pipes and meters bright and clean, and the contraction and expansion are avoided. Most people like to take the chill off the air in damp summer weather, and will use the heat if the meter is left in. We take meters off after the season is over for repairs and repainting, except when consumers desire to use some steam in the summer. In those cases we leave them on.

The insulation consists of an iron pipe to circulate the steam. That is placed on rests 1 in. high within bored logs, the bore being 2 ins. greater than the pipe, so as to give 1 in. of dead air, the best insulator, all about the iron pipe, which latter is wrapped with asbestos. The log has a shell 4 ins. thick lined with tin which has been submitted to materials to prevent water soaking and decay. This again is covered with a 3-ply tarred roofing felt, and laid on a board at the bottom of a 5-ft. trench. Expansion joints, or "variators," doing away with all packed joints, are inserted at proper intervals with brick work built above them. Special protection at end joints of the logs where they fit into each other. The whole then covered with earth specially tamped down, proper tile drainage being placed beneath the structure to take away all surface water. These are substantially the elements of the insulation and construction of the system we use, being known as the Holly System of Steam Heating. While this insulation is not absolutely perfect, it is practically so, and makes it possible to circulate the steam for long distances in proper sized pipes.

We pay 3 per cent from our street railroad earnings, and 3 per cent from our steam heat earnings, upon our whole capitalization. The growth of the heating business is shown by an increase of receipts from \$2800 in 1894-5 to \$4500 in the season of 1897-8. A satisfactory number of new customers have already made application to connect with our mains for the season of 1898-9.

The heat is sold by the square foot of radiation, cubic foot of space, by meter, and at flat rates, in the various localities where it is used. We adopt and prefer the meter. We think it would be as wise to sell gas and electric light on flat rates as to sell steam heat. The amount of heating which a power plant may be able to do with its exhaust steam can be closely approximated by the following rules, viz.: That the exhaust steam from 100 h.p. engines when in use will heat 1,000,000 cu. ft. of space in average

buildings in the severest weather. This rule is believed to be substantially correct, and at the minimum rate of \$13 per 1000 cu. ft. would amount to the sum of \$3000 per year.

### Track Bonding in Brooklyn

BY R. P. BROWN AND G. E. CHAPIN

The tracks of the Brooklyn Heights Railroad system were originally bonded with the familiar supplementary wires, the section of the rail being such that it was difficult to use any other method. This wire, as well as the branches leading to the rails, was tinned so as to make good contact with the earth, and large copper plates, also tinned, were placed in the damp soil or water in the vicinity of the power house. These plates soon became corroded and coated with insulating substances, and were of practically no value in returning the return current, so return feeder wires were run out to make frequent taps to the supplementary wire. As the traffic of the road increased, the cost of this return copper became a serious matter, and when it became necessary to relay the tracks in 1895 the question of bonding received careful consideration. The rails were practically carrying no current, and it was decided that the new construction of 9-in. girder rails would increase considerably the conductivity of the return circuit provided they were properly bonded.

To take full advantage of the large amount of metal for the track, a bond of high conductivity, the shortest possible length, and low contact resistance was required. At that time no bond meeting all these conditions could be found, and one was designed by the engineers of the company. As the joints were suspended there was sufficient space between the ties for supplying bonds underneath the base of the rail, and arrangements were accordingly made to make contacts at that point. The bond decided upon was of cast copper, the full width of the base of the rail and the connection between bond and rail was obtained by surface contact, about 12 sq. ins. of surface being covered by the bond on the end of each rail. This contact came within  $\frac{3}{4}$  in. of the end of the rail, and the connecting metal was left the same size, 5 ins. wide and 1-6 in. in thickness, the bond being a trifle thicker at the point of contact. The connecting piece of metal was curved so as to allow for expansion. To secure good connection, a re-enforcing plate of cast iron was placed underneath the area of contact, and the bond pressed firmly against the rail by 2 $\frac{1}{2}$ -in. bolts passing through the base of the rail. No machine work is done on those bonds other than girdling the contact face. The scale was removed from the rail where the bond was to be applied by grinding with a portable emery wheel. This was not a very costly operation, as the rails were arranged with bases uppermost, as they were unloaded from the lighter, and no rehandling was necessary.

To prevent corrosion a shallow groove was formed around the contact space, and an attempt made to seal the bond water-tight by forcing into this groove a non-hardening pitch, heated until very fluid. Owing to the fact that the groove was necessarily very shallow, the bond plate being only 3-16 in. thick, this sealing was unsuccessful in practice, but, owing to the large area of contact, if rust had formed in the contact, it has in no way effected the conductivity, as recent tests show these bonds to be practically of the same resistance as when first installed, three years ago.

The cost of these bonds was not greater than that of the 0000 bond going completely around the fish-plate, and having two or three times the electrical resistance of this connection. The difficulty of attaching a bond underneath the base of the rail, however, was considerable, and careful supervision was necessary to have the work performed in a proper manner. This trouble led to further investigations, with the result that a bond electrically brazed to the rail was adopted the following year. This bond was somewhat cheaper than the plate bond, and good work was more easily obtained on account of the better chance of inspection. The use of such a bond had been discussed the two previous years, but was not developed on account of a doubt whether the contact could be made large enough to prevent heating when considerable current was flowing, that might give rise to thermo-electric effects between the copper and the iron.

A sample of copper brazed to steel was secured, and after careful tests it was found that the contact between copper and steel was of negligible resistance, as compared with the resistance of the copper strip. Owing to patent difficulties it was impossible to make any arrangements with the firm supplying this sample for the use of the bond that year, but a series of experiments demonstrated the possibility of doing the brazing by a process developed by the electricians of the company. There was not sufficient time to obtain special apparatus for doing this work, so the electrical current needed was taken from the railway circuit. To obtain the low voltage required the brazing apparatus was connected in

series with a generator between the circuit breaker and the negative bus of the station. The voltage of this dynamo was raised high enough to overcome the added resistance, and the generator run in multiple with the others in the power station. Several brazing contacts were in series, so that the resistance could be kept as uniform as possible, and, owing to the large output of the stations, the variation in the load was slight, and very little was given the regulation of the dynamos used in the welding circuit. Transformers have since been obtained for doing this work, and the brazed bond has been adopted as the standard on all the heavy lines of the system. As no portable brazing apparatus had been obtained, the bond is made in two parts, and brazed on the rail before they are removed from the yard.

The shape of the bond depends on whether it is placed on the web of the rail, so as to come underneath the fish-plate, or, as they are now applied, on the base and upper flange of the rail, outside of the joint plate. All forms of the bond, however, are made up of ten or twelve leaves of 1-64-in. soft copper, the carrying portion of the bond being 1 $\frac{3}{4}$  ins. wide, and the brazed contact having an area of about 1 sq. in. Soft spelter, with suitable flux, is used in brazing the copper to the steel rail. The bond is divided longitudinally into three parts, so as to give greater flexibility. When the rails are in position the ends of these bond leaves are interlaced and fastened together by rivets and also by solder. The length of the bond between center of contacts is 5 ms., and its cross section is equal to 350,000 c.m.

All the brazing of the several thousand bonds now installed has been done with a makeshift device, employing processes developed entirely by the electricians of the company. License under the patents of General Payne, of Elmira, and the Thomson Welding Company has been obtained to guard against any claim of infringement.

On account of the great number of miles of track that are rapidly being relaid it was found to be impossible to braze bonds for all the rails with the inadequate means at hand, so the lighter lines have been bonded with the short bonds of the "horseshoe" type placed underneath the fish-plates. The holes for these bonds are drilled by the makers of the rail, and they are reamed out with emery paper to remove the rust that may have formed during shipment. If care is used in compressing the terminal of those bonds there is no necessity for drilling or reaming of holes on the ground, as any slight irregularity in the drilling fills up when the soft copper is thoroughly upset. The horseshoe bonds are 3 $\frac{1}{4}$  ins. in length of No. 0000 cross-section, and have  $\frac{3}{4}$ -in. diameter terminals. As a measure of safety, as well as to lower the resistance of the joints, all rails are double bonded, whether the brazed or horseshoe bonds are used.

Curved rail, switches and other special work are often difficult to bond satisfactorily in the yard, and the joint plates are of such section that the bond cannot be placed underneath. In such work long bonds going around the fish-plates are used. On account of the excessive wear on special work the joints are particularly liable to loosen, so that the bond must be extremely flexible.

The No. 0000 bonds are used on this work, and to keep the conductivity the same as the street rail both sides of the special work are cross bonded and the circuit re-enforced by running 500,000 c.m. wires joining these cross connections, the number of wires used depending on the current density of the track in each section. The straight track is cross connected every 750 ft. These cross connections are made of 500,000 c.m. wire fastened to the rail with a terminal for the contact similar to that of the plate bond mentioned before. These terminals have about 6 sq. ins. of contact, and are soldered to the rail. The terminals have a cast iron re-enforcement, and are bolted to the web of the rail, so that no mechanical strain can come on the soldered joints. This same terminal is used to connect the return wires in the track adjacent to the power house to the negative bus.

It has been found that if a simple bond is used it should be placed at the center of the web of the rail if sufficient contact can be obtained at that point. If contact is made at either the base or upper flange the length of the circuit is increased by the height of the rail, and in case of the 9-in. girder the increased resistance is equal to a half of the total resistance of the bond itself. On account of the greater depth of metal it would seem advisable when two bonds are used to apply one on the top of the upper flange of the rail and the other on the base. Solid joints are very apt to break if the joint plates become loosened to any extent, and are consequently never used on special work. Contrary to the former practice of tinning the bonds and supplementary wire, the bonds and their exposed copper surface are carefully coated with an insulating paint, so that if there is any flow of the current of the track to the surrounding soil it must leave from the steel, and not from the copper. This prevents the bonds being destroyed by electrolysis or other corrosive action.

The Falk cast welded joints make the best possible electrical

connection, and if care is used in the installation, conductivity almost equal to the continuous rail can be obtained. The new electrically welded rail joint made by the Johnson Electric Company promises to be equally good.

To guard against imperfect workmanship a system of testing bonds has been practiced. Usually only the joints on one line of rail are tested, though in sections of high current density, as in the vicinity of power houses, the resistance of each joint is obtained. The test is simple comparison of the fall of potential across the joint and on a measured portion of an unbroken rail. Two Weston millivolt meters, with scales ranging from .001 to .3 of a volt, are used, the readings being taken simultaneously. Contact is obtained by pressing hardened steel points on the surface of the rails. These points are set in wooden blocks and placed 6 ins. apart if used on the joints, and 2 ft. apart for test on solid rail. The distance on the rail is taken for 2 ft., instead of 1 ft., on account of the small amount of current flow in the rail on some of the lighter lines. These testing terminals are provided with handles of convenient length, so that the person using them can stand upright and apply the necessary pressure with one foot. Two men can test joints very rapidly with this outfit. The current density of some of the rails was too low to give reliable readings with these instruments, so a portable resistance was arranged on a wagon and the necessary current readily obtained from the trolley wire. This resistance allowed about 300 amps. to flow from the line to the rail, and as it could be very quickly applied, rendered it a comparatively easy matter to test the joints in any section of the city.

Although the bonds are less than 6 ins., that length selected for the distance between terminals of the volt meter used in testing joints, because it gives a convenient fraction to subtract from the length of each rail in arriving at the total resistance in line of track. The drop of these 6 ins. was considered as increasing the length of the rail by an amount proportionate to the drop in the rail itself. From this percentage that the rail of any line approached the conductivity of the solid steel rail could be easily determined.

The following results were obtained from different joints:

Drop.		FALK JOINT.		Per Cent of Conductivity.
1' of rail.	1' of joint.	(30' rail).....	(60' rail).....	
.00215	.00355	.....	.....	98
				99
DOUBLE BRAZED BOND				
1' of rail.	1' of joint.	(30' rail).....	(60' rail).....	
.00725	.00758	.....	.....	99.8
				99.9
JOHNSON BOND				
2' of rail.	6" of joint.	(30' rail).....	(60' rail).....	
.00364	.00342	.....	.....	95.6
				97.8
PLATE BOND				
2' of rail.	6" of joint.	(30' rail).....	(60' rail).....	
.0109	.0233	.....	.....	89
				94

It will be seen by the foregoing that it is a comparatively easy matter to get a conductivity of over 90 per cent of a continuous steel rail. As high as 600 amps. can be safely carried on any of the bonds mentioned, and the cost of double bonding in a satisfactory manner should not exceed 75 cents per joint. The conductivity of steel varies with the amount of carbon in its composition, but, generally speaking, it is about one-eighth of the conductivity of commercial copper. Bearing these facts in mind it will be readily seen that it is much cheaper to make the return circuit wholly of well bonded steel rails, supplementing the track in the vicinity of the power house with worn out rails carefully bonded.

### Individual Fare Boxes

BY T. J. NICHOLL

For many months before I made the attempt to introduce the fare box on the Rochester Railway I had watched with great interest the methods in use in Canada, England, and some cities of the United States, where various fare boxes are used, and after careful investigation, not only of the system, but also the box or receptacle, I finally made up my mind that the box used on the Toronto Railway was probably the best, as it seemed to be a well made and ingenious device, the outcome of years of experience. The slot in which the money was to be dropped, was so arranged that the coin or ticket once entered, no matter how short a distance, could not be withdrawn, thus avoiding any sleight-of-hand work on the part of the passenger. The coin or a ticket dropped on a shelf or table that was easily and quickly seen by the conductor, and, best of all, when the coin or ticket was tripped into the final receptacle it was utterly impossible for it to be extracted

without breaking the box. In fact, I could not see that a fare box could be more perfect, unless it might be made to register the number of times the table or shelf catching the money was tripped, which would be of very little value.

Having my mind made as to the kind of box that I would use, and still believing most firmly that by its use we could—first, collect more of our revenue than we did by allowing our conductors to handle it; and, second, that they would be relieved of a very large portion of their clerical work, I introduced the same on the cars of two of our best lines June 29, 1898. I first had these boxes turned into the office at the end of each trip, and caused the conductor to ring up his cash fare and transfer registers, the same as usual (we use two registers), turning in his transfers each trip with the box, and giving the last number of each register. This I soon found required too large a clerical force in the office, and accordingly lengthened the time out so as to take in the entire running time of each conductor; that is, they took their boxes at the beginning of their run, and kept them until they came off duty, but each trip turned transfer tickets into the office with register readings, etc.

During the time of trial—first, the receipts of both lines were very closely scrutinized and compared with like weeks and days of the years before and with similar seasons, considering weather, etc., and little or no appreciable increase in the receipts could be discovered, showing that our conductors were apparently dealing squarely with us, or had some other ways of beating us; second, we found that in crowded cars, for short distances especially, it was impossible to collect all of the fares, as the conductor was obliged to make change, and the people seemed desirous of causing delay purposely, in many cases putting five pennies into the boxes (which took just exactly as long as collecting five fares in the usual way), and generally required change, much more than usual. The operation was often as follows: The conductor would demand fare, the party would hand him 25 cents, 50 cents or a dollar bill for change; the conductor would make change and hand same back to passenger, who would count it once or twice, in some cases putting it into his pocket without dropping the fare into the box; the conductor would call the attention of passenger to this fact, and an argument would be the result, all of which, you will understand, would take much more time than simply making change by the conductor. Of course, the party would generally put fare in box; this is only one instance of many. Third, the box had to be carried by the conductor, either in his hand or under his arm, as they did not like to carry it on a strap, and this was the cause of several trifling accidents, such as dropping the box on people's knees, shoulders and feet, causing no little trouble in this way. Fourth, notwithstanding the fact that we provide hooks for the purpose of hanging the boxes up out of the way, inside the car, we found it frequently the case that on account of having the box in his hand the conductor failed to catch the trolley when it jumped the wire, in time to save it from striking guy wires, etc. Fifth, it was discovered that if the conductor desired to be dishonest he could be so just as well with the box as without it, in a crowded car, and the people encouraged it by assistance very often. Sixth, we found our patrons disliked the use of the box very much, and would insist upon not putting their fares into it, throwing them on the seat and floor or handing them to the conductor to put in the box, all of which occurrences caused trouble and annoyance, but this antipathy, I believe, would soon wear off when people became accustomed to them.

Summing it up, I find that the objections to the individual fare box are very much in the majority, the two things in its favor being—first, the saving of labor by conductor in having no reports to make out except the report of register readings, allowing him more time to the attention of his passengers; and, second, whatever was dropped into the box, be it buttons, dead nickels or bad money, belonged to the company, and no opportunity is given to the conductor to distribute the company's revenue according to his own ideas. Both of these are of great importance, but not sufficiently so, in my opinion, to overcome the objections previously stated, and therefore the use of the fare box has been abandoned by this company after its employment for the neighborhood of six weeks, during which time the men, as well as the officials, gave it a most fair trial.

While it would seem, from the above, that the individual fare box is not practical in operation in a street railway doing a large business, at the same time I am convinced that it would be a most excellent device for the use of lines with a light traffic, and would undoubtedly give them almost their entire revenue with very little expense for inspection, etc., which can hardly be afforded by such lines.

People have said to me that our citizens were too dishonest to admit of the system being a success in the United States. I don't believe one word of this, and have not the slightest doubt that we could use it on the entire Rochester Railway without trouble, if

we so desired, as it really is no reflection upon the honesty of the men; on the contrary, to an honest man it removes all possibility of suspicion. I am also equally certain that our men are as honest as can be found anywhere, and that in Toronto, Montreal or elsewhere where boxes are used, more fares are missed than would be stolen.

The "Springfield Republican" has wisely said: "Thus we are brought back to the necessity of recognizing that the honesty of the conductor must be to some extent presumed and relied upon. This is a factor which cannot possibly be entirely eliminated from the conduct of any corporation or business. Inspectors may be employed to watch, but who is to watch the inspector? And the wise corporation manager, who is acquainted with human nature, knows that a man's honesty is never improved by proceeding on the assumption that he is dishonest. The more effective way would seem to be to give the conductor a fair wage, reasonable hours and good treatment generally, and place him on his honor as a man to deal honestly in return."

### Track Construction in Brooklyn

BY D. F. CARVER

The essential feature of good track construction and good pavement is a good foundation. In a majority of cases this exists naturally at the depth at which ties are laid. If the natural foundation is not suitable it can be made so by the use of broken stone or gravel. The ties should be of the best quality of yellow pine ties, sawed four sides, and of a size sufficient to give a bearing on foundation of not less than  $4\frac{1}{2}$  sq. ft. per tie. A very excellent and economical spacing has been found to be twenty-four ties to a 60-ft. rail. All ties should be thoroughly tamped near the rail, and the joint ties tamped throughout their lengths. The dirt

which avails of the bearing surface beneath the head and tram and beneath the base, and of the upper surface of the base of the rails which it connects. Either joint, to be entirely successful, however, must be laid with tight joints, so that passing wheels will have a continuous bearing.

This method of construction will, in time, force the track out of line, and where the line is curved to any extent will push the curve out of line, and also in renewing any position of the track in warm weather it will be found almost invariably impossible to put in new pieces of the same size as the old removed, because the great compression strain closes up the opening. Still, with all these objections, the added length of life of joints gained is of decided advantage.

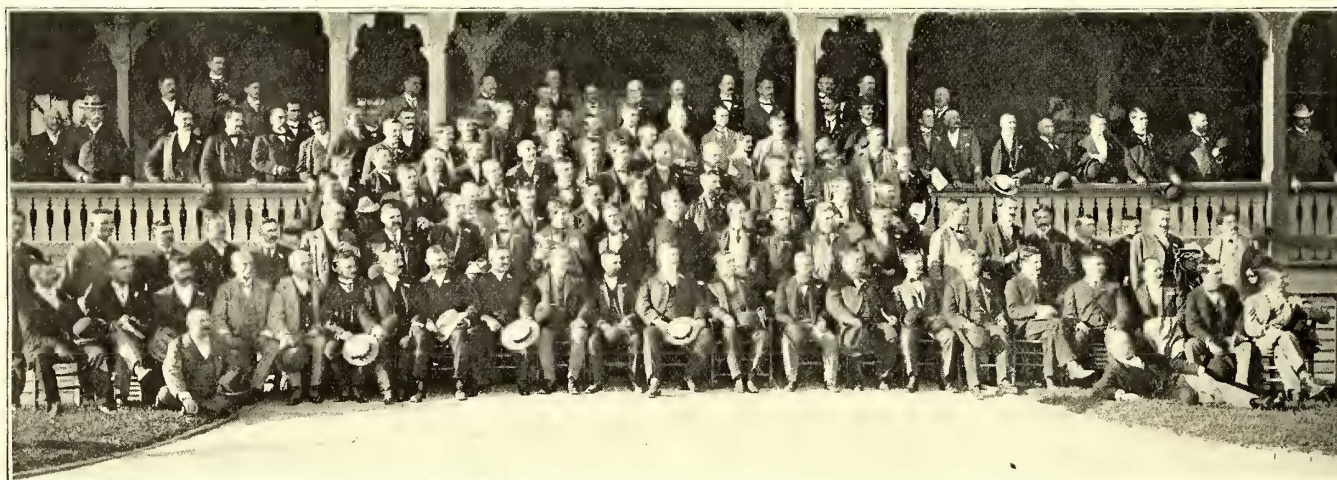
With the girder rail sections in block paved streets it is absolutely necessary to use a rail filler. We have experimented with the burnt brick, which was found to crumble badly under heavy wagon traffic, and it has been abandoned. In its place is used hemlock planks, which give the best results on the investment.

In paving up the street, the portions outside the outside rail and between the tracks should be paved and thoroughly rammed before the sections between the rails are paved. This prevents the crowning of the stones between rails from forcing the track out of gage.

A bed of concrete between ties has been tried to prevent the paving blocks from sinking, but such experience as the writer has had with this construction has not been very satisfactory, and, as its first cost is great, and also as the interest on this extra investment is, in many cases, greatly in excess of the maintenance charges, which it is intended to prevent, he is led to doubt very greatly its utility.

### Electric Development in Cuba and Porto Rico

The American Indies Company was formed in Trenton, N. J., on Sept. 6, for the purpose of developing the vast resources of



DELEGATES AND VISITORS AT THE NEW YORK STATE CONVENTION

under the base of the rail should also be thoroughly tamped, otherwise there will be a settlement which will allow the rail stones to be forced down.

The rail used should be of hard steel, and of a section that will give it great stiffness. The tread should be either level, or, as is becoming common practice, should bevel, so that the wheels will have a bearing for the width of the tread. This latter arrangement gives greater contact for traction and stoppages, and also causes less damage to wheels that are skidded in an emergency stop. The web of the wheel should be as nearly as possible beneath the center of the tread, so that the resultant of the forces of weight and lateral motion of the wheel shall fall within the width of the base.

As the lightest section of 9-in. rail is more than amply strong to stand the strain of carriage, provided, of course, that every tie has a first-class bearing, it has been found desirable to roll the web down to the thinnest section possible, and accept the small losses due to rails splitting along the web from the tension caused by the very unequal distribution of metal. The breakage above referred to has been found to be, throughout a year's work, about 0.25 per cent rail laid.

The problem of the joint rail has been a very trying one, but it is fast approaching a successful and satisfactory solution, the essential features of which are either a welded joint, which makes a rail practically one continuous mass, or the mechanical joint,

Cuba and Porto Rico. Its charter is an exceedingly broad one, covering the power to generate, accumulate, distribute and supply electricity for light, heat, power and signaling purposes; to construct, own and operate plants for the conveyance of electrical current for telegraph, telephone and other purposes; to construct, own and operate telephone exchanges; to manufacture and supply gas for fuel and illuminating purposes; to light cities, buildings and places, both public and private, by gas and electricity; to acquire, own and manage real estate, timber, mineral and oil properties and rights, and to carry on the business of mining, smelting, refining and coke manufacturing.

The capital stock of the new company is \$18,000,000, and its incorporators include some of the strongest capitalists of New York and Philadelphia, among them being Thomas Dolan, P. A. B. Widener, W. L. Elkins, Thomas F. Ryan, Frederic P. Olcott, Anthony N. Brady, R. A. C. Smith, Henry D. MacDona, J. M. Ceballos, Guillermo de Zaldo, H. P. Booth and H. G. Runkle.

It is understood that the incorporators will contribute all necessary capital, and that there will be no public subscription.

The La Societe International d' Exploitation Electriques has been formed in Brussels, Belgium, with a capital of \$2,000,000, to undertake all kinds of electrical developments. It is understood that many electrical companies in this country will be asked to quote prices on the requirements which the company will need,

# AT THE BOSTON CONVENTION

## Representatives of Street Railway Companies

- Allentown, Pa.—A. F. Walter, Sec. and Treas., and Jilson J. Coleman, Director, Allentown & Lehigh Valley Traction Co.
- Alton, Ill.—J. F. Porter, Pres., and H. H. Harrison, Elec., Alton Ry. & Illuminating Co.
- Amherst, Mass.—D. N. Wheelock, Amherst & Sunderland St. Ry.
- Amsterdam, N. Y.—E. F. Seixas, Supt. Amsterdam St. R.R. Co.
- Athol, Mass.—W. D. Smith, Gen. Man., and A. P. Granger, Elec., Athol & Orange St. Ry.
- Asbury Park, N. J.—S. F. Hazclrigg, Man., Atlantic Coast Elec. R.R.
- Atlanta, Ga.—E. Woodruff, Pres.; J. Carroll Payne, V.-Pres.; Thomas Elliott, Chief Eng., and N. W. L. Brown, Elec., Atlanta Consolidated St. Ry. Co.
- Baltimore, Md.—P. O. Neilholtz, Elec. Eng.; J. M. Christopher, Mast. Mech., and D. E. Evans, Baltimore Consolidated Ry. Co.
- Baltimore, Md.—F. L. Hart, Gen. Man. Baltimore City Pass. Ry. Co.
- Bangor, Maine.—Jas. H. Green, Supt., Bangor, Hampden & Winterport Ry.
- Bangor, Maine.—W. H. Snow, Supt., and C. H. Sanborn, Bangor St. Ry.
- Battle Creek, Mich.—L. N. Downs, Pres.; E. Hope Norton, V.-Pres.; Dee Allen, Sec., and Fred I. Griswold, Gen. Man., Michigan Traction Co.
- Bay City, Mich.—W. R. Morrison, Asst. Gen. Man., and R. S. Ashe, Supt., Bay Cities Consolidated St. Ry. Co.
- Binghamton, N. Y.—G. Tracy Rogers, Pres.; J. P. E. Clark, Man., Binghamton R.R. Co.
- Boston, Mass.—William A. Bancroft, V.-Pres.; Charles S. Sergeant, 2d V.-Pres.; R. H. Derrah, Executive Clerk; J. H. Goodspeed, Comptroller; J. E. Rugg, Supt. of Transportation; John Balch, Engineering Dept.; Charles H. Bigelow, Engineering Dept., and Edwin W. Creed, Boston Elevated Ry. Co.
- Boston, Mass.—L. D. Alb, Treas.; M. R. Wendell, and C. H. Martin, Commonwealth Ave. St. Ry.
- Braintree, Mass.—John F. Merrill, Pres., Braintree St. Ry. Co.
- Bridgeport, Conn.—Andrew Radel, Pres., and George H. Sanford, Counsel, Bridgeport Traction Co.
- Brockton, Mass.—Horace B. Rogers, Gen. Man.; John P. Morse, Director; H. E. Reynolds, and A. L. McDonald, Brockton St. Ry. Co.
- Brockton, Mass.—A. C. Ralph, Supt.; A. B. Williams, and P. W. Sprague, Brockton, Bridgewater & Taunton St. Ry. Co.
- Brooklyn, N. Y.—Clinton L. Rossiter, Pres.; Ira A. McCormack, Gen. Supt.; J. H. Vander Veer, Supt. Motor Dept., and W. W. Wicks, Brooklyn Heights R.R. Co.
- Brooklyn, N. Y.—M. W. Conway, Contractor, Brooklyn City & Newtown R.R. Co.
- Brooklyn, N. Y.—Albert L. Johnson, Pres.; Wm. F. Ham, Sec., and Frank S. Drake, Gen. Supt., Nassau R.R. Co.
- Buffalo, N. Y.—George Chambers, Supt. Buffalo Traction Co.
- Buffalo, N. Y.—Robert Dunning, Mast. Mech., and R. E. Danforth, Supt., Buffalo Ry. Co.
- Butte, Mont.—Jesse R. Wharton, Butte Consolidated Ry. Co.
- Camden, N. J.—G. G. Browning, Treas., and Walter E. Harrington, Gen. Man., Camden & Suburban Ry. Co.
- Carbondale, Pa.—C. E. Flynn, Gen. Man., Carbondale Traction Co.
- Catskill, N. Y.—Louis E. Robert, Catskill Elec. Ry. Co.
- Charleston, S. C.—F. D. McEowen, Sec. and Treas.; T. W. Passailaigie, Gen. Supt., and A. S. Bayer, Director, Charleston City Ry. Co.
- Chicago, Ill.—John Farson, Pres., and H. M. Sloan, Gen. Man., Calumet Elec. Ry. Co.
- Chicago, Ill.—George A. Yuille, Asst. Gen. Man., and W. Frank Carr, Eng., West Chicago St. R.R. Co.
- Chicago, Ill.—T. C. Pennington, Treas.; Frank R. Greene, Sec.; G. W. Knox, Elec. Eng.; C. J. Reilly, Chief Eng.; A. C. Heidelberg, Asst. Supt.; Charles E. Moore, Mast. Mech.; Walter V. Pennington, Clerk; J. J. O'Keefe, C. L. Compton, and G. O. Nagle, Chicago City Ry. Co.
- Chicago, Ill.—John M. Roach, 2d V.-Pres. and Man.; James R. Chapman, Man. Elec. Dept., and John Millar, Mast. Mech., North Chicago St. R.R. Co.
- Cincinnati, Ohio.—Bert L. Kilgour, Elec., Cincinnati St. Ry. Co.
- Cleveland, Ohio.—John Ehrhart, Asst. Sec., Cleveland City Ry. Co.
- Cleveland, Ohio.—H. J. Davies, Asst. Sec. and Treas., and W. G. McDole, Auditor, Cleveland Elec. Ry. Co.
- Colorado Springs, Col.—A. L. Lawton, Gen. Man., Colorado Springs Rapid Transit Ry. Co.
- Columbus, Ohio.—W. F. Kelly, Gen. Supt., and P. V. Burington, Auditor, Columbus St. Ry. Co.
- Cottage City, Mass.—Fred Nichols, Treas.; John A. Dugan, Man., and E. H. Kitfield, Cottage City St. Ry. Co.
- Cornwall, Ont.—D. A. Starr, Pres., Cornwall Elec. St. Ry. Co.
- Council Bluffs, Ia.—W. S. Dimmock, Gen. Supt., Omaha & Council Bluffs Ry. & Bridge Co.
- Dayton, Ohio.—George B. Kerper, Gen. Man.; George B. Kerper, Jr., Asst. Gen. Man., People's Ry. Co.
- Derby, Conn.—H. Holton Wood, Pres.; B. W. Porter, Gen. Man., and W. J. Clark, Derby St. Ry. Co.
- Dubuque, Ia.—H. G. Torbert, Gen. Man., Dubuque Light & Traction Co.
- Easton, Pa.—Charles F. Roberts, Easton Transit Co.
- Elmira, N. Y.—J. B. Cahoon, Gen. Man., Elmira & Horsheads Ry. Co.
- Exeter, N. H.—C. L. Cotton and A. E. MacReel, Exeter St. Ry.
- Fall River, Mass.—Robert H. Goff, Pres. and Man.; H. H. Reed, Treas.; J. H. Bowker, Supt., and G. W. Palmer, Jr., Elec. Eng., Globe St. Ry. Co.
- Findlay, Ohio.—Charles D. Kinney, Treas., and Charles F. Smith, Supt., Findlay St. Ry. Co.
- Fitchburg, Mass.—H. G. Lowe, Treas., Fitchburg & Suburban Ry. Co.
- Fitchburg, Mass.—W. W. Sargent, Supt., and W. J. Beane, Fitchburg & Leominster St. Ry. Co.
- Framingham, Mass.—J. J. Hennessy, Supt., Framingham Union St. R.R.
- Galveston, Tex.—F. W. Fratt, Supt. and Eng., Galveston City R.R. Co.
- Girardville, Pa.—E. W. Ash, Gen. Man., and C. A. Bragg, Director, Schuylkill Traction Co.
- Gloucester, Mass.—W. B. Ferguson, Pres., and H. E. Reed, Supt., Gloucester St. Ry. Co.
- Halifax, N. S.—Fred A. Huntress, Man., Halifax Elec. Tramway Co.
- Hanover, Mass.—Chas. H. Killam, Hanover St. Ry. Co.
- Hamilton, Ont.—V. H. Waggoner, Elec. and Mech. Eng., and J. F. Little, Hamilton St. Ry. Co.
- Harrisburg, Pa.—F. B. Musser, Supt.; Mason D. Pratt, Eng., Harrisburg Traction Co.
- Hartford, Conn.—E. S. Goodrich, Pres.; Elmer M. White, Cashier, Hartford St. Ry. Co.
- Hartford, Conn.—J. W. Haynes, Sec. and Supt., Hartford, Manchester & Rockville Tramway Co.
- Hazleton, Pa.—A. Markle, Gen. Man., and G. W. Thompson, Supt., Lehigh Traction Co.
- Hingham, Mass.—George W. Semple and Gardner F. Wells, Hingham St. Ry. Co.
- Hoboken, N. J.—G. T. Lister, Auditor, and W. S. Hall, Supt., North Hudson County Ry. Co.
- Holyoke, Mass.—Wm. S. Loomis, Pres., Holyoke St. Ry.
- Houston, Tex.—A. H. Parlin, Pres., and Newton Jackson, Adjuster, Houston Elec. St. Ry. Co.
- Hyde Park, Mass.—R. D. Colburn, Norfolk Suburban St. Ry.
- Indianapolis, Ind.—Miller Elliott, Supt., Citizens' St. R.R. Co.

- Jersey City, N. J.—Charles Y. Flanders, Director, and Ralph H. Beach, Director, Consolidated Traction Co.
- Johnstown, Pa.—H. C. Evans, Director, Johnstown Pass. Ry. Co.
- Kalamazoo, Mich.—L. N. Downs, Pres.; Dee Allen, Sec., and F. N. Rowley, Treas., Michigan Traction Co.
- Kansas City, Mo.—Charles F. Morse, Pres., and W. H. Holmes, V.-Pres. and Gen. Man., Metropolitan St. Ry. Co.
- Kingston, N. Y.—C. T. Reed, Supt., Colonial City Traction Co.
- Lancaster, Pa.—F. S. Given, Pennsylvania Traction Co.
- Lansing, Mich.—L. N. Downs, Pres., and Lawrence Barrett, Treas., Lansing City Elec. Ry. Co.
- Lawrence, Mass.—Alfred A. Glasier, V.-Pres.; N. E. Norton, Supt., Lawrence Division, and Franklin Woodman, Supt., Haverhill Division, Lowell, Lawrence & Haverhill St. Ry. Co.
- Leominster, Mass.—Edward T. Bates, Foreman; Geo. H. Burgess, and C. E. Barnes, Leominster & Clinton St. Rys.
- Little Rock, Ark.—J. W. Waterman, Little Rock Traction & Elec. Co.
- London, Ont.—C. E. A. Carr, Gen. Man., London St. Ry. Co.
- Long Island City, N. Y.—J. R. Beetem, V.-Pres., New York & Queens County Ry. Co.
- Lowell, Mass.—P. F. Sullivan, Man.; Percy Parker, Treas.; M. M. Nash, Andrew Moffatt, Wm. H. McCaren, M. E. Donnel, and A. M. Day, Lowell & Suburban Ry. Co.
- Lynchburg, Mass.—H. P. Woodson, Lynchburg & Rivermont St. Ry.
- Lynn, Mass.—C. M. Wicker (Pres. North Shore Traction Co.), Amos F. Breed, Pres.; E. C. Foster, Gen. Man.; H. C. Page, Supt., Salem Division; William Pestell, Elec.; M. Hooper, Elec. Eng.; H. E. Farrington, Lynn & Boston R.R. Co.
- Manchester, N. H.—J. Brodie Smith, Newport & Fall River St. Ry.
- Manchester, N. H.—E. P. Shaw, Jr., Gen. Man., and N. H. Walker, Supt., Manchester St. Ry. Co.
- Mansfield, Mass.—H. W. Smith, Mansfield & Norton St. Ry. Co.
- Mansfield, Mass.—Chas. E. Bibber, Mansfield & Easton St. Ry. Co.
- Marlboro, Mass.—A. H. Fitch, Marlboro St. Ry. Co.
- Macon, Ga.—E. E. Winters, Supt., Consolidated St. Ry. Co.
- Memphis, Tenn.—F. G. Jones, V.-Pres. and Gen. Man., and C. A. Ruddock, Director, Memphis St. Ry. Co.
- Meriden, Conn.—N. H. Heft, Pres.; G. Stanley Heft, Elec. Eng.; Charles P. Clark, John Henney, S. M.; William Appellard, M. C.; J. Smith, Mast. Mech.; John F. Vaughan, Elec. Eng.; Dr. F. B. Devons and E. C. Boynton, Meriden Elec. R.R. Co.
- Mexico, Mexico.—Arthur S. Partridge, Eng. Compania de Ferrocarriles del Distrito Federal de Mexico.
- Middletown, N. Y.—William A. Grafton, Middletown-Goshen Traction Co.
- Milford, Mass.—C. W. Shipper, W. S. Reed, H. E. Bullard, A. & W. Ry.
- Milford, Mass.—W. B. Ferguson, Pres., G. A. Butman, Sec. and Treas., and Washington E. Benedict, Milford, Holliston & Framingham St. Ry. Co.
- Milwaukee, Wis.—Henry C. Payne, V.-Pres.; John I. Beggs, Gen. Man.; T. E. Mitten, Gen. Supt., Railway Dept.; H. C. Mackay, Comptroller and Auditor, and E. W. Olds, Supt. of Rolling Stock, Milwaukee Elec. Ry. & Light Co.
- Minneapolis, Minn.—J. F. Calderwood, Sec., Twin City Rapid Transit Co.
- Mobile, Ala.—J. H. Wilson, Pres. and Man., Mobile Light & R.R. Co.
- Muskegon, Mich.—Fred W. Thompson, Supt., Muskegon St. Ry. Co.
- Nashville, Tenn.—E. G. Connette, Gen. Man., and George Swint, Gen. Supt., Nashville St. Ry. Co.
- Nashville, Tenn.—T. O. Price, Sec., Citizens' Rapid Transit Co.
- Natick, Mass.—Geo. F. Keep, Supt., and F. P. Quackenbush, Natick & Cochituate St. Ry. Co.
- Natick, Mass.—W. B. Ferguson, Pres.; J. W. Sullivan, Supt., South Middlesex St. Ry. Co.
- New Bedford, Mass.—E. E. Potter, Gen. Supt.; A. C. Gardiner, Treas.; I. W. Phelps, Claim Agent, and Clarence A. Cook, Union St. Ry. Co.
- New Britain, Conn.—Lincoln S. Risley, Clerk, Central Ry. & Elec. Co.
- New Brunswick, N. J.—Edward H. Radel, Gen. Man., and R. L. Rand, Supt., Brunswick Traction Co.
- New Haven, Conn.—I. A. Kelsey, Gen. Man., and A. E. Pond, Supt., Winchester Ave. R.R. Co.
- New York, N. Y.—H. H. Vreeland, Pres., Metropolitan St. Ry. Co.
- New Haven, Conn.—L. Candee, Sec. and Treas., Fair Haven & Westville R.R. Co.
- New Orleans, La.—C. Densmore Wyman, Gen. Man., New Orleans Traction Co.
- Newark, N. J.—W. H. Adams, Asst. Elec. Eng., Newark & South Orange Ry. Co.
- Newburyport, Mass.—Charles Odell, Pres., and W. P. Clark, Director, Newburyport & Amesbury St. R.R. Co.
- Newport, N. H.—R. H. Fillmore, Jr., Supt., Newport & Fall River St. Ry.
- Newton, Mass.—Winthrop Coffin, Pres., Newton St. Ry.
- Niagara Falls, N. Y.—C. K. Marshall, Supt., Buffalo & Niagara Falls Elec. Ry.
- North Adams, Mass.—C. L. Richmond, Pres., Hoosac Valley St. Ry. Co.
- Norfolk, Mass.—Francis Doane, Norfolk Central St. Ry. Co.
- Norfolk, Mass.—Edward F. Draper, Norfolk Suburban St. Ry.
- Northampton, Mass.—E. C. Clark, Northampton St. Ry. Co.
- Norfolk, Va.—R. Lancaster Williams, Pres.; J. H. Hegarty, Gen. Supt., Norfolk St. R.R. Co.
- Norristown, Pa.—R. M. Douglass, Gen. Man., Schuylkill Valley Traction Co.
- North Tonawanda, N. Y.—W. Caryl Ely, Pres., Niagara Falls & Buffalo Elec. Ry. Co.
- Norwalk, Conn.—William P. Acton, Gen. Man., and A. B. Hill, Eng., Norwalk St. Ry. Co.
- Norway, Maine.—F. B. Lee, Gen. Man., Norway & Paris St. Ry. Co.
- Norwich, Conn.—W. A. Tucker, Pres.; W. L. Adams, and P. L. Saltonstall, Norwich St. Ry. Co.
- Omaha, Neb.—D. H. Goodrich, Sec., Omaha St. Ry. Co.
- Orange, N. J.—Watson Whittlesey, Suburban Traction Co.
- Ottawa, Ont.—H. R. Oliver, Ottawa St. Ry. Co.
- Palmer, Mass.—Chas. S. Grosvenor, C. D. Shephard, Palmer & Monson St. Ry. Co.
- Paterson, N. J.—Wm. Barbour, V.-Pres., Paterson Ry. Co.
- Peoria, Ill.—M. C. Draper, Elec., Central Ry. Co.
- Philadelphia, Pa.—Albert Layton Register, Fairmount Park Transportation Co.
- Philadelphia, Pa.—J. C. Lugar, Gen. Man.; W. H. Janney, Supt., and John A. Brill, Director, Roxborough, Chestnut Hill & Norristown Ry. Co.
- Pittsburgh, Pa.—J. G. Carroll, Foreman, United Traction Co.
- Pittsburgh, Pa.—Geo. W. Saxton, Pittsburgh & Birmingham Traction Co.
- Pittsfield, Mass.—P. H. Dolan, Pittsfield Elec. St. Ry.
- Plymouth, Mass.—B. F. Sherburne, Supt., and Charles Litchfield, Plymouth & Kingston St. Ry. Co.
- Port Chester, N. Y.—N. H. Heft, Elec. Eng., and W. J. Clark, Director, Port Chester Elec. Ry. Co.
- Port Huron, Mich.—William Canahan, Pres., and W. L. Jenks, Treas., City Elec. Ry. Co.
- Port Jervis, N. Y.—C. J. Nell, V.-Pres., Port Jervis Elec. St. Ry.
- Port Jervis, N. Y.—E. H. Beachum, Supt., Port Jervis Elec. St. Ry.
- Portsmouth, Va.—Horace G. Williams, Pres., Portsmouth St. Ry. Co.
- Portland, Maine.—H. R. MacLeod, Gen. Man.; J. A. Watt, A. S. MacRae, Supt.; John Wright, Chief Eng., and M. R. Griffeth, Portland & Cape Elizabeth Ry. Co.
- Portland, Maine.—Wm. R. Wood, Pres.; A. Whitney, Director; Charles F. Libbey, Director, and E. W. Newman, Gen. Man., Portland R.R. Co.
- Portland, Maine.—Lewis B. Wheildon, Gen. Man., and W. G. Wheildon, Treas., Portland & Yarmouth Elec. Ry. Co.
- Providence, R. I.—A. T. Potter, Gen. Man.; Henry V. A. Joslin, Sec.; A. E. Potter, Supt. Transportation; M. H. Bronson, Chief Eng.; W. D. Wright, Elec., Union R.R. Co.
- Quincy, Ill.—E. K. Stone, Jr., Sec., and C. E. Stone, Asst. Supt., Quincy Horse Ry. & Carrying Co.
- Quincy, Mass.—John R. Graham, Pres.; Fred W. Smith, Treas.; Benjamin J. Weeks, Supt.; A. D. Gore, Supt. of Construction; D. J. McLane, Chief Elec., and Arthur Buinhane, Quincy & Boston St. Ry. Co.



- Reading, Pa.—John A. Rigg, Pres.; S. P. Light, Director; W. R. McIlvain, Director, and R. E. Moore, Director, United Traction Co.
- Richmond, Va.—E. Randolph Williams, Pres., and P. L. Williams, Treas., Richmond Traction Co.
- Rochester, N. Y.—W. H. Gillette, Rochester, Charlotte & Manitou Beach R.R.
- Rochester, N. Y.—J. W. Hicks, Supt.; LeGrand Brown, Chief Eng.; J. H. Stedman, Man. Transfers, Rochester Ry. Co.
- Rockland, Maine.—Thomas Hawken, Supt.; H. C. Weston, Asst. Supt.; Valentine Chisholm, Elec., and F. B. Lee, Rockland, Thomaston & Camden St. Ry. Co.
- Rockland, Mass.—John S. Spene, V.-Pres.; T. Dorsey, Minot Lapham, B. N. Lake, James F. Skchan, E. A. Smith, I. R. Anderson, T. A. Creming, H. S. Sprague, Geo. Blake, Rockland & Abington St. Ry.
- St. Joseph, Mich.—W. Worth Bean, Pres., St. Joseph & Benton Harbor Elec. Ry. & Light Co.
- St. Joseph, Mo.—W. T. Van Brunt, V.-Pres., and J. H. Van Brunt, Supt. of Ry., St. Joseph Ry., Light, Heat & Power Co.
- St. Louis, Mo.—D. G. Hamilton, Pres.; Robert McCulloch, Gen. Man.; Richard McCulloch, Elec. Eng.; Bruce Hamilton, and Frank J. Duffy, Citizens' Ry. Co.
- St. Louis, Mo.—F. B. Brownell, Receiver, People's Ry. Co.
- St. Louis, Mo.—Harry Scullin, V.-Pres. and Gen. Man., and C. H. Pierson, Mast. Mech., Union Depot R.R. Co.
- Sanford, Maine.—C. A. Bodwell, Gen. Man., Mousam River R.R.
- Seattle, Wash.—David Bruce, Supt., Union Trunk Line.
- Sioux City, Ia.—Chester P. Wilson, Elec. Eng., Sioux City Traction Co.
- Skowhegan, Maine.—C. J. Abbey, Skowhegan Light & Power Co.
- South Chicago, Ill.—William Walmsley, Supt., South Chicago City Ry. Co.
- Springfield, Mass.—George W. Cook, Cashier; George S. Webb, Elec.; George F. Reed, Elec. Supt., and F. E. Sawyer, Roadmaster, Springfield St. Ry. Co.
- Springfield, Ohio.—S. L. Nelson, Gen. Man.; L. O. Williams, Supt.; L. F. Purcell, Director, Springfield Ry. Co.
- Springfield, Vt.—E. C. Crosby, V.-Pres. and Gen. Man., Springfield Elec. Ry. Co.
- Staten Island, N. Y.—Henry S. Kemp, Staten Island Elec. Ry. Co.
- Staten Island, N. Y.—W. B. Rockwell, Pres. and Gen. Man., Staten Island Midland R.R. Co.
- Syracuse, N. Y.—William H. Tucker, Syracuse Rapid Transit Co.
- Taunton, Mass.—S. M. Thomas, Pres.; George F. Seibel, Supt.; C. B. Reynolds, F. S. Quandlett, Taunton St. Ry. Co.
- Taunton, Mass.—M. A. Cavanagh, East Taunton St. Ry.
- Taunton, Mass.—Douglass A. Brooks, Norton & Taunton St. Ry. Co.
- Toledo, Ohio.—Albion E. Lang, Pres.; E. J. Bechtel, Supt. Construction; George A. Cooke, Asst. Supt., and Fred B. Perkins, Elec. Eng., Toledo Traction Co.
- Topeka, Kan.—Albert M. Patten, Supt., Topeka Ry. Co.
- Trenton, N. J.—Henry C. Moore, Pres. and Gen. Man.; P. E. Hurley, Supt.; R. S. Woodruff, Director, and Samuel Moore, Trenton Pass. Ry. Co., Consolidated.
- Wakefield, Mass.—C. W. Holmes and W. M. Butler, Directors, Mystic Valley St. Ry. Co.
- Wakefield, Mass.—Joseph F. Shaw, Treas., and George A. Butman, Director, Wakefield & Stoneham St. Ry. Co.
- Warren, Mass.—M. S. Myrick, Pres.; C. A. Richardson, Director; C. A. Jefts, Supt., Warren, Brookfield & Spencer Ry. Co.
- Washington, D. C.—J. Colvin, Supt., Washington, Alexandria & Mt. Vernon Ry. Co.
- Washington, D. C.—John E. Lloyd and Thomas O'Brien, Brightwood St. Ry. Co.
- Washington, D. C.—R. W. Palmer, Elec., Capital Traction Co.
- Washington, D. C.—Theodore J. King, Sec., and A. B. Coppes, Auditor, Columbia Ry. Co.
- Waterbury, Conn.—M. E. Stark, Supt., Waterbury Traction Co.
- Waterville, Mass.—J. A. Hamblin, Gen. Man., Waterville & Fairfield St. Ry.
- Webb City, Mo.—F. H. Fitch, Supt., and H. P. Fitch, Sec., Southwest Missouri Elec. Ry. Co.
- Westfield, Mass.—Robert P. Lee, Woronoco St. Ry. Co.
- Wichita, Kan.—Herbert B. Church, Pres., Wichita Ry., Light & Power Co.
- Wilkesbarre, Pa.—John Graham, Treas. and Gen. Man.; J. C. Meixel, Supt.; James Fagan, Elec. Eng., and P. R. Raife, Wilkesbarre & Wyoming Valley Traction Co.
- Williamsport, Pa.—Ernest H. Davis, Gen. Man.; Charles T. Herrick, Supt. Motive Power; James O. Goole, Supt. of Power, Williamsport Pass. Ry. Co.
- Wilmington, N. C.—A. B. Skelding, Wilmington St. Ry. Co.
- Worcester, Mass.—Francis H. Dewcy, Pres.; A. H. Stone, Treas.; John N. Akarman, Supt., and Robert A. Reid, Worcester Consolidated St. Ry. Co.
- Worcester, Mass.—Edwin L. Watson, Pres., and H. L. Osgood, Asst. Supt., Worcester & Suburban St. Ry.
- Worcester, Mass.—John W. Ogden, Supt., and W. R. Dame, Worcester & Clinton St. Ry.
- York, Pa.—W. H. Lanius, Pres.; Charles H. Mayer, Treas., York St. Ry. Co.
- Youngstown, Ohio.—A. A. Anderson, Gen. Man., Mahoning Valley Ry. Co.

### Visiting Ladies

In addition to the local committee of ladies, the following ladies were present at the convention:

- Mrs. Wm. A. Bancroft, Boston.  
 Mrs. Chas. S. Sergeant, Boston.  
 Mrs. Mary E. Chambers, Buffalo.  
 Mrs. G. George Browning, Camden.  
 Mrs. Walter E. Harrington, Camden.  
 Mrs. T. C. Penington, Chicago.  
 Mrs. Maud A. Penington, Chicago.  
 Mrs. Frank R. Greene, Chicago.  
 Mrs. Geo. W. Knox, Chicago.  
 Mrs. James R. Chapman, Chicago.  
 Mrs. H. J. Davies, Cleveland.  
 Miss B. S. Scotland, Cleveland.  
 Mrs. W. G. McDole, Cleveland.  
 Mrs. W. J. Kelly, Columbus.  
 Mrs. Geo. B. Kerper, Dayton.  
 Mrs. B. S. Fife, Derby, Conn.  
 Mrs. B. W. Porter, Derby, Conn.  
 Miss Downs, Derby, Conn.  
 Mrs. Beach, Derby, Conn.  
 Mrs. Branion, Derby, Conn.  
 Mrs. J. C. Hutchins, Detroit, Mich.  
 Mrs. J. B. Cahoon, Elmira, N. Y.  
 Mrs. Robert S. Goff, Fall River, Mass.  
 Mrs. H. H. Read, Fall River, Mass.  
 Mrs. F. B. Musser, Harrisburg, Pa.  
 Mrs. W. H. Holmes, Kansas City, Mo.  
 Miss Flowerre, Kansas City, Mo.  
 Mrs. N. E. Norton, Lowell, Mass.  
 Mrs. G. C. Tripp, Lowell, Mass.  
 Mrs. A. B. Bruce, Lowell, Mass.  
 Mrs. Alfred A. Glasier, Lowell, Mass.  
 Mrs. C. E. A. Carr, London, Ont.  
 Mrs. H. C. Page, Lynn, Mass.  
 Mrs. William Postell, Lynn, Mass.  
 Mrs. E. C. Foster, Lynn, Mass.  
 Mrs. Haskel, Lynn, Mass.  
 Mrs. M. H. Walker, Manchester, N. H.  
 Mrs. F. G. Jones, Memphis, Tenn.  
 Miss Mallory, Memphis, Tenn.  
 Mrs. N. H. Heft, Meriden, Conn.  
 Mrs. C. Taylor, Meriden, Conn.  
 Mrs. E. C. Boynton, Meriden, Conn.  
 Mrs. E. G. Connette, Nashville, Tenn.  
 Mrs. E. E. Potter, New Bedford, Mass.  
 Mrs. W. Caryl Ely, Niagara Falls, N. Y.  
 Mrs. J. C. Lugar, Philadelphia.  
 Miss B. Libby, Portland, Maine.  
 Mrs. A. T. Potter, Providence, R. I.  
 Mrs. A. E. Potter, Providence, R. I.  
 Mrs. E. K. Stone, Quincy, Ill.  
 Mrs. Geo. H. Graham, Quincy, Mass.  
 Mrs. Benjamin J. Weeks, Quincy, Mass.  
 Mrs. A. D. Goree, Quincy, Mass.  
 Mrs. Thos. Hawken, Camden, Maine.  
 Mrs. H. C. Weston, Rockland, Maine.  
 Mrs. C. F. Reed, Springfield, Mass.  
 Mrs. S. L. Nelson, Springfield, Ohio.  
 Mrs. L. O. Williams, Springfield, Ohio.  
 Mrs. W. Worth Bean, St. Joseph, Mich.  
 Mrs. F. B. Brownell, St. Louis, Mo.  
 Miss Brownell, St. Louis, Mo.  
 Mrs. W. H. Tucker, Syracuse, N. Y.  
 Mrs. George F. Seibel, Taunton, Mass.  
 Mrs. S. M. Thomas, Taunton, Mass.  
 Mrs. A. E. Lang, Toledo, Ohio.  
 Mrs. E. J. Bechtel, Toledo, Ohio.  
 Mrs. W. J. Cooke, Toledo, Ohio.  
 Miss Cooke, Toledo, Ohio.  
 Mrs. F. B. Perkins, Toledo, Ohio.

Mrs. F. H. Fitch, Webb City, Mo.  
 Mrs. James Fagan, Wilkesbarre, Pa.  
 Mrs. J. C. Meixell, Wilkesbarre, Pa.  
 Mrs. Ernest H. Davis, Williamsport, Mass.  
 Mrs. S. Lanus, York, Pa.  
 Miss Grace A. Lanus, York, Pa.  
 Mrs. W. C. Wood, Hoboken, N. J.  
 Mrs. M. S. P. Williams, Boston.  
 Mrs. T. W. Yardley, Boston.  
 Mrs. H. W. Weller, Baltimore, Md.  
 Mrs. Westervell, Jersey City.  
 Mrs. H. H. Windsor, Chicago.  
 Mrs. H. W. Smith, Boston.  
 Mrs. Sims, Quincy.  
 Mrs. J. B. Van Wagoner, Pittsburgh, Pa.  
 Mrs. W. H. Tucker, Syracuse, N. Y.  
 Mrs. Van Horn, Albany, N. Y.  
 Mrs. J. McLeod Murphy, New York.  
 Mrs. and Miss Peckham, New York.  
 Mrs. A. O. Norton, Boston.  
 Mrs. Nethercut, Boston.  
 Mrs. F. A. Estep, Allegheny, Pa.  
 Misses M. and E. Parmenter, Cambridgeport.  
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 Joseph Wetzler, "Electrical Engineer," New York.  
 A. C. Shaw, "Electrical Engineer," New York.  
 F. E. Kingsman, "Electrical Engineer," New York.  
 C. B. Fairchild, "Electrical Engineer," New York.  
 Walter Redding, "Railway World," London, England.  
 E. A. Simmonds, "Railroad Gazette," New York.  
 Arthur J. Wood, "Railroad Gazette," New York.  
 F. R. Low, "Power," New York.  
 Elmer E. Wood, "American Electrician," New York.  
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 George R. Warden, "Municipal Record and Advertiser," New York.  
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 T. E. Crossman, Official Stenographer.  
 Frank N. Applegate, Stenographer, Accountants' Association.

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 Abbott, Ira. .... Young Lock Nut Co., New York City.  
 Acker, Andrew. .... Joseph J. Dunn, Hyde Park.  
 Ackerman, P. C. .... American Electrical Works, New York.  
 Adams, H. C., Jr. .... Phillips Insulated Wire Co., Pawtucket.  
 Adams, Walter S. .... J. G. Brill Co., Philadelphia.  
 Ager, B. F. .... Taunton Loco. Mfg. Co., Taunton.  
 Ainsworth, F. W. .... Pettingell-Andrews Co., Boston.  
 Aitkin, J. H. .... General Electric Co., Schenectady, N. Y.  
 Alcorn, John H. .... Barbour-Stockwell Co., Cambridgeport.  
 Allberg, J. H. .... Standard Thermometer & E. Co., Peabody.  
 Allison, Giles S. .... Hildreth Varnish Co., New York.  
 Amtz, Wm. C. .... Penna Steel Co., Boston.  
 Angerer, Victor. .... Wm. Wharton, Jr., & Co., Incor., Phila.  
 Anthony, James S. .... Walker Co., Cleveland, Ohio.  
 Anthony, Willis M. .... New Haven Car Reg. Co., New Haven.  
 Ashton, H. H. .... Ashton Valve Co., Boston.  
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 Augher, P. G. .... C. A. Schieren & Co., New York.
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 Babson, Roger Ward. .... E. H. Gay & Co., bankers, Boston.  
 Bacon, Charles. .... Lyte Steel & Lead Woven Tread, Boston.  
 Bailey, Chas. D. .... Universal Car Bearing, New York City.  
 Bailey, Geo. C. .... John A. Roebling's Sons' Co., Chicago.  
 Bailey, Theo. P. .... General Electric Co., Chicago.  
 Bailey, Wm. H. .... Tonkin Boiler Co., New York.  
 Baird, John H. .... Jos. Dixon Crucible Co., Jersey City.  
 Baird, Robert S. .... Charles S. Baird & Co., Wilmington, Del.  
 Baker, A. E. .... Baltimore Car Wheel Co., Baltimore.  
 Baker, E. A. .... The E. T. Burrowes Co., Portland, Maine.  
 Baker, John S. .... Beverly Machine Works, Beverly, Mass.  
 Baker, J. Paul. .... Baltimore Car Wheel Co., Baltimore, Md.  
 Ballard, E. O. .... Safety Third Rail Elec. Co., New York.  
 Baldwin, Arthur. .... General Electric Co., Schenectady.  
 Baldwin, R. A. .... N. Y. Switch & Cross. Co., Hoboken, N.J.  
 Barr, Harry P. .... New York.  
 Barr, James C. .... Wilson, Thomson & Co., Brooklyn, N. Y.  
 Barker, Walter S. .... New York Insulated Wire Co., Boston.  
 Barrett, J. W. .... Hipwood-Barrett Co., Boston.  
 Barnes, R. N. C. .... Bryan-Marsh Co., Boston.  
 Barry, Chas. E. .... General Electric Co., Schenectady.  
 Barry, Charles B. .... D. Peabody & Co., New York.  
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 Bau, J. .... Clinton, Ohio.  
 Beach, H. E. .... Gold Street Car Heating Co., New York.  
 Beach, R. H. .... General Electric Co., New York.  
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 Bell, Louis. .... Electrical Engineer, Boston.  
 Berry, A. Hall. .... H. W. Johns Mfg. Co., New York.  
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 Bibber, Thos. H. .... Bibber-White Co., Boston.  
 Bigelow, H. T. .... Hale & Kilburn Mfg. Co., Chicago.  
 Billings, H. E. .... The Billings & Spencer Co., Hartford.  
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 Bishop, R. S. .... Bethlehem Fdy. & Mach. Co., New York.  
 Bissell, Daniel S. .... Duquesne Forge Co., Pittsburgh.  
 Bjorkengren, Louis. .... Fitchburg, Mass.  
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 Blackwell, F. O. .... General Electric Co., Schenectady.  
 Blizard, Charles. .... Elec. Storage Battery Co., New York.  
 Boardman, A. T. .... Boardman-Tucker Co., Somerville, Mass.  
 Bodwell, H. E. .... Pettingell-Andrews Co., Boston.  
 Boerum, H. H. .... F. H. Newcomb, New York.  
 Botfield, Alfred B. .... Sanitary Engineering Co., Philadelphia.  
 Bowen, Frank. .... Composite Brake Shoe Co., Bristol, Conn.  
 Bowers, G. H. .... Peckham Truck Co., New York.  
 Boyd, F. C. .... New Haven Car. Reg. Co., New Haven.  
 Boyd, J. H. .... New Haven Car Reg. Co., New Haven.  
 Boynton, Moody. .... Boston.  
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 Brady, D. M. .... Brady Metal Co., Derby, Conn.  
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 Brett, J. A. .... Electrical Installation Co., Chicago.  
 Bright, Chas. .... General Electric Co., Buenos Ayres.  
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 Briggs, Wm. O. .... Briggs Carriage Co., Amesbury, Mass.  
 Brinkerhoff, H. G. .... Fuel Economizer Co., Boston.  
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 Brown, E. L. .... Bibber-White Co., Boston.  
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 Brown, R. S. .... Westinghouse Elec. & Mfg. Co., Boston.  
 Brown, T. J. .... General Electric Co., Portland, Me.
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 Burnaby, Wm. .... Westinghouse Elec. & Mfg. Co., Boston.  
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 Case, F. E. .... General Electric Co., Schenectady, N. Y.  
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 Christensen, N. A. .... Christensen Engineering Co., Milwaukee.  
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 Clark, W. J. .... General Electric Co., New York.  
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 Clitz, R. .... The Johnson Co., Boston.  
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 Forsyth, W. H.....Forsyth Bros. Co., Chicago.  
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 Hale, G. H.....Consolidated Car Fender Co., Providence.  
 Hale, J.....Blood & Hale, Boston.  
 Ham, H. B.....Babcock & Wilcox Co., Boston.  
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 Hamlen, W. R.....Johnson Co., Johnstown.  
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 Hanna, J. W.....Hanna Solid Oil Co., Chicago, Ill.  
 Hanna, L. A.....Peckham Motor Truck & W. Co., Everett.  
 Hanford, Scott.....John T. McRoy, Chicago.  
 Harding, E. R.....Chicago Rheostat Co., Chicago.  
 Harding, H. McL...Walker Co., New York.  
 Hardy, Charles C...Am. Whelock Engine Co., Worcester.  
 Harrington, E. J...Elmer P. Morris, New York.  
 Harrington, H. C...Samson Cordage Works, Boston.  
 Harrington, S. H...Harrington Rail Bonding Co., New York.  
 Hartzel, Elmer.....John A. Roebling's Sons' Co., Chicago.  
 Haskell, G. M.....J. G. Brill Co., Philadelphia.  
 Haskins, Caryl D...General Electric Co., Boston.  
 Hastings, Geo. Starr. J. G. Brill Co., Philadelphia.  
 Hatch, E. B.....H. W. Johns Mfg. Co., New York.  
 Hathaway, Alfred G. Street Railway Supplies, Cleveland, Ohio.  
 Hawks, T. C.....Walker Co., Malden.  
 Haycox, W. E.....Mansfield, Ohio.  
 Hayden, Roy.....General Electric Co., Boston.  
 Held, Chas. W.....Wilson, Thomson & Co., Quincy, Mass.  
 Henderson, Jas. H...N. Y. Electrical Works, Brooklyn, N. Y.  
 Henry, F. H.....Heywood Bros. & Wakefield Co., Boston.  
 Herrick, Albert B...Consulting Engineer, New York.  
 Hess, Harlem P...Kosmic Oil Filter Co., Easton, Pa.  
 Heywood, A. S.....General Electric Co., Atlanta, Ga.  
 Hickmott, G. F...Boston Brass Co., Boston.  
 Hicks, J. B.....Pratt & Lambert, New York.  
 High, John M.....Pantasote Co., New York.  
 Hill, C. J.....American Vitified C. Co., New York.  
 Hill, J. M.....Bryan-Marsh Co., Chicago.  
 Hilman, C. D.....Methuen Elec. Co., Methuen, Mass.  
 Hitchcock, James...Wheeler Seat Co., New York.
- Hoadley, Geo. M.....Bemis Car Box Co., Springfield, Mass.  
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 Hopewell, F. B.....L. A. Chase & Co., Boston.  
 Hobbs, H. W.....Walker Co., Boston.  
 Hood, R. O.....General Electric Co., Boston.  
 Hoffman, J. Ellis...Wendell & MacDuffie, New York.  
 Horst, E. Vanderbilt, John Stephenson Co., New York.  
 Howe, F. C.....Wm. Wharton, Jr., & Co., Philadelphia.  
 Howell, W. G.....John Stephenson Co., New York.  
 Houghton, C. W...Ashton Valve Co., North Cambridge.  
 Hubbard, M. G., Jr...McGuire Mfg. Co., Chicago.  
 Hughes, T. E.....Standard Underg'd Cable Co., Pittsburgh.  
 Hultman, E. G.....Barbour-Stockwell Co., Cambridgeport.  
 Hunt, H. H.....Simonds Mfg. Co., Boston.  
 Huntress, F. E.....Neal Electric Headlight Co., Boston.
- Inlay, L. E.....Westinghouse Elec. & Mfg. Co., Pittsb'g'h.  
 Issertel, A. Norman. Manoe's Railway Co., New York.  
 Issertel, Henry G...Walker Co., Boston, Mass.
- Jackman, Geo. W...Springfield Mfg. Co., Bridgeport, Conn.  
 Jackson, John.....Simonds Mfg. Co., Pittsburgh, Pa.  
 Jackson, J. Monteith, Jackson & Sharp Co., Wilmington, Del.  
 Jackson, Newton...Am. Mutual Indemnity Co., Scranton, Pa.  
 Jackson, Wm. H...Ridgway Dynamo & Engine Co., Boston.  
 Jefferson, Charles W. Mica Insulator Co., New York.  
 Jennison, A. W.....Rooke Register Co., Peoria, Ill.  
 Jewell, J. F.....Page W. W. Fence Co., Adrian, Mich.  
 Johnson, C. F.....Burdett & Johnson, Pearl St., Boston.  
 Jones, C. S.....Western Gear Co., Milwaukee.  
 Jones, Fred B.....The Adams & Westlake Co., Chicago.  
 Jones, B. J.....Sargeant & Lundy, Chicago, Ill.  
 Jones, H.....Burdett & Johnston, Boston.  
 Johnston, Harry C...Charles Scott Spring Co., Philadelphia.
- Kahn, Gus.....Safety Third Rail Elec. Co., New York.  
 Kasson, R.....Taylor Electric Truck Co., Troy, N. Y.  
 Kavanagh, Jas. E...Wm. Wharton, Jr., & Co., Philadelphia.  
 Kerschner, W. R...The Columbia Mach. Works, B'klyn, N. Y.  
 Keeran, N. C.....Wabash Ry., Chicago.  
 Keeler, H. E.....The Adams & Westlake Co., New York.  
 Keenan, W. J.....Pettingell-Andrews Co., Boston.  
 Kellogg, E. W.....Frank Ridlon Co., Boston.  
 Kendall, C. C.....Simmons Hardware Co., St. Louis.  
 Kendall, W. D.....Worcester Construction Co., Worcester.  
 Kilbourn, W. H...Greenfield.  
 Kimball, Fred H...General Electric Co., Boston.  
 Kimball, James L...Ridgway Dynamo & Engine Co., Boston.  
 Kitfield, E. H.....Consulting Engineer, Boston.  
 King, C. K.....The Ohio Brass Co., Mansfield, Ohio.  
 King, C. P.....Brady Metal Co., New York.  
 King, J. W.....The Peckham Truck Co., Providence.  
 Kingston, Wm. W...The Johnson Co., Atlanta, Ga.  
 Kirkland, H. B...Am. Circular Loom Co., New York City.  
 Kilvert, Maxwell A. Washburn Coupler Co., Chicago.  
 Kissam, Geo. ....Geo. Kissam & Co., New York.  
 Knapp, E. G.....Partridge Carbon Co., Sandusky.  
 Knickerbocker, C. K. Griffin Wheel Co., Chicago.
- Lacy, George W...Peckham Truck Co., Kingston, N. Y.  
 Ladd, E. H.....E. F. Burrowes Co., Portland, Maine.  
 Lapham, F. A.....Cleveland Frog & Cross'g Co., Cleveland.  
 Lasell, Edw.....New York.  
 Law, M. D.....Walker Co., Cleveland.  
 Lawless, E. J.....American Car Co., New York.  
 Lawrence, F. W...Lawrence Wiggin, Boston.  
 Lawrence, Stewart G. General Electric Co., Boston.  
 Lawson, F. A.....J. G. Brill Co., San Francisco.  
 Lawton, J. B.....Smith & Wallace, Boston.  
 Leidenger, Joseph...Dayton Mfg. Co., Dayton, Ohio.  
 Leidenger, Peter...Dayton Mfg. Co., Dayton, Ohio.  
 Lewee, J. B.....L. V. V. B. Co., New York.  
 Libby, S. H.....Sprague Electric Co., New York.  
 Littlefield, W. R...Pettingell-Andrews Co., Boston.  
 Livingston, M. S...Standard Thermometer Elec. Co., Peabody.  
 Lockhart, H. R...General Electric, Montreal.  
 Lockwood, L. A...Crefeld Electrical Works, Pawtucket, R. I.  
 Lomat, J. Acton...General Electric Co., New York.  
 London, B. T.....Swift & McGrady, Boston.  
 Lougee, C. L...Heywood Bros. & Wakefield Co., Boston.  
 Long, E. G.....Peckham Truck Co., New York.  
 Long, Geo. E.....Jos. Dixon Crucible Co., Jersey City, N. J.  
 Loper, A. N.....Rooke Register Co., Chicago.  
 Lovejoy, W. A...Chas. Scott Spring Co., Boston.  
 Ludington, R. B...Columbia Refining Co., New York City.  
 Ludlow, W. E...Am. Rail Joint & Mfg. Co., Cleveland.  
 Luther, B. S.....Linton Mfg. Co., Boston.  
 Luther, H. R...Barbour-Stockwell Co., Cambridgeport.  
 Lyall, W. R.....General Electric Co., Boston.
- MacDonald, A. F...General Electric Co., Boston.  
 MacDuffie, R. L...Wendell & MacDuffie, New York.

- Mace, Romaine.....The Okonite Co., New York City.  
 MacGregory, F. S....R. Woodman Mfg. & Supply Co., Boston.  
 Macomber, F. B....Leschen-Macomber-Whyte Co., Chicago.  
 Mahoney, J. J....General Electric Co., New York.  
 Mangree, C. E. S....General Electric Co., Boston.  
 Mansfield, D. S....Valentine Co., Boston.  
 Mansfield, F....16 Central Street, Boston.  
 Manson, D. D. E....Westinghouse Elec. & Mfg. Co., Boston.  
 Marshall, Oliver W....Duplex Car Co., New York.  
 Marshall, Wm....The Anglo-Am. Varnish Co., Newark, N. J.  
 Martin, Geo. E....Springfield Mfg. Co., Bridgeport, Conn.  
 Mason, J. H....Simplex Electric Co., Boston.  
 Massgrove, E. G....Gold Street Car Heating Co., New York.  
 Mayer, Charles J....Mayer & Englund, Philadelphia, Pa.  
 McBride, Geo. W....General Electric Co., Boston.  
 McCardell, J. R....McCardell, West & Co., Trenton, N. J.  
 McCarthy, Louis....W. T. C. Macallen Co., Boston.  
 McCoy, Frank....Pennsylvania Car Wheel Co., Pittsburgh.  
 McCutchen, John I....Standard Air Brake Co., Boston.  
 McElroy, James F....Consolidated Car Heating Co., Albany.  
 McGrady, J. H....Swift & McGrady, Boston.  
 McGhie, John....General Electric Co., New York.  
 McKenna, E. B....New York Car Wheel Works, Buffalo.  
 McKinlock, Geo. A....Central Electric Co., Chicago.  
 McLenee, F. C....The Brady Metal Co., New York.  
 McLey, Frederic A....Lobdell Car Wheel Co., Wilmington, Del.  
 McMahon, J. P....Rochester Hose Bridge Co., Rochester.  
 McRoy, John T....New York.  
 Meaker, J. W....Meaker Mfg. Co., North Chicago.  
 Medbury, Charles F....Westinghouse Elec. & Mfg. Co., Detroit.  
 Meek, J. E....H. W. Johns Mfg. Co., New York City.  
 Meek, Stuart G....H. W. Johns Mfg. Co., New York City.  
 Mendum, A. B....Bibber-White Co., Boston.  
 Mercur, H. T....Corning Brake Shoe Co., Buffalo, N. Y.  
 Merrick, F. A....Johnson Co., Johnstown, Pa.  
 Merritt, Meldon H....Edison Elec. Illuminating Co., Boston.  
 Metzger, Charles W....McCardell, West & Co., Trenton.  
 Milbank, L. A....Holmes, Booth & Haydens, New York.  
 Miller, Carl G. M....L. A. Chase & Co., Boston.  
 Miles, J. E....Stanley & Miles, Whitman.  
 Mix, Charles Dorf....Park Bros. & Co., Pittsburgh.  
 Montgomery, A. F....Crefeld Electrical Works, Pawtucket, R. I.  
 Moore, Arthur S....Boston Artificial Leather Co., Boston.  
 Moore, Chas. K....Lap Joint Railway T. Co., New York City.  
 Moore, F. M....McGuire Mfg. Co., Boston.  
 Moore, Frank W....Boston.  
 Moore, George....Duplex Car Co., Boston.  
 Moore, John D....Walker Co., New York.  
 Moore, James....Lap Joint Railway T. Co., New York City.  
 Moore, H. P....Shawmut Fuse Wire Co., Boston.  
 Morgan, E. H....Greenfield.  
 Morrell, F. A....Sterling Supply & Mfg. Co., New York.  
 Morris, Elmer P....Manufacturers' Agent, New York.  
 Morse, Geo. C....Rochester Car W. Works, Taunton, Mass.  
 Murdock, H. D....Westinghouse Elec. & Mfg. Co., Pittsb'gh.  
 Murdock, Wm. J....Wm. J. Murdock & Co., Boston.  
 Murphy, J. McLeod.Safety Third Rail Elec. Co., New York.  
 Murphy, John....General Electric Co., Boston.  
 Munroe, Chas. O....General Electric Co., Boston.
- Nay, Henry M....Wagner Electric Mfg. Co., St. Louis.  
 Nelson, L. D....Sterling Supply & Mfg. Co., New York.  
 Ness, T. W....The Holtzer-Cabot Elec. Co., Brookline.  
 Nethercut, Edgar S....Paige Iron Works, Chicago.  
 Newcomb, F. H....13 Astor Place, New York.  
 Newell, J. F....J. F. Newell & Co., Gardiner, Maine.  
 Newkirk, H. R....Wendell & MacDuffie, New York.  
 Newton, Capt. H. W.Lap Joint Railway Track Co., New York.  
 Nicholson, Charles....Hampton Corundum W. Co., Springfield.  
 Nord, Chas. G....R. Bliss Mfg. Co., Pawtucket, R. I.  
 North, J. H....Parker Bros. & Co., Ltd., Pittsburgh, Pa.  
 Norton, Harry A....A. O. Norton, Boston.  
 Nourse, Frank O....Boston.  
 Noyes, E. K....Walker Co., Boston.
- Ogden, George H....Providence.  
 O'Hern, John....General Electric Co., Boston.  
 Ohmer, John F....John F. Ohmer Register Co., Dayton, O.  
 Olney, Geo. H., 2d....American Electrical Works, Providence.  
 Osgood, Richard P....Methuen Elec. Co., Methuen, Mass.
- Packard, Frank L....American Conduit Co., Philadelphia.  
 Page, A. D....General Electric Co., Harrison, N. J.  
 Page, F. G....Fayerweather & Ladew, New York.  
 Paine, F. B. H....Westinghouse Elec. & Mfg. Co., N. Y.  
 Parker, Fred E....The Watson-Stillman Co., New York.  
 Parker, A. H....The Wire Goods Co., Worcester, Mass.  
 Parmenter, Geo. A....Cambridgeport, Mass.  
 Parsons, J. N....A. Mertes Mfg. Co., Pittsburgh, Pa.  
 Parsons, F. B....Safety Insulated Wire Co., New York.  
 Partridge, Arthur S....Street Railway Supplies, St. Louis.  
 Pear, Chas. D....Albert & J. M. Anderson Mfg. Co., Boston.  
 Peavy, M. V....Adam Cook's Sons, Fall River, Mass.  
 Peckham, E....Peckham Truck Co., New York.
- Peirce, Stephen H....Geo. A. Parmenter & Co., Cambridgeport.  
 Pemay, Alfred W....Electric W. Equipment Co., Birmingham.  
 Perry, F. D....American Car Sprinkler Co., Worcester.  
 Perry, E. C....American Car Sprinkler Co., Worcester.  
 Perry, James W....H. W. Johns Mfg. Co., Philadelphia.  
 Peterson, Wm. A....Pettingell-Andrews Co., Boston.  
 Pettee, Edward E....Standard Air Brake Co., Boston.  
 Pfingst, Louis....Boston.  
 Phillips, Eugene F....American Electrical Works, Providence.  
 Phillips E. Rowland.American Electrical Works, Providence.  
 Phillips, Frank N....American Electrical Works, Providence.  
 Pierce, Robert....Crosby Steam Gage & Valve Co., Boston.  
 Pierce, D. F....The Bigelow Varnish Co., Newark, N. J.  
 Pierce, Frank S....Pettingell-Andrews & Co., Boston.  
 Plummer, C. S....Westinghouse Elec. & Mfg. Co., Boston.  
 Poor, James W....Poor's Fountain Brush Co., Boston.  
 Pope, W. H....Bibber-White Co., Boston.  
 Pope, W. R....Taunton Locomotive Mfg. Co., Taunton.  
 Porter, H. F. J....Bethlehem Iron Co., South Bethlehem, Pa.  
 Porter, George F....Okonite Co., New York.  
 Post, W. B....The Billings & Spencer Co., Hartford.  
 Post, C....The Buront Co., New York.  
 Powell, A....Cleveland Frog & Cross'g Co., Cleveland.  
 Powers, Charles P....India Alkali Works, Boston.  
 Prather, Henry L....Falk Mfg. Co., Milwaukee, Wis.  
 Pratt, G. E....Ajax Metal Co., Philadelphia.  
 Pratt, Mason D....The Penn. Steel Works Co., Steelton, Pa.  
 Prehn, Edw. J....Le Valley Vitæ Carbon B. Co., N. Y.  
 Price, Chas. B....Pettingell-Andrews Co., Boston.  
 Prince, Albert E....Boston Artificial Leather Co., Boston.  
 Prouty, G. M....W. T. C. Macallen & Co., Boston.  
 Provost, Geo. W....R. D. Nuttall Co., Pittsburgh, Pa.  
 Pugh, D. W....John Stephenson Co., Ltd., New York.  
 Pullen, C. L....Philadelphia Car Wheel Co., Philadelphia.  
 Putnam, H. S....Wadsworth, Howland & Co., Boston.
- Raberm, D. S....Elmer P. Morris, New York.  
 Randall, J. H....Duplex Car Co., Boston.  
 Randall, F. C....Christensen Engineering Co., Hartford.  
 Randall, R. M....Randall Car Co., Boston.  
 Randolph, R. J....222 West Twenty-sixth Street, New York.  
 Randolph, J. R....Sterling Arc Lamp Co., New York.  
 Ransom, H. N....Consolidated Car Heating Co., Albany.  
 Raymond, Chas. O....Supt. Consolidated Co., Portland, Maine.  
 Record, E. A....Vacuum Oil Co., Boston.  
 Record, E. E. D....Vacuum Oil Co., Boston.  
 Reed, John D....H. Gore & Co., agents, Boston.  
 Remington, C. R., Jr.American Electrical Works, Providence.  
 Rhodes, James D....Pennsylvania Car Wheel Co., Pittsburgh.  
 Richards, Edward N.The Bemis Car Box Co., Springfield, Mass.  
 Richards, J. N....The Standard Paint Co., New York.  
 Richardson, James A.Rochester Car Wheel Works, Liverpool.  
 Richardson, A. H....Pearson Jack Co., Boston.  
 Ridlon, Frank....Frank Ridlon Co., Boston.  
 Riley, Joseph C....Swift & McGrady, Boston, Mass.  
 Rinehart, F. A....Standard Undergr'd Cable Co., Pittsburgh.  
 Robinson, J. B., Jr.Wm. Wharton, Jr. & Co., Philadelphia.  
 Robinson, Wm....Robinson Elec. T. & Supply Co., Boston.  
 Robinson, Edw....The Wells Light Mfg. Co., New York.  
 Robinson, E. I....Laclede Car Co., St. Louis.  
 Robinson, John C....Wm. Wharton, Jr. & Co., Philadelphia.  
 Rockwell, W. B....Am. Mutual Indemnity Co., Scranton, Pa.  
 Rogers, W. Cogswell.Peckham Truck Co., New York.  
 Rooke, Geo. F....Rooke Register Co., Peoria, Ill.  
 Rosenthal, Geo. D....General Electric Co., St. Louis.  
 Ross, Edward L....Chapman Valve Mfg. Co., Indian Orchard.  
 Rowbotham, G. W....Jandus Elec. Co., Cleveland, Ohio.  
 Rugg, O. Willis....O. Willis Rugg, Worcester.  
 Rundlett, H. E....The Edward P. Allis Co., New York.  
 Russel, W. H....Watertown, 47 Auburn Street.  
 Russell, F. D....Rochester Car Wheel Works, Rochester.  
 Russell, H. H....The Johnson Company, Cleveland, Ohio.  
 Rutherford, J. A....The E. T. Burrowes Co., Portland, Maine.
- Sanderson, H. A....Mason Mfg. Co., Springfield.  
 Sargent, Fitzwilliam.The American Brake Shoe Co., Chicago.  
 Savage, H. M....General Electric Co., Boston.  
 Saville, George G....Young Lock Nut Co., New York City.  
 Sawyer, W. H....American Electrical Works, Providence.  
 Sawyer, W. D....Mass. Mohair Plush Co., Boston.  
 Sawyer, F. W....Walker Co., Boston.  
 Schefhamor, Rupert.Sterling Arc Light Co., New York.  
 Scott, Wm. M....The Cutter Elec. & Mfg. Co., Philadelphia.  
 Scragham, G. R....Craghead Eng. Co., Cincinnati.  
 Searles, Richmond P.Consolidated Car Heating Co., Chicago.  
 Seaverns, Houghton.United Electric Inspect. Co., Philadelphia.  
 Sherburne, Chas. S....Sherburne Co., Boston.  
 Shields, Edw. T....Bibber-White Co., Boston.  
 Simmons, G. D....Walker Co., Boston.  
 Simmons, B. A....General Electric Co., Boston.  
 Simms, J. P....Rochester Car Wheel Works, Quincy.  
 Simpson, N. A....Newport.  
 Small, E. E....N. Y. N. H. & H. R. R R., Berlin, Conn.  
 Smith, M. L....National Scale Co., Providence, R. I.  
 Smith, Clement L....Falk Mfg. Co., Milwaukee.

- Smith, F. B. . . . . National Arc Lamp Co., Boston.  
 Smith, Melian. . . . . Mech. Eng., Walworth C. & S. Co., Bost.  
 Smith, R. D. . . . . General Electric, Westboro, Mass.  
 Smith, Pemberton. . . . . New York Car Wheel Works, Buffalo.  
 Smith, Wm. M. . . . . Chicago Insulated Wire Co., Chicago.  
 Smith, H. W. . . . . Bibber-White Co., Boston.  
 Snow, F. A. . . . . H. B. Camp Co., Brookline.  
 Southgate, H. M. . . . . Westinghouse Elec. & Mfg. Co., Boston.  
 Spaulding, H. C. . . . . H. W. Johns Mfg. Co., Boston.  
 Stanley, G. E. . . . . Stanley & Miles, Whitman.  
 Stearns, E. H. . . . . The Adams & Westlake Co., Chicago.  
 Stearns, Charles K. . . . . Holtzer-Cabot Elec. Co.  
 Stevens, J. F. . . . . Keystone Electrical Instrument Co., Phila.  
 Stieringer, Luther. . . . . New York.  
 St. John, E. A. . . . . Jos. Dixon Crucible Co., Jersey City.  
 Strickland, A. H. . . . . Rochester Car Wheel Works, New York.  
 Strickland, F. . . . . Rochester Car Wheel Works, Boston.  
 Strieby, F. H. . . . . General Electric Co., Cincinnati, Ohio.  
 Stone, Theo. W. . . . . Electric Mutual Cas. Assn., Philadelphia.  
 Stone, Frank J. . . . . Electric Storage Battery Co., Boston.  
 Storer, N. W. . . . . Westinghouse E. & M. Co., Pittsburgh.  
 Stout, J. E. . . . . Wm. Hall & Co., Boston.  
 Suckow, Gustav. . . . . Vose Spring Co., New York.  
 Summer, Geo. Fred. . . . . Knitted Mattress Co., Canton Junction.  
 Sutton, Wm. . . . . American Car Co., St. Louis, Mo.  
 Swan, G. W. . . . . John A. Roebling's Sons' Co., New York.  
 Swartz, B. F. . . . . McKee, Fuller & Co., Catsauqua.  
 Sweet, D. C. . . . . Springfield, Mass.  
 Swift, W. H. . . . . Swift & McGrady, Boston.  
 Sylvester, John E. . . . . Sylvester & Co., Boston.
- Taylor, John . . . . . Taylor Electric Truck Co., Troy, N. Y.  
 Taylor, Frank H. . . . . Westinghouse Elec. & Mfg. Co., Pittsb'gh.  
 Thayer, Winthrop. . . . . Thayer & Co., Inc., Boston.  
 Thomas, Jos. N. . . . . Blood & Hale, New York.  
 Thomson, W. E. . . . . Wilson-Thomson Co., Brooklyn.  
 Thompson, F. H. . . . . F. H. Thompson, Portland.  
 Tillinghast, B. D. . . . . Duff Mfg. Co., Allegheny, Pa.  
 Tesseyman, H. . . . . The Barney & Smith Car Co., Dayton, O.  
 Titus, J. V. E. . . . . Garton-Daniels Elec. Co., Keokuk, Ia.  
 Tolman, L. P. . . . . Taunton Locomotive Mfg. Co., Taunton.  
 Tontrup, Louis H. . . . . American Car Co., St. Louis, Mo.  
 Townley, Calvert. . . . . Westinghouse Elec. & Mfg. Co., Boston.  
 Trainer, H. R. . . . . H. W. Johns Mfg. Co., Boston.  
 Tufethan, E. F. . . . . A. O. Norton, Boston.  
 Tucker, Frank S. . . . . Boardman-Tucker Co., Boston.  
 Tupper, G. Aubrey. . . . . Taylor Electric Truck Co., Troy, N. Y.  
 Turner, W. C. . . . . Thayer & Co., Inc., Philadelphia.  
 Turner, Wm. S. . . . . Consulting Engineer, New York.  
 Tuttle, E. O. . . . . Pearson Jack Co., Boston.  
 Tuttle, T. Edward. . . . . Pearson Jack Co., Boston.  
 Tyler, W. H. . . . . W. H. Tyler, Worcester.
- Upton, Edgar W. . . . . Standard Thermometer & E. Co., Boston.
- Van Dorn, W. T. . . . . W. T. Van Dorn Co., Chicago.  
 Van Dorn, J. H. . . . . Van Dorn & Dutton Co., Cleveland, Ohio.  
 Van Wagoner, C. S. . . . . Van Wagoner & Williams H. Co., Clevel'd.  
 Van Wagoner, J. B. . . . . Pittsburgh.  
 Vaughan, F. G. . . . . General Electric Co., Boston.  
 Vosburgh, A. C. . . . . New Process Raw Hide Co., Syracuse.
- Wagenseio, C. H. . . . . American Electrical Works, Providence.  
 Walker, W. J. . . . . J. P. Sjoberg & Co., New York.  
 Waller, C. W. . . . . Ft. Wayne Elec. Corporation, Boston.  
 Walker, E. C. . . . . Hampden Corundum W. Co., Springfield.  
 Wallace, J. Edward. . . . . Smith & Wallace, Boston.  
 Wallace, H. T. . . . . Diamond State Iron Co., Wilmington, Del.  
 Ward, W. W. . . . . Westinghouse Elec. Mfg. Co., Boston.  
 Ward, John E. . . . . Gold Street Car Heating Co., New York.  
 Wardley, Thos. W. . . . . R. Woodman Mfg. & Supply Co., Boston.  
 Wardwell, Fred S. . . . . Danbury, Conn.  
 Washburn, Wm. A. . . . . Cambria Iron Co., New York.  
 Watkins, S. W. . . . . Christensen Engineering Co., Milwaukee.  
 Watson, W. J. . . . . American Electrical Works, Providence.  
 Wattles, James F. . . . . Rand-Avery Supply Co., Boston.  
 Weare, T. . . . . General Electric Co., New York.  
 Weaver, H. B. . . . . Pittsburgh Trolley Pole Co., Pittsburgh.  
 Webb, H. E. . . . . Solar Carbon & Mfg. Co., Pittsburgh.  
 Weeks, A. T. . . . . Smith & Wallace, Boston.  
 Weinz, Theo. A. H. . . . . The Warrenton Woolen Co., New York.  
 Welch, Robert W. . . . . John A. Roebling's Sons' Co., Yardley, Pa.  
 Wendell, Jacob, Jr. . . . . Wendell & MacDuffie, New York.  
 Werner, R. L. . . . . Westinghouse Elec. & Mfg. Co., Boston.  
 West, C. L. . . . . American Railway Imp. & E. Co., Boston.  
 Westervelt, Harry. . . . . Jos. Dixon Crucible Co., Jersey City, N. J.  
 Weston, Samuel L. . . . . Boston Artificial Leather Co., Boston.  
 Weston, George. . . . . Naugle, Holcomb & Co., Chicago.  
 Weston, Fred. . . . . Gold Street Car Heating Co., New York.  
 Whall, F. R. . . . . C. H. Whall & Co., Boston.  
 Whitney, J. D. . . . . Crew-Levick Co., Philadelphia.  
 Wharton, Wm. W. . . . . Electric Mutual Cas. Assn., Philadelphia.  
 Wharton, Wm., Jr. . . . . Wm. Wharton, Jr., & Co., Inc., Phila.
- Wheeler, Chas. R. . . . . Edward Smith & Co., Springfield.  
 Wheeler, H. W. . . . . Campbell & Zell Co., Baltimore, Md.  
 Whipp, Geo. S. . . . . Contractor, Brooklyn.  
 Whitaker, A. M. . . . . John A. Roebling's Sons' Co., New York.  
 Whitcomb, Wm. W. . . . . Composite Brake Shoe Co., Boston.  
 White, C. T. . . . . Central Union Brass Co., St. Louis, Mo.  
 Whiteley, Fred W. . . . . Sherburne Co., Boston.  
 Whittaker, C. H. . . . . Baltimore Car Wheel Works, Boston.  
 Whittlesey, Jas. T. . . . . John Stephenson Co., New York.  
 Wick, George. . . . . Elec. Railway Equipment Co., Cincinnati.  
 Wight, A. M. . . . . Ham Sand Box Co., Troy, N. Y.  
 Wiley, George L. . . . . Standard Underground Cable Co., N. Y.  
 Wilkes, Fred H. . . . . L. C. Chase & Co., Boston.  
 Wilkinson, W. L. . . . . The Ohio Brass Co., Mansfield, Ohio.  
 Williams, M. S. P. . . . . Sterling Supply & Mfg. Co., Boston.  
 Williams, John R. . . . . The Electric Storage Battery Co., Phila.  
 Williams, J. H. . . . . Williams Truss Rail Joint Co., Chicago.  
 Wilson, John A. . . . . Wash. Elec. St. Railway, Washington, Pa.  
 Wilson, J. E. . . . . Pettingell-Andrews Co., Boston.  
 Wilson, Charles H. . . . . Manufacturers' Agent, Boston.  
 Wilson, George W. . . . . Boston, Mass.  
 Wilson, Chas. . . . . Wilson, Thomson Co., Brooklyn.  
 Wingate, Chas. S. . . . . Briggs Carriage Co., Amesbury, Mass.  
 Winsor, Paul. . . . . Southern Electric Co., Baltimore, Md.  
 Wirt, H. C. . . . . General Electric Co., Schenectady, N. Y.  
 Wise, Cliff . . . . . General Contractor, Chicago.  
 Wood, Chas. N. . . . . Manufacturers' Agent, Boston.  
 Wood, N. L. . . . . Chas. N. Wood, Boston.  
 Wood, W. C. . . . . N. Y. Switch & Cross Co., Hoboken, N.J.  
 Woods, Henry. . . . . John Stephenson Co., Ltd., New York.  
 Woodbridge, J. L. . . . . Electric Storage Battery Co., Boston.  
 Woodman, R. . . . . R. Woodman Mfg. & Supply Co., Boston.  
 Woodward, A. H. . . . . The International Register Co., Chicago.  
 Woodworth, A. C. . . . . The Consolidated Car F. Co., Providence.  
 Woodworth, A. C., Jr. . . . . The Consolidated Car F. Co., Providence.  
 Woolsey, Palmer. . . . . American Pin Co., New York.  
 Wordell, F. C. . . . . C. N. Wood, Boston.  
 Worthington, W. W. . . . . The Q. & C. Co., New York.  
 Wright, J. H. . . . . Wendell & MacDuffie, New York.  
 Wurster, E. A. . . . . Falk Mfg. Co., Milwaukee, Wis.
- Yardley, John H. . . . . Pennsylvania Car Wheel Co., Philadelphia.  
 Young, W. D. . . . . Baltimore & Ohio Railroad, Baltimore.  
 Young, C. J. . . . . Mr. Reckor, Boston.

### Standard Air Brakes in Boston

No better test of the efficiency of braking apparatus for street cars could be given than that to which the Standard air brakes on the Commonwealth Avenue cars were subjected during the trip to Norumbega Park on the last day of the convention. Many delegates remained for this excursion and all spoke in highest terms of the results given by the Standard air brakes. The exhibit was arranged by J. R. Ellicott, general manager of the Standard Air Brake Company, and took place on the return trip. A heavily laden car was taken at random for the purpose, and Superintendent C. N. Smith, of the Commonwealth Avenue Line, assumed control of the motors and brake. The car was stopped quickly several times when under full speed, but without jar, and stops were made later on down grades. In every case the brakes acted quickly, positively and without noise.

### Pennsylvania Street Railway Association

The Seventh Annual Convention of the Pennsylvania Street Railway Association will be held in Scranton, Oct. 19 and 20. The association will convene in the Board of Trade rooms on Oct. 19, at 11 A. M. At this meeting the usual annual business will be transacted, including the election of officers for the ensuing year. Scientific papers on subjects of special interest to the association will be read and discussed and methods for the promotion of the general interests of street railways will be considered. On the second day a series of entertainments will be provided for members and visitors, including an excursion over the lines of the Scranton Railway Company. An interesting programme has been arranged and will in due time be published and mailed to members of the association and street railway people generally throughout the State. All street railway companies of Pennsylvania are eligible to active membership and all manufacturers or dealers in street railway supplies are eligible to associate membership in the association, the membership fee in each case being \$25. Members of the association are urged to send as many representatives as possible to the convention, and those who have not yet joined are also cordially invited to attend and participate in the exercises and entertainments of the meeting. All communications should be addressed to S. P. Light, secretary, Lebanon, Pa.

## EXHIBITS AT THE CONVENTION

W. R. EVANS, of Portland, Me., exhibited a new illuminated car sign.

D. C. SWEET, of Springfield, Mass., exhibited his car wheel grinding machinery.

THE POTTIER & STYMUS COMPANY, of New York, showed one of its car seats.

THE WILLIAM H. GALLISON COMPANY, of Boston, Mass., showed samples of relief valves.

THE PAIGE IRON WORKS, of Chicago, had their interests cared for by their engineer, A. P. Nethercut.

THE MASSACHUSETTS MOHAIR COMPANY, of Boston, Mass., showed samples of car and furniture plush.

THE CENTRAL ELECTRIC COMPANY, of Chicago, was represented by its president, George A. McKinlock.

C. S. KNOWLES, Boston, made no exhibit, but was represented by W. O. Turner, George A. Ober, J. L. Rowell and H. A. Cole.

THE REED MANUFACTURING COMPANY, of Erie, Pa.

This company has been in business for a long period of time, and its different devices are widely and favorably known. The exhibit was in charge of R. Woodman and T. W. Wardley.

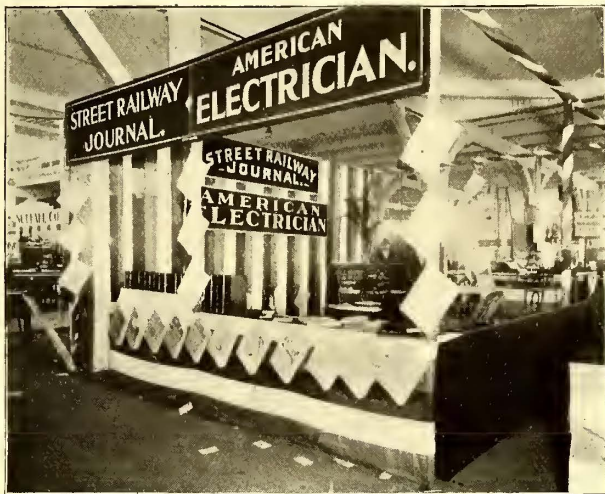
THE AMERICAN WHEELOCK ENGINE COMPANY, of New York, exhibited part of an engine showing the Green-Wheelock valve system. The plugs and valves and valve motion were clearly indicated. Charles C. Hardy had charge of the exhibit.

THE ADAMS & WESTLAKE COMPANY, of Chicago, was represented by Fred B. Jones, H. E. Peter, E. H. Stearns and W. S. Bartholomew. A full line of this company's car trimmings was exhibited.

THE SAMSON CORDAGE WORKS, of Boston, Mass., exhibited a large show case containing samples of fancy and plain cords of different kinds, including signal cords, trolley cords, arc lamp cords, etc.

THE CHICAGO RHEOSTAT COMPANY, through E. R. Harding, showed one of its motor rheostats, which attracted considerable attention from those convention goers who were also interested in electric lighting.

THE MONARCH track cleaners were shown by Charles N.



HEADQUARTERS OF STREET RAILWAY JOURNAL



BUREAU OF INFORMATION

had on exhibition several of its automatic self-adjusting pipe wrenches.

THE ASHTON VALVE COMPANY, of Boston, Mass., exhibited a full line of safety valves, gages, stopcocks and recorders for steam, gas, water, etc.

THE SOUTHERN ELECTRIC COMPANY, of Baltimore, Md., installed in convention hall several of its intercommunicating automatic setback telephones.

JOHN T. McROY, of New York, exhibited a sample of the McRoy vitrified clay conduit, also a photograph showing the method of installing this conduit.

THE JACKSON & SHARP COMPANY, of Wilmington, Del., was represented by J. Monteith Jackson and E. C. Jackson, but had no regular exhibit at the hall.

SHERBURNE & CO. had a large space, in which a full line of track drills, hand cars, car replacers, rail benders, etc. were shown. The company also showed a Q. & C. rail saw.

A. O. NORTON, of Boston, had a full line of track and car jacks on exhibition. Mr. Norton is now making over forty patterns of jacks for the use of street railway companies.

THE R. WOODMAN MANUFACTURING & SUPPLY COMPANY, of Boston, Mass., displayed glass cases filled with its numerous specialties, including ticket punches, baggage checks, hat and breast badges, numbers, etc., buttons, speed indicators, etc.

Wood, as a part of his large and handsome exhibit. These devices attracted considerable attention, and a number of orders for them were taken at the convention.

THE WESTERN GEAR COMPANY, of Milwaukee, had its interests cared for by C. L. Jones, who has long been known to Convention goers. The company is doing a large business and is enjoying an especially large European trade.

THE DUFF MANUFACTURING COMPANY, of Allegheny, Pa., showed several of the Barrett patent compound lever and track jack. This jack is in use on a number of street railways and is giving complete satisfaction wherever employed.

THE BRADY METAL COMPANY, of New York, exhibited several samples of street car and electric car brass castings, bearings and trolley wheels. This company makes its devices of magnus metal, phosphor bronze and babbitt metal.

A. L. LAWTON, of Colorado Springs, Col., was present as a delegate, and also exhibited a model of the Lawton Peerless fender, which has given excellent results in Colorado Springs and Denver. The agent for the fender is John C. Curtis, of Chicago.

ALBERT B. HERRICK, of New York, had on exhibition his testing set. This set, which is all combined on one board, enables all kinds of tests on car motors and overhead appliances to be made. Mr. Herrick personally explained the operation of the system.

THE WATSON-STILLMAN COMPANY, of New York, was represented by George L. Gillon. This company's exhibit con-

sisted of a motor lift for working over car pits in repair shops, hydraulic jacks, rail punches and rail benders. It attracted much attention.

JOHN D. REED, through his New England agents, H. Gore & Company, of Boston, showed several sections of the new Reed

Car Company, and other large car manufacturing establishments. A sample of cattle hair carpet for car floors was also shown in connection with this exhibit. The Sanford Mills were represented by Frank B. Hopewell and George Goodall.

THE CAMBRIA IRON COMPANY, of Philadelphia, Pa.,

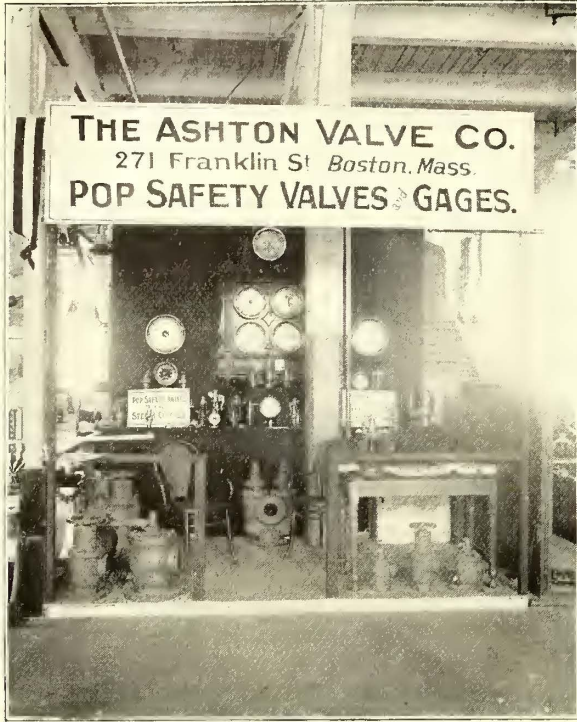


EXHIBIT OF ASHTON VALVE CO.



EXHIBIT OF SAMSON CORDAGE WORKS



EXHIBIT OF JOS. DIXON CRUCIBLE CO.



EXHIBIT OF CAMBRIA IRON CO.

system of track construction. It is claimed with this method that pounded-out rail ends can be raised and securely held in place.

L. M. CHASE & COMPANY, of Boston, Mass., selling agents for the Sanford Plush Mills, made an attractive display of different grades and patterns of plush for upholstering car seats, etc. These plushes are in very general use, being employed almost exclusively by the Pullman Palace Car Company and the Wagner Palace

had at Boston sections of all of the standard rails for electric railway service which it manufactures. The assortment was an unusually complete one and was examined with great interest by those present.

THE COLEMAN FAREBOX COMPANY, of Tottenham, Ontario, exhibited samples of the Coleman farebox. This device is in very general use throughout Canada and has a number of advantages, one of them being that the conductor does not have to



handle the money, the passenger dropping his fare into the box himself. The conductor does not have to keep a record of any kind, the box being turned into the general office at the end of each run and the records made up by special clerks.

THE GARTON-DANIELS COMPANY, of Keokuk, Ia., showed lightning arresters through its agents, Elmer P. Morris, Pettingell-Andrews Company and the Ohio Brass Company. The secretary of the company, J. V. E. Titus, from the home office, was present.

THE NEW PROCESS RAWHIDE COMPANY, of Syracuse had no exhibit, but presented to delegates a tasteful match safe and cigar cutter, which was very popular. The company was represented by Mr. Vosberg, who had many customers among those present.

THE VACUUM OIL COMPANY, of Rochester, N. Y., was

and pleasing designs in "Pantasote." The company was represented by John M. High and H. M. Grier.

THE ROCHESTER HOSE BRIDGE COMPANY, of Rochester, N. Y., had a Rochester hose bridge on exhibition at the exhibition hall. The bridge shown has a new improvement consisting of strong supporting bars which add greatly to the strength and durability of the device.

THE RUSSELL MANUFACTURING COMPANY, of Chicago, showed a trolley harp which has been particularly designed to follow curves in the overhead wire, and it is claimed that with this device it is impossible for the trolley wheel to jump the wire at curves and cross-overs.

THE STANDARD PAINT COMPANY, of New York, manufacturers of the well-known P. and B. paint and insulation, dis-



PART OF EXHIBIT OF ELMER P. MORRIS

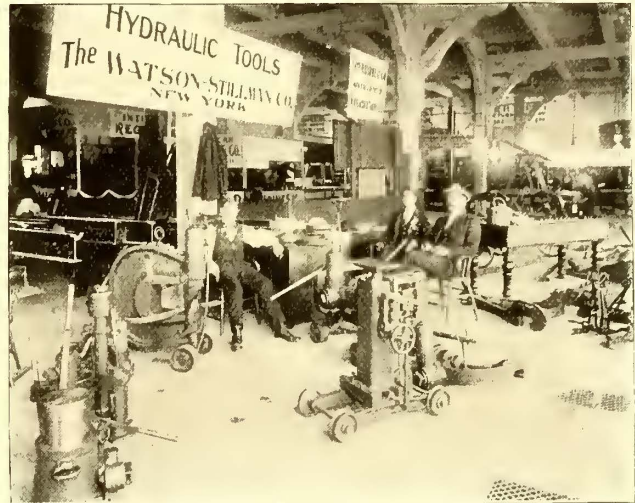


EXHIBIT OF WATSONS-TILLMAN CO.



EXHIBIT OF BEVERLY MACHINE WORKS AND BRADY METAL CO.



EXHIBIT OF BALTIMORE CAR WHEEL CO.

represented by the superintendent of the sales department, E. A. Record. This company had a glass show case filled with bottles containing samples of the many different varieties of oils which it manufactures.

THE AJAX METAL COMPANY, of Philadelphia, showed an interesting assortment of metals of all kinds for use in bearings, etc., trolley wheels, bonds, and other apparatus manufactured by it. G. E. Pratt represented the company, and was known to every one at the Convention.

THE PANTASOTE COMPANY, of New York, displayed various samples of "Pantasote" for curtains for all kinds of street railway cars. This material has many advantages, as it will not crack or peel and does not show signs of wear after the roughest handling. It is also possible to stamp a number of very attractive

tributed at the convention as a souvenir of the occasion a very tasteful pocketbook, which was one of the most popular gifts presented during convention week.

MCCARDELL, WEST & COMPANY, of Trenton, N. J., showed the well-known Trenton tower wagon, which is claimed to be light, safe, strong and durable, and the only one that can be handled by one man. J. R. McCardell was present, and explained the advantages of the tower wagon.

THE AMERICAN RAIL JOINT & MANUFACTURING COMPANY, of Cleveland, Ohio, was ably represented by its general manager, W. E. Ludlow, and its agents, Wendell & MacDuffie, Julian L. Yale & Company, and Mayer & Englund. Mr. Ludlow said that this convention was for him the most successful of the year. His booth was crowded continually, and he

took a number of orders. He had a fine display of joints, one in particular being a 9-in. double lock. He also showed the joint in use on a rail, and the driving on and off of the joints always drew a crowd.

THE DIAMOND STATE IRON COMPANY, of Wilmington, Del., exhibited samples of the Churchill rail joint, which it employed on 40 miles of 9-in. girder rail construction made this year in Boston by the Boston Elevated Railroad. The joint is equally good on T-rail construction.

THE JOSEPH DIXON CRUCIBLE COMPANY, of Jersey City, was represented by Messrs. Baird, Haasis and St. John, who distributed souvenir pencils to all visitors, and exhibited samples of Dixon's wood grease for gears, silica graphite paint for trucks, and graphited track grease for curves.

THE CAHALL SALES DEPARTMENT, of Pittsburg, Pa., exhibited a flowed steel header for boilers and a swinging manhole plate. This company has installed a large number of boilers in electric railway and light stations, and much interest was expressed by the delegates in its exhibit.

THE AMERICAN ELECTRIC HEATING CORPORATION, of Cambridgeport, Mass., exhibited a full line of car heat-

economical, owing to the fact that the backs will slide to and fro, thus permitting both sides of the plush to be used, and thereby greatly increasing the life of the cushions. The company was represented by James Hitchcock, general sales agent.

THE JANDUS ELECTRIC COMPANY, with the Creaghead Engineering Company, displayed several well-known types of its lamps, including five in series, for street railway circuits, 110 volt, and alternating circuits. The company claims that it has more lamps in use on street railways than any other lamp concern.

THE ROBINSON ELECTRIC TRUCK & SUPPLY COMPANY was represented by William Robinson, who showed the well-known Robinson radial truck, and also a special six-wheel truck for parlor cars. Mr. Robinson was present, and distributed some circulars relating to the use of his trucks on several street railways.

THE AMERICAN RAILWAY SUPPLY COMPANY, of New York, displayed a board containing samples of the regular line of cap and coat badges of all kind which this company supplies. The badges are made of various metals including aluminum, brass, German silver, etc. A sample of the badges used by the New York police force was also shown, this company having re-

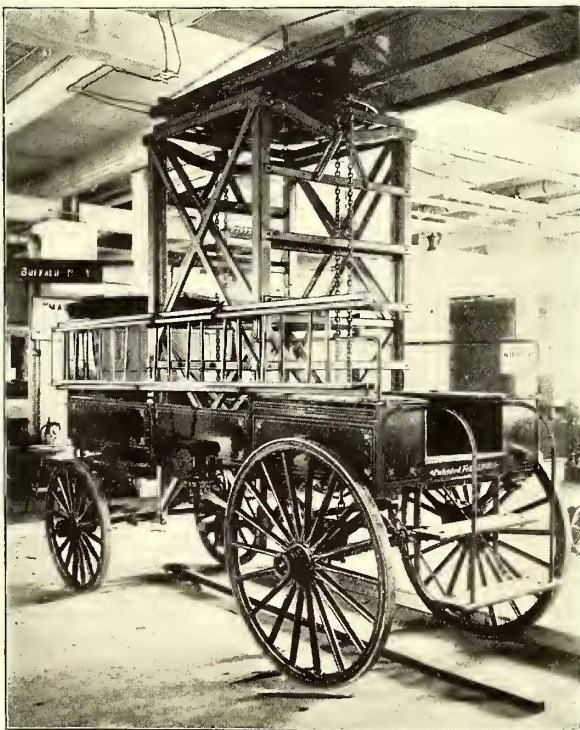


EXHIBIT OF McCARDELL, WEST & CO.

ers and switches. The exhibit was made in connection with that of Charles N. Wood, and the company was represented by James I. Ayer, general manager, and C. J. Mayer.

THE ELECTRIC STORAGE BATTERY COMPANY was represented in large force, although it made no regular exhibit. Those present in its interests were F. H. Clark, of Chicago; F. J. Stone, of Boston; Chas. Blizard, of New York; J. R. Williams, of Philadelphia, and J. L. Woodbridge, of Boston.

THE CENTRAL UNION BRASS COMPANY, of St. Louis, was represented at the Convention in the person of T. C. White, who gave out a beautiful souvenir in the shape of a miniature overhead hanger. Mr. White said that this was a good convention for business, and that he picked up some fine orders.

THE BALTIMORE CAR WHEEL COMPANY, of Baltimore, Md., was represented at the Convention by J. Paul Baker and A. E. Baker. The company had at Boston one of its standard single trucks, as well as one of its standard double trucks. These trucks showed well by comparison with others at the Convention.

THE BUSHNELL MANUFACTURING COMPANY AND WHEELER CAR SEAT COMPANY, having headquarters at New York, made a joint exhibit of car seats, one Wheeler seat and one Bushnell seat being shown. The mechanism of these seats is very simple, there being very few parts, and they are extremely



EXHIBIT OF AMERICAN RAIL JOINT & MFG. CO.

cently secured a contract for supplying the entire police force of Greater New York with necessary badges. Walter Chur, of New York, represented the company.

THE KNITTED MATTRESS COMPANY, of Canton Junction, Mass., displayed samples of its knitted cotton padding for upholstering car seats and chairs and for mattresses, table pads, etc. This padding is firm, soft and easily washed, and when used in upholstering work tends to preserve the life and finish of plush coverings.

THE BARBOUR-STOCKWELL COMPANY, of Cambridgeport, Mass., displayed samples of special work, trogs, mates and rails. This company has done a great deal of work in and around Boston, and its special work received many encomiums, not only from users, but also from all who inspected the construction carefully.

THE AMERICAN VITRIFIED CONDUIT COMPANY, of New York, had an extensive exhibit of its glazed vitrified conduit for underground street construction. A full size manhole was shown with the conduits in place. The company was represented by C. J. Field, general manager and chief engineer, and Frank Packer.

W. H. SWIFT showed a model of Swift's illuminated reversible signs. By this system all the hood signs on a street car can be

changed by moving a small lever on the inside of the car roof. This model received a great deal of attention from the street railway men attending the Convention. J. H. McGrady, of Boston, Mass., is agent for this device.

THE DIAMOND STATE IRON COMPANY, of Wilmington, Del., showed samples of the Churchill rail joint for T and girder rail. H. T. Wallace, secretary, represented the company. The exhibit attracted a great deal of attention and many favorable comments were heard regarding the joint.

THE HANNA SOLID OIL COMPANY, of Chicago, was represented by its president, J. W. Hanna, who reported a good business. It is claimed for the Hanna lubricant that one packing of the box lasts during the life of the wheel. The company guar-

harp. This harp is guaranteed to run ten to thirty days without refilling. It is made entirely of brass with steel axle, and is sent on thirty days' trial. It is claimed that its use saves wear and tear on wheels and bushings, and effects a great saving in oil.

WADSWORTH, HOWLAND & COMPANY, of Boston, Mass., manufacturers, importers and dealers in paints, varnishes, Japans, stains, colors, etc., had on exhibition fifty-six panels, each colored a different shade, suitable for street car bodies. This company grinds all the colors used on the cars of the Boston Elevated system. Frederick A. Gunnison had charge of the exhibit.

THE WHEEL TRUING BRAKE SHOE COMPANY, of Detroit, Mich., showed a line of brake shoes for truing up flat wheels. These shoes are similar to composition shoes now on the



EXHIBIT OF BARBOUR-STOCKWELL CO.

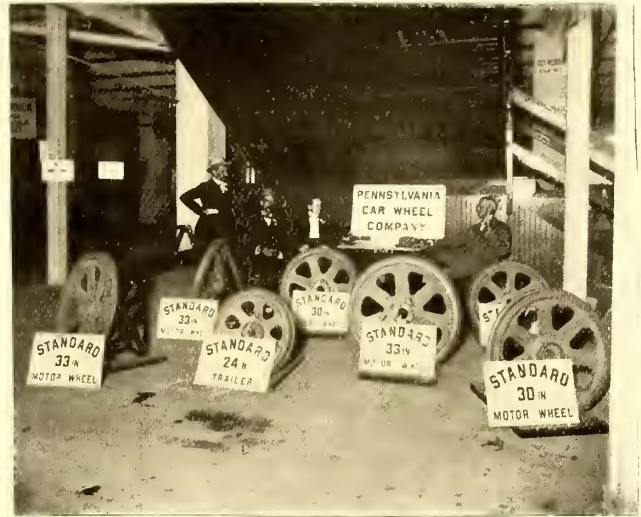


EXHIBIT OF PENNSYLVANIA CAR WHEEL CO.



EXHIBIT OF TAUNTON LOCOMOTIVE MFG. CO.

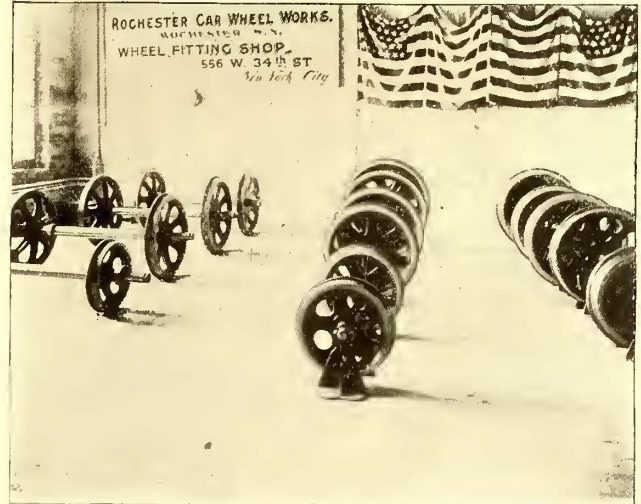


EXHIBIT OF ROCHESTER CAR WHEEL WORKS

antees on contract to supply a lubricant at a saving of 20 per cent over any other oil or grease.

GEORGE A. PARMENTER & CO., of Cambridgeport, Mass., exhibited a fender, wheel guards and track cleaners. The Parmenter fender is in use in a number of cities throughout the country, and it is stated that not a single serious accident has been caused by cars equipped with this device.

THE CRANE COMPANY, of Chicago, which is usually extremely prominent at conventions, was not present this year. We understand that this was due to the large number of orders upon which the company is busily engaged, and which prevented the executive officers from taking up the subject of an exhibit in time to make arrangements to have one at Boston.

THE INTERNATIONAL SPECIALTY COMPANY, Detroit Mich., through E. A. Candler, showed its self-oiling trolley

market; the composition is, however, a form of emery, and a single day's use of the shoes, it is claimed, will put the worst wheels in good order. Mr. J. M. Griffin, president of the company, was in charge.

JAMES BRYAN & CO., of Pittsburgh, Pa., had on exhibition several sections of rails supplied with the Bryan bond. A number of advantages are claimed for this bond, among them being that it requires no expert labor to apply it, it is very flexible and scrap trolley wire can be used for making the bonds. The bond is used extensively in Pittsburgh and elsewhere and is giving excellent results.

THE AMERICAN CAR SPRINKLER COMPANY, of Worcester, was represented at the Convention by F. C. and Frank D. Perry and had in the convention hall a number of photographs of its well-known sprinkler. Those who wished to inspect the sprinkler in actual operation, however, had an opportunity of doing so, as American sprinklers have been in use in Boston on the

Boston Elevated Railway system since June 11. One of these sprinklers was operated on a regular circuit during the Convention, running on Boylston, Dover and Berkley Streets, Harrison Avenue, Northampton Street and Columbus Avenue, and received much attention.

THE ALLEN & MORRISON BRAKE SHOE & MANUFACTURING COMPANY, of Chicago, was represented by Julian L. Yale & Company, selling agents, who presented visitors with a very handsome celluloid-covered note book, which was well appreciated by all. This brake shoe is made on a new principle, so far as the composite part is concerned, and is meeting with excellent success.

THE TAUNTON LOCOMOTIVE MANUFACTURING COMPANY exhibited three snow plows, which attracted much attention. These were the Standard plow, heavy plow and share-plow. W. R. Billings, treasurer of the company, was present, as also were Messrs. Wendell & MacDuffie, the New York agents for the company. The exhibit was favorably commented upon by those in attendance.

THE WILLIAMS TRUSS RAILWAY JOINT COMPANY, of Boston, Mass., exhibited samples of the Williams truss joint. This rail joint is composed of five parts and no bolts or nuts are

or police box, and can be placed on poles at turnouts or other points. A. F. Boardman had charge of the exhibit.

THE BEMIS CAR BOX COMPANY, of Springfield, Mass., showed a sample of its standard single truck and No. 73 pivotal double truck. The company has sold many trucks in the neighborhood of Boston, and the smooth running qualities of these were favorably commented upon by those who were present. The company was well represented by George M. Hoadley, general manager, and Edward M. Richards, superintendent.

WENDELL & MACDUFFIE, of New York, were represented by Messrs. Wendell & MacDuffie, and also by J. H. Wright, B. F. Ayer and J. Ellis Hoffman. As representatives of the Taunton Locomotive Manufacturing Company, the firm had the well-known snow plows of this company as an exhibit, and as representatives of the American Rail Joint and Western Gear Company, had the exhibits of those companies in their charge.

THE NEW YORK SWITCH & CROSSING COMPANY, of Hoboken, N. J., had on exhibition its electric tongue switch, which is operated from the motor car, simply and effectually. This switch has been employed on a number of roads, and many railway managers examined its working with interest. The company also showed samples of its frogs, crossings and other pieces of special work and was represented by W. C. Wood and L. E. Robert.

THE STANDARD UNDERGROUND CABLE COMPANY, of New York, had a very pleasant booth where samples of the company's products were exhibited. These included samples of various kinds of cables and insulated wire, rubber, paper and fibre insulated railway feeder cables, aerial weather-proof feeder cables, etc. The interests of the company were cared for by F. A. Rinehart, treasurer, G. L. Wiley, of New York, and T. E. Hughes, of Philadelphia.

J. P. SJOBERG & COMPANY, of New York, was represented by W. J. Walker, who showed some samples of the Sjoberg well-known woodwork for street cars, and also a sash spring manufactured by him which has been widely employed on street rail-

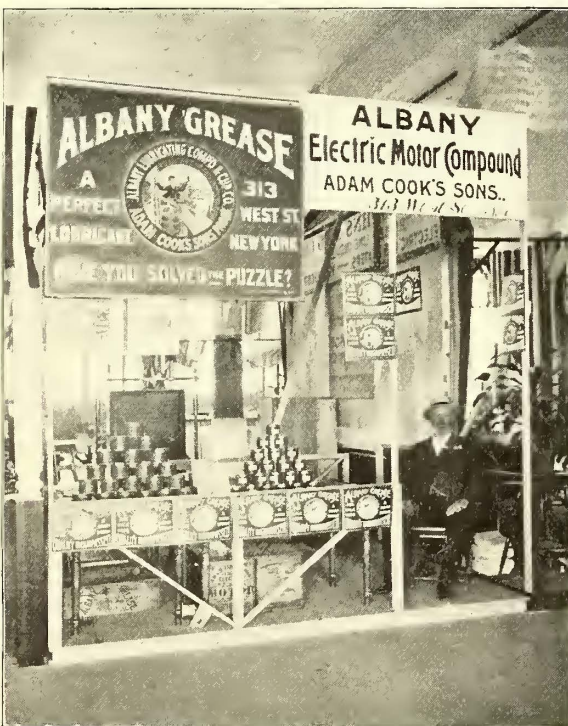


EXHIBIT OF ADAM COOK'S SONS

used in fastening the parts together. The joint is built on the truss bridge principal, and it is claimed the parts will never work loose, and will not show wear as long as the rail lasts. No bonding is necessary with this type of rail joint.

THE ROCHESTER CAR WHEEL WORKS, of Rochester, N. Y., made an extensive display of steam and street railway car wheels, both single and mounted on axles. These wheels ranged from 15 ins. to 40 ins. in diameter and included wheels for use in all kinds of service, from the lightest to the heaviest electric locomotive requirements. The company was represented by Frank D. Russell, George C. Morse and A. H. Strickland.

THE PENNSYLVANIA CAR WHEEL COMPANY, of Pittsburgh, had on exhibit a line of different types of car wheels, and attracted much interest on account of the recent entry of the company into the car wheel business. The wheels shown were of all the standard types used in electric railway service. James D. Rhodes, of Pittsburgh, and John Howard Yardley, of Philadelphia, were present in the interests of the company.

THE BOARDMAN-TUCKER COMPANY, of Boston, Mass., had a number of samples of its telephones on exhibition. This company makes wall and desk telephones for office use and a special railway telephone for outside use. This latter instrument is furnished in a cast iron weather-proof case similar to a fire alarm

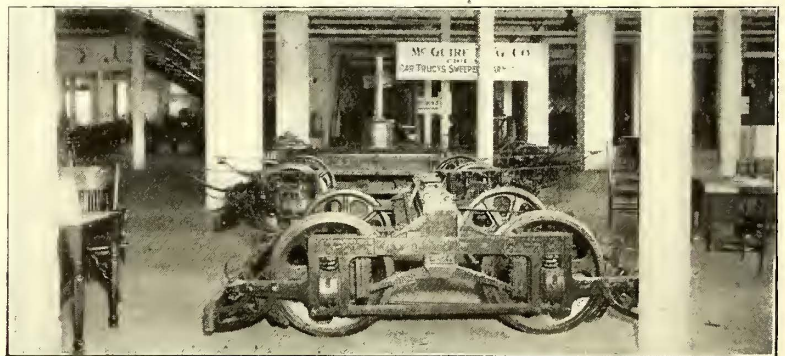


EXHIBIT OF BEMIS CAR BOX CO.

ways, and has been found excellent for the purpose for which it is designed. Mr. Walker was formerly connected with the John Stephenson Company, and had many friends in attendance at the convention.

THE W. T. VAN DORN COMPANY, of Chicago, formerly known as the Fitzgerald-Van Dorn Company, was represented, as usual, by Mr. Van Dorn, whose couplers are to-day the street railway standard not only of this country, but of the world. Besides filling many large orders for home service, he has shipped couplers to Australia, Japan and many places in Europe, within the last year. His exhibit was made up of aluminum models and a book of elegant blue prints.

THE METHEUN ELECTRICAL COMPANY, of Methuen, Mass., exhibited samples of a new insulator for two-way connections. This device is a decided novelty, and it is claimed will make a considerable saving in the expense of connecting up street railway motors, as the use of all tape is done away with and the connections can all be broken and remade in  $2\frac{1}{4}$  minutes, as against thirty minutes by the old method where tape had to be wound around each connection.

THE HAM SAND BOX COMPANY, of Troy, N. Y., exhibited samples of the No. 3 and No. 4 Ham sand boxes. The style No. 4 box is a modification of the No. 1 Ham sand box, and has a ventilating feed spout which prevents any moisture from

being drawn up into the sand reservoir. This company's No. 3 box has recently been adopted as standard by the South Chicago Street Railway Company. A. M. Wight, secretary of the company, had charge of the exhibit.

THE PETTINGELL-ANDREWS COMPANY, of Boston, Mass., had a sample switchboard fitted with different styles of switchboard instruments. This company showed samples of overhead material, trolley poles and construction tools for all kinds of track and overhead construction work. A reel of 500,000 cm O. K. feeder cable was also shown. The following representatives of this company were in attendance: C. B. Price, F. P. Price, J. E. Wilson, W. A. Peterson and W. J. Keenan.

THE WAGNER ELECTRIC MANUFACTURING COMPANY, of St. Louis, Mo., made an extensive display of switchboard instruments for street railway work; also carbon brushes, switches and standard transformers. A number of large photo-

graphs were shown illustrating several of the more prominent installations which the Wagner Company has made. E. H. Abadie, manager of sales, of St. Louis, and H. M. Nay, of Boston, represented the company at the Convention.

being able to work at an angle with the same force as if working perpendicularly, and the weight is under perfect control at all times. The jacks are made in various sizes and to work with bar or ratchet, the examples shown being 60-lb. jacks of from 20 to 25 tons capacity, and 30-lb. jacks of two types.

ADAM COOK'S SONS, of New York, displayed sample jars filled with Albany grease and Albany electric motor compound. The Albany lubricants are now in use in a large majority of the street railway power stations throughout the country and have won for themselves an enviable reputation. The electric motor compound especially is giving great satisfaction wherever it is used. Adam Cook and John Engle, of New York, and M. V. Peavey, agent for New England and Canada, were in attendance.

THE CROSBY STEAM GAGE & VALVE COMPANY, of Boston, Mass., had on exhibition a number of Crosby steam indicators, valves, gages, recorders, etc., also a very large three-



EXHIBIT OF PETTINGELL-ANDREWS CO.

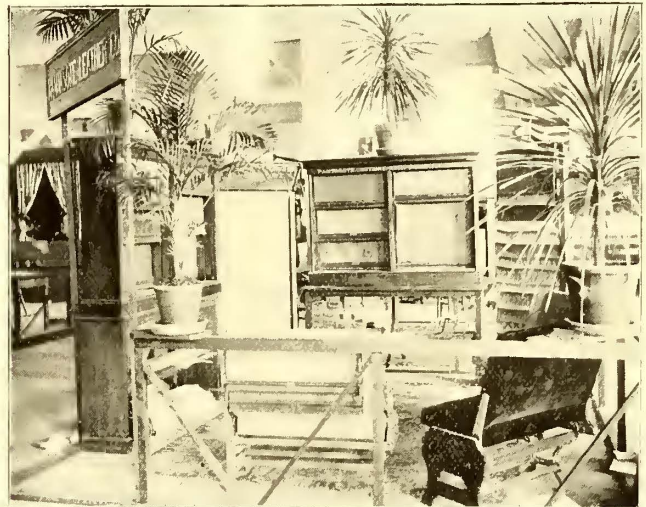


EXHIBIT OF PANTASOTE LEATHER CO.

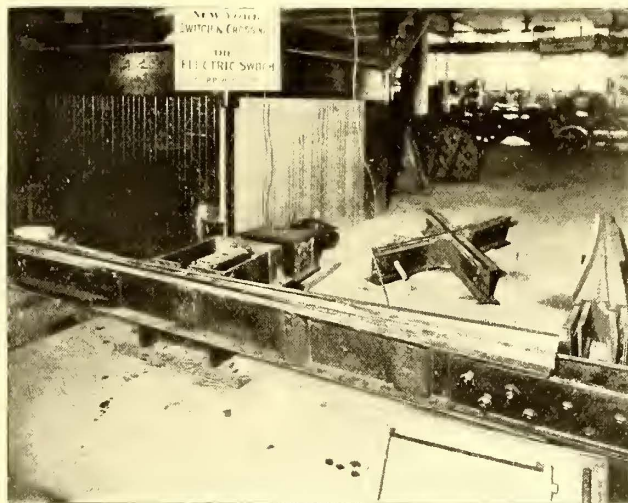


EXHIBIT OF NEW YORK SWITCH AND CROSSING CO.



EXHIBIT OF PEARSON JACK CO. AND WAGNER ELEC. MFG. CO.

graphs were shown illustrating several of the more prominent installations which the Wagner Company has made. E. H. Abadie, manager of sales, of St. Louis, and H. M. Nay, of Boston, represented the company at the Convention.

THE BEVERLY MACHINE WORKS, of Beverly, Mass., had on exhibition car trimmings and various street railway supplies which they manufacture. A sample of the Beverly brake handle was shown and also a ratchet clutch vertical brake wheel for vestibule cars. This wheel is extremely compact, simple and powerful, and will be found a great improvement over the ordinary type of brake handle wherever space is limited. John S. Baker and Wm. E. Bailey represented the company.

THE PEARSON JACK COMPANY, of Boston, showed several samples of the Pearson jack for replacing derailed cars. This jack will lift or hoist, and possesses the additional feature of

chime steam whistle. The instruments and appliances manufactured by the Crosby Steam Gage & Valve Company are standard in many of the largest power houses in the country, and in workmanship and accuracy they are all that can be desired. This exhibit was in charge of Robert Pirie, Charles M. Gibbs and S. G. Reed.

STANLEY & MILES, of Whitman, Mass., had on exhibition a new emergency brake for street cars which employs a rather novel principle. The brake in an ordinary application, is set by turning the brake handle in the usual way, but an emergency stop is made by a sudden pressure of the handle. The brake shoes are applied to the wheel by spring action working through a system of levers. The brake can be used on the largest and heaviest of interurban cars and with comparatively little exertion on the part of the motorman.

E. F. DE WITT & CO., of Lansingburg, N. Y., were represented by Mr. De Witt, who is a well-known figure at all conven-

tions and who explained to all interested the merits of the Common Sense Sand Box. Mr. De Witt showed the box in actual service, and it was noticeable that the sand which he used contained stones of considerable size. This was done, Mr. De Witt said, to prove that the box will not become clogged when in use, if the sand is not carefully screened. The box can be used also with wet sand, if necessary.

THE BILLINGS & SPENCER COMPANY, of Hartford,

THE HIPWOOD-BARRETT CAR & VEHICLE FENDER COMPANY, of Boston, Mass., had a model of its fender in operation. This fender is designed to work as well on very rough pavements as on smooth pavements, and the model track upon which the miniature fender was in operation was extremely rough. Despite this fact the fender in all cases picked up without injury any moveable object which it struck. A full size sample of the Hipwood Barrett fender is in operation in Newtownville, Mass.

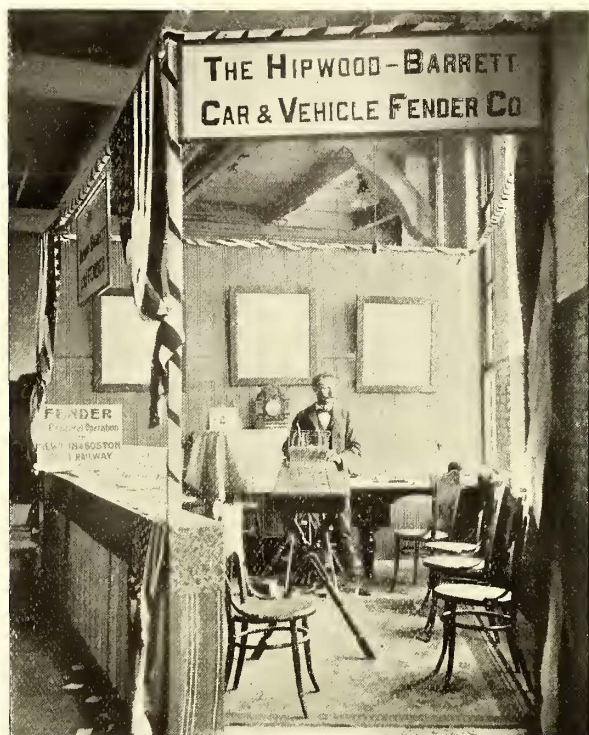


EXHIBIT OF HIPWOOD-BARRETT FENDER



EXHIBIT OF CROSBY STEAM GAGE AND VALVE CO.

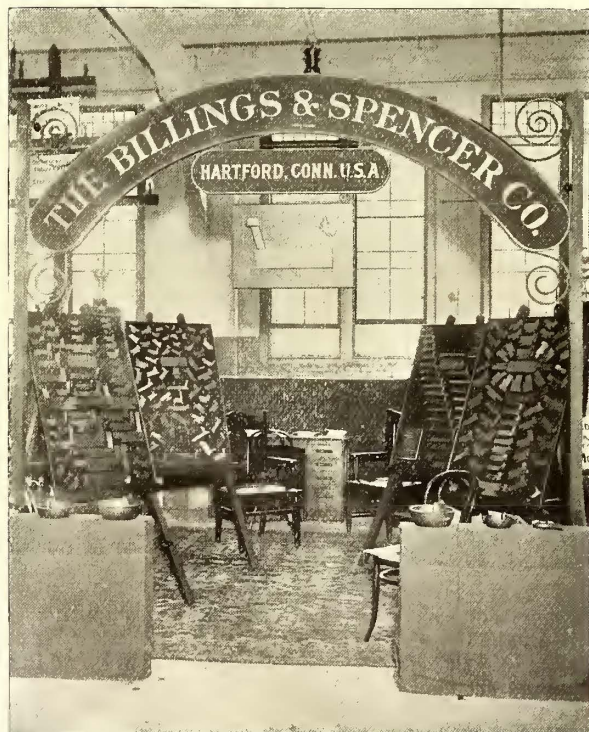


EXHIBIT OF BILLINGS & SPENCER CO.

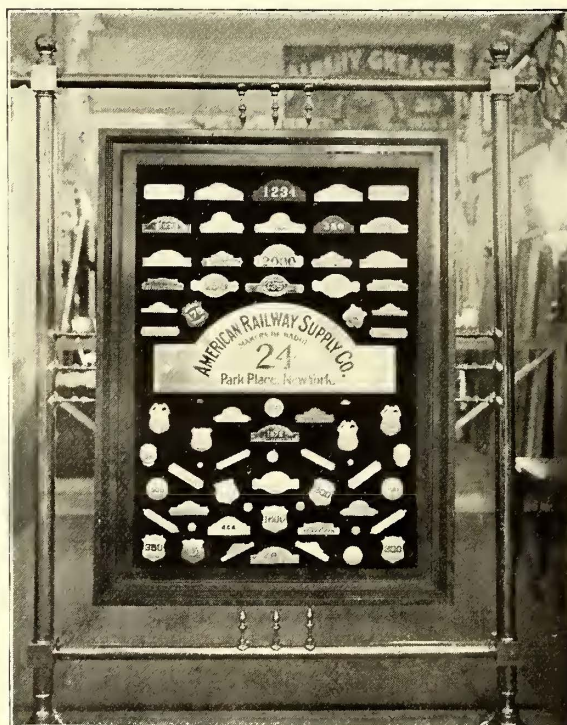


EXHIBIT OF AMERICAN RY. SUPPLY CO.

Conn., exhibited a number of sample boards of commutator segments, also several samples of overhead material. There was also shown what is thought to be one of the smallest and also one of the largest commutator segments ever made. The large segment shown weighed about 25 lbs., and was constructed for a Westinghouse motor at Niagara Falls. Several drop forgings made of soft steel for Lundell motors were also exhibited. W. B. Post and H. E. Billings had charge of this exhibit.

George Hipwood had charge of the company's interests at the convention.

THE NEAL ELECTRIC HEADLIGHT COMPANY, of Boston, Mass., did not make an exhibit at the exhibition hall, but the Neal headlight is in use on all of the cars of the Boston Elevated system, so that visitors and delegates to the Convention had a good opportunity to examine them in practical operation. A

great deal of interest was shown by the visitors in these headlights and many favorable comments were made on their appearance and evident wearing qualities. There are about 7000 of the Neal headlights in use on New England street railways alone.

THE STANDARD AIR BRAKE COMPANY, of New York, had no exhibit in the convention hall, but showed its apparatus in a most practical way in use on sixteen cars on the Commonwealth Avenue line in Boston. This was the line taken by the delegates in their trip to Norumbega Park, so that those who took that excursion had an opportunity of inspecting the brakes in actual practice. J. B. Ellicott, general manager of the company, was present at the Convention, assisted by C. A. Ball and Pettey & McCutchen, eastern agents of the company.

THE DUQUESNE FORGE COMPANY, of Rankin, Pa., had four sets of forged steel, split axle gears on exhibition. This

and gives the car a neat and attractive appearance. F. H. Henry had charge of this exhibit.

F. H. NEWCOMB, of New York, who confines his entire attention to making uniform caps of every description for firemen, policemen, conductors, motormen, trainmen, expressmen, etc., showed a few of his standard styles of caps. Mr. Newcomb is now supplying the employees of many large companies with caps, including the Postal Telegraph, the New York Central & Hudson River Railroad Company, and the Metropolitan Street Railway Company, the Nassau Electric Railway Company, the Burlington Traction Company, of Burlington, Vt., the Schenectady Railway Company and many others.

THE VAN WAGONER & WILLIAMS HARDWARE COMPANY, of Cleveland, Ohio, through its representative, Chas. N. Wood, showed a handsome board filled with polished commutator segments for different types of machines, also a



EXHIBIT OF L. C. CHASE & CO.



EXHIBIT OF CONSOLIDATED CAR FENDER CO.

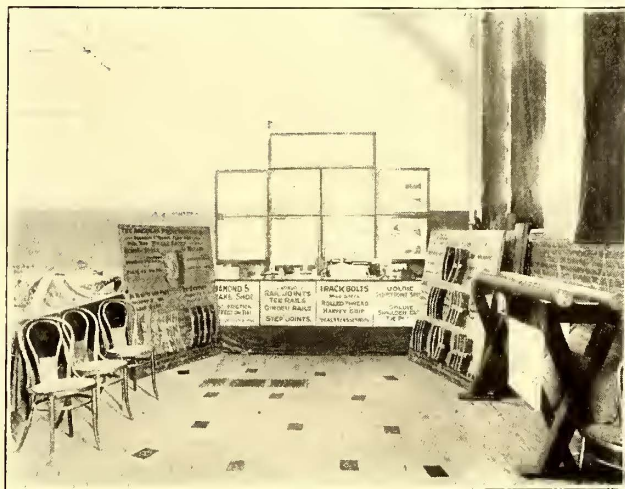


EXHIBIT OF W. F. ELLIS



EXHIBIT OF ALBERT & J. M. ANDERSON MFG. CO.

company makes gears for all the standard types of motors, and is prepared, it is stated, to furnish the trade not only with pinion gears, but also split axle gears, made of a grade of steel specially suited to the purpose, thereby insuring greater strength, less weight, uniformity and entire absence of blow holes and other imperfections. David S. Bissel, president, and J. C. Parsons and J. B. Van Wagener looked after the interests of the company.

HEYWOOD BROTHERS & WAKEFIELD COMPANY, of Boston, Mass., displayed several of its regular line of seats. It also exhibited several other devices and materials which it manufactures, including folding iron end chairs for casinos, parks, pleasure resorts, etc., rattan brooms, braided coco matting for car floors, and woven rattan in rolls. The braided matting for car floors, which this company supplies, is extremely well adapted for the use for which it was designed, as it is easily cleaned and aired,

and gives the car a neat and attractive appearance. C. S. Van Wagoner, president of the company, spent two days at the Convention, conferring with his agents and meeting his customers. The Van Wagoner Company was also represented by C. J. Mayer, of Philadelphia, and George W. Provost, of Pittsburgh, and also Charles N. Wood, the New England sales agent.

THE CONSOLIDATED CAR FENDER COMPANY, of Providence, R. I., had a well-located space near that of the General Electric Company. In the center of the space were two car platforms equipped with three fenders, one finished in white enamel, one in black enamel, and one in brass plate, all three secured to a central platform. The company also showed the different parts of its fender, and gave as a souvenir a very attractive representation of an "old oaken bucket." The company's representatives present were A. C. Woodyorth, general manager; A. C.

Woodworth, Jr., superintendent, and George H. Hale, general agent.

THE ALBERT & J. M. ANDERSON MANUFACTURING COMPANY, of Boston, Mass., was represented at the convention by Albert Anderson and C. B. Pear. This company's regular line of overhead material was shown, including the West End type of hangers, insulators, ears, crossovers, etc. A recent addition has been made to the extensive line of Anderson material in the way of an insulated crossing which is made of steel. This device is in use on the lines of the Union Traction Company, of Philadelphia, and is designed to be extremely light. The Albert & J. M. Anderson Company distributed a very serviceable notebook as a souvenir.

NAUGLE-HOLCOMB & CO., of Chicago, were represented by George Weston, manager of the company's construction department, who distributed one of the neatest souvenirs seen at the Convention; it was a handsome seal card case containing a memorandum book, in which was printed the programme of the Convention, the names of the officers of the association, a list of interesting trips about Boston, both land and water, and other valuable information. The company is one of the large contracting concerns of the West, and, besides its tie, pole and paving business, undertakes the construction and complete equipment of railways of any size.

THE AMERICAN MASON SAFETY TREAD COMPANY, of Boston, Mass., exhibited samples of the non-slipping treads

railways in the country, and among the orders filled by the company are 5000 for the New York, New Haven & Hartford Railroad Company; 5000 for the Boston & Maine Railroad Company, and large orders on the Lynn & Boston and Boston Elevated Railways. Other street railways using them are the Consolidated Traction Company, of Jersey City; the Brooklyn Heights Railroad Company; Third Avenue Railroad Company, of New York, and others. N. H. Colwell, general manager, and Charles O. Hood, were present.

THE ROOKE REGISTER COMPANY, of Peoria, Ill., made its initial exhibit at the Boston convention. The Rooke register, which was described in the September issue of the STREET RAILWAY JOURNAL, is an entirely new device in fare registration, and the system was devised to provide means for registering each fare before it comes into the possession of the conductor. By this method the street car company has a record of each nickel, and all mistakes made by conductors neglecting to ring up fares are obviated. The registers aroused considerable interest, and a large number of street railway men expressed themselves favorably in regard to them. The company's representatives were G. F. Rooke, A. N. Loper and Albert Jameson.

THE INCANDESCENT ELECTRIC LIGHT MANIPULATOR & CLEANING COMPANY, of Hyde Park, Mass., exhibited a very interesting novelty in the way of a device for removing and cleaning incandescent light globes situated in inaccessible positions. This invention consists of a light telescoping



EXHIBIT OF HEYWOOD BROS. & WAKEFIELD CO.

which it has recently introduced on the market. These treads are designed to be placed on the edge of the steps of closed cars, running boards of open cars, etc., to prevent passengers and conductors from slipping. The tread consists of a thin base of steel supporting ribs between which are firmly held strands of lead of equal height with the steel ribs. The tread is almost indestructible, and when once placed in position will require no further attention for years. The interests of this company were looked after by John E. Welsh, special traveling agent.

WILSON, THOMSON & COMPANY, of Brooklyn, aroused considerable interest in their patent trolley pole catcher and reel, which was shown in connection with the exhibit of Charles N. Wood. This catcher is so designed that at whatever height the trolley wheel may be the trolley cord is always taut, thus doing away with the annoyance caused by the slack cord catching passengers, signs, headlight and bumpers. Besides this, the catcher catches the pole the instant the wheel leaves the wire, thus preventing damage to the overhead work or to trolley pole, fork or wheel. The interests of this company were looked after by Messrs. Wilson, Thomson and Held, of Brooklyn.

THE R. BLISS MANUFACTURING COMPANY, of Pawtucket, R. I., showed a sample of its Wood's patent car gate. This gate has been adopted on some of the large steam and street



EXHIBIT OF W. T. VAN DORN AND ROOKE REGISTER CO.

pole having at the end nippers which are designed to grasp the electric light bulb, and mechanism is provided for turning these nippers. In this way the bulb can be removed or thoroughly cleaned as desired. With this device it is possible for one man to operate, keep burnt out lights replaced and clean a large number of globes without the aid of ladders of any description. Joseph J. Dunn, manager of the company, was in attendance.

THE BOSTON ARTIFICIAL LEATHER COMPANY, of Boston, Mass., made a very attractive exhibit of its material for car curtains, seat covering, etc., this being the first time that it has ever been represented at a street railway convention, although it is well known among steam railway officials. This company's material is known as "Moroccoline" and is an excellent substitute for leather. Six cross seats were shown, together with one side seat, all of which were covered with "Moroccoline" of different shades. This company also exhibited a dozen rolls of its material draped in such a way as to make a very attractive background for the exhibit. The interests of the company were looked after by the manager, Walter M. Dole, who was assisted by Albert E. Prince.

THE CHARLES SCOTT SPRING COMPANY, of Philadelphia, had one of the most tasteful exhibits at the Convention, and it was a center of interest for the visiting delegates. The space



was a prominent one, near the General Electric globe, and was railed off with colored spiral springs joined together and supported on ornamental bases. In the center of the exhibit were three large leaf springs, nickel, and surrounding these were various other types of springs both elliptical and spiral, of different forms, attractively arranged. A number of potted palms added to the effect. The company distributed a souvenir in the form of a pocket memorandum book handsomely bound in leather, which was much sought after. The representatives present were D. S. Roche and H. C. Johnston.

THE R. D. NUTTALL COMPANY, of Allegheny, occupied a prominent position in the exhibition hall, and in the minds of all who saw its exhibit. The space was attractively surrounded by gears and pinions of various sizes mounted on racks. The gears represented the latest types manufactured for the different motors recently placed on the market, as well as for the standard types in general use. The exhibit of trolleys was a particularly interesting one, as the company is sole licensed manufacturer of trolley poles. Five of these trolleys were shown. In the interests of the company at the Convention were F. A. Estep and George W. Provost, of Pittsburgh; C. J. Mayer, of Philadelphia; Charles N.

THE ELECTRICAL INSTALLATION COMPANY, of Chicago, which is among the most prominent railway contractors in the West, was ably represented by the general manager of the company, J. A. Brett, having been actively engaged in electric railway work since 1886, when he was an apprentice in the shops of the Sprague Electric Railway & Motor Company, then in New York. Mr. Brett may be classed as a pioneer, and there are few men in the country who have been allied with electric railway work as long. The Electrical Installation Company is now engaged on its one hundred and first railway contract, a record that indicates a vast amount of work, and explains the wide acquaintance which Mr. Brett enjoys, and which was plainly apparent at the convention. The company's headquarters were at Suite 118, Brunswick Hotel.

THE LACONIA CAR COMPANY WORKS, of Laconia, N. H., intended to make an exhibit at the Convention, but, owing to the large amount of work which this company had on hand, it was found impossible to carry out its plans. Ernest W. Hall and J. Emel Johnson attended the Convention. Mr. Gilman, the company's manager, also intended to be present, but was detained through important work outside. When the new section of the



EXHIBIT OF R. WOODMAN MFG. & SUPPLY CO.



EXHIBIT OF BOSTON ARTIFICIAL LEATHER CO.

Wood, of Boston; A. S. Partridge, of St. Louis, and Edgar A. Newman, of Newman & Spranley, of New Orleans.

THE LAP JOINT RAILWAY TRACK COMPANY, of New York City, exhibited a wooden model of its system of laying lap joints. This system aroused considerable interest among the street railway men in attendance at the convention, and the company received many endorsements from superintendents and engineers who examined it. The chief claims made for this system of track construction are economy of cost in first installation and economy in maintenance and renewal. It is also claimed that low joints are impossible and that no spreading of the track can occur, also that absolute electrical continuity is obtained without wire bonding. The Lap Joint Railway Track Company was represented by T. H. Gibbon, chief engineer, who fully explained all the details of the system to those interested.

THE NEW HAVEN CAR REGISTER COMPANY, of New Haven, Conn., showed a number of different types of New Haven Registers, one of particular interest being devised for use on two connecting roads running cars over each others lines. This register keeps the record of each company entirely separate. Registers were also shown for making separate records of five cent fares and transfers and of five cent fares, transfers and ten cent fares. These registers will be found of particular value to roads having more than one rate of fare. There was also shown at this exhibit a new duplex counter for the use of warehouses, merchants, etc., in keeping a separate record of each lot of goods handled, and also a total record of the whole. The company was represented by Wm. M. Anthony, F. C. Boyd and J. S. Bradley.

Boston Subway, which runs to the Union Station, was opened recently, is was inspected by the railway officials and a number of invited guests, including the Governor and his council. The president of the Boston Elevated Railway Company gave orders to have five of the best cars used on this trip, and it is interesting to note that all of the five cars used were built by the Laconia Car Company Works.

THE HALE & KILBURN MANUFACTURING COMPANY, of Philadelphia, Pa., showed a new car seat of the "Walk-over" type, which is constructed without ironwork at the end nearest the aisle, all of the slideways being placed under the seat. This construction enables the seat cushion to be brought the entire length of the seat, and also gives about 3 ins. more aisle room. Another valuable feature of this seat is the fact that the seat cushion does not change its position when the seat back is moved from one side to the other, but simply tilts in order to give it proper inclination. The Hale and Kilburn Company also showed a patented grip handle for the car seat backs, making it possible for passengers to secure a good support without having to hold on to the car straps. This grip or handle is made of bronze, nickel plated. H. T. Bigelow, of Chicago, had charge of this exhibit.

THE AMERICAN BRAKE SHOE COMPANY, of Chicago, had on exhibition several of the "Diamond S" brake shoes. These shoes are made by casting soft iron around a bundle of expanded steel sheets cut into diamond shaped meshes; this construction, it is claimed, securing for the shoe all of the advantages of a plain cast shoe with greatly increased friction. The "Diamond S" shoes are now in use on a number of large street railway systems,

and they are entirely fulfilling the guarantee of the manufacturers. A sample board was shown in connection with this exhibit, on which were displayed a number of new and worn out plain iron shoes and "Diamond S" shoes. The comparison between the average service and the average mileage of the cast iron shoes and the "Diamond S" shoes was very much in favor of the latter. This exhibit was made in connection with the exhibit of W. F. Ellis.

THE FRANK RIDLON COMPANY, of Boston, made an exhibit of a large and complete variety of assembled segments ready for slipping on to the commuters. This display was made in connection with the exhibit of Charles N. Wood, the sales agent of this company.

THE HAMPDEN CORUNDUM WHEEL COMPANY, of Brightwood, Mass., had on exhibition one of its car-wheel grinders. This grinder is arranged to do its work without dismount-

Current was conveyed to a one-sixth size, completely equipped car operating over about 150 ft. of track, with all sorts of curves and grades, and the working of the miniature system seemed to be in every way successful. The space allotted to the company was almost constantly occupied by interested spectators, among whom railroad men were very much in evidence. The company was represented by John McLeod Murphy, inventor of the system; E. V. Baillard, who built the model road shown, and by Gustavus Kahn, William Devoe and John J. Cokely. It is stated that a controlling interest in the stock of this company has been purchased by Emerson McMillin & Co., of New York, who will soon construct a full working system of several miles in length as a demonstration of its safety and efficiency.

THE DEARBORN DRUG & CHEMICAL WORKS, of Chicago, were represented by Robert F. Carr, who gave away some handsome paper cutters, match boxes and some of the neatest ad-

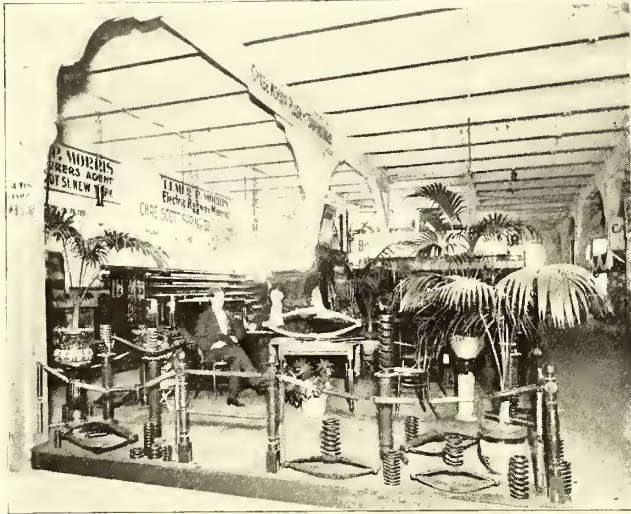


EXHIBIT OF CHAS. SCOTT SPRING CO.

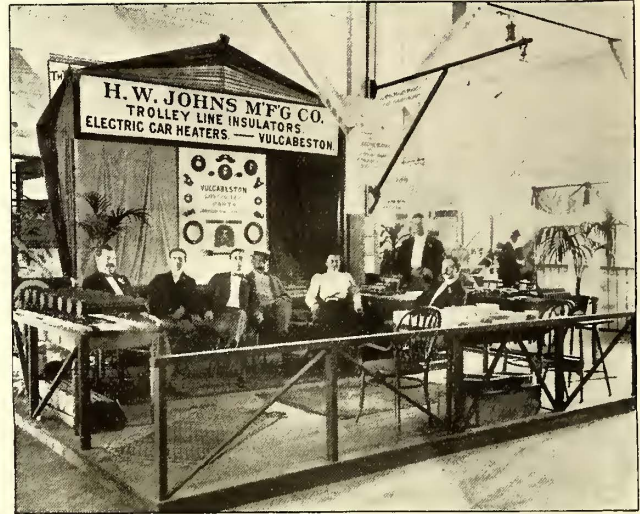


EXHIBIT OF H. W. JOHNS MFG. CO.



EXHIBIT OF WM. WHARTON, JR. & CO.



EXHIBIT OF SAFETY THIRD RAIL ELECTRIC CO.

ing the wheels from the car, thus saving much time and labor in the car house. The essential for performing this work satisfactorily, the company claims, is that the car wheel must be revolved at a very slow speed; that is, not less than 3 or more than 20 r.p.m. The Hampden grinder is arranged to revolve the wheel at this speed by means of a small friction wheel, and at the same time the car wheel is ground by an emery wheel. Power can be furnished either by an old electric motor or by a belt from a line of shafting. The company has had excellent success in the introduction of these grinders, and has an especially large demand from abroad, two of its heavy type of grinders having recently been shipped to England. The company was represented at the convention by Charles Nicholson.

THE SAFETY THIRD RAIL ELECTRIC COMPANY, of New York, displayed in a 21 ft. x 39 ft. space, in the lower exhibition room, a complete miniature working model of its system.

vertising pamphlets seen at the Convention. This company is doing a very successful business with the large manufacturing interests and street railways, treating boiler feed waters for scale formation, corrosion, pitting and the general troubles experienced with boilers. Their laboratories in Chicago are the most completely equipped on the continent, and their lubricating oil department has, within the past few years, grown to very large proportions. Street railway men are every day coming to believe that the highest grade of lubricants are the most economical and satisfactory. This company is interested in the Tyonia oils of Pennsylvania, and, with its extensive laboratory facilities, is testing each shipment and preparing special oils to suit the varying conditions met with. It will repay any steam user to visit the company's institution in the Rialto Building, Chicago.

WILLIAM WHARTON, JR., & COMPANY, Incorporated, of Philadelphia, had a very extensive exhibit of its special

work. This exhibit was made in connection with the Wharton agents in Boston, Harrington, Robinson & Company, and attracted much attention. The special work was of the manganese steel type, and included a switch, mate and a frog of manganese steel, a Wharton unbroken main line switch and mate, and Carver tongue switch with spring attachment; also switches, mates and frogs of other types. One of the novelties this year was a frog and mate cast solid of manganese steel. The center of the space occupied by the company contained a spring split switch for T-rail track and a Pennsylvania standard steel railroad crossing, which is probably the most elaborate steam and street railroad crossing in use. The company was represented by William Wharton, Jr., president; F. P. Howe, first vice-president, and V. Angerer, second vice-president; also by J. C. Robinson and J. B. Robinson, of Harrington, Robinson & Company.

WILLIAM F. ELLIS, of Boston, Mass., had an attractive exhibit, near the entrance to the meeting hall, of the various apparatus for which he is agent. Conspicuous among these was the Diamond S brake shoe. These shoes, of which a full line was shown, were arranged on two panels in a tasteful design, and their records in service were given. Mr. Ellis also showed some samples of the continuous rail joint for T and girder rail. This joint is employed on the Boston Subway, and is well liked in that city.

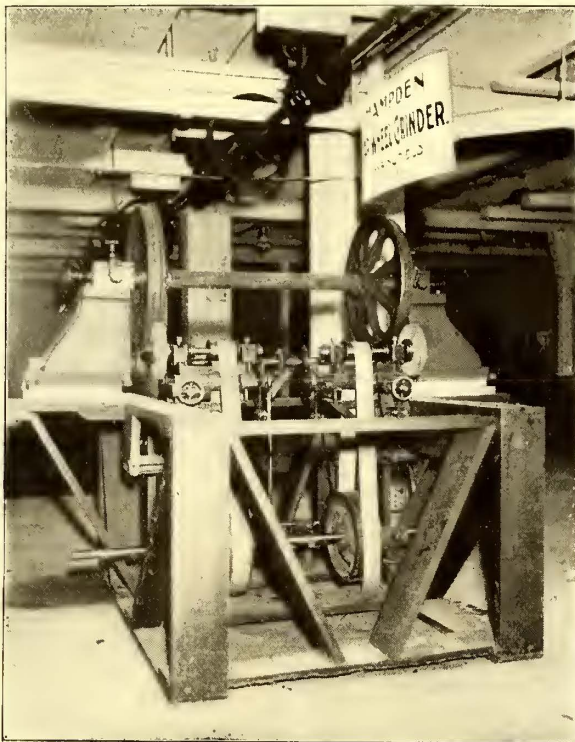


EXHIBIT OF HAMPTON CAR WHEEL GRINDER

A line of steel car axles made by Dilworth, Porter & Co., of Pittsburgh, and of Goldie perfect point spikes, completed the exhibit of Mr. Ellis, which was one of the most interesting at the Convention. In the background of the exhibit were shown photographs of the Boston Terminal, Metropolitan Elevated Railway, of Chicago, and Boston Subway, with samples of continuous rail joints, Goldie claw shoulder and tie plates, spikes and Sternbergh Harvey Grip rolled thread steel bolts, that are in use on the tracks of the Boston Subway.

THE H. W. JOHNS MANUFACTURING COMPANY, of New York, occupied space not far from the center of the convention hall, opposite the Westinghouse space. On one side there was a table showing the company's new cross seat heater of quite a novel type. In the rear of the exhibit was a seat arranged to represent the longitudinal seat of a street car. This seat was equipped with three types of heaters, two of the panel type and one cross seat heater. Above the exhibit was an all-steel flexible bracket. This bracket contained no malleable or cast iron, the flexible feature being secured by the use of two springs at the base of the brace. Three exhibition panels showed types of controller parts made of vulcabeston, and various overhead parts made by the company. Other objects shown were specialties of moulded mica, such as switch parts. Those present were J. Emory Meek, S. Glenn Meek and J. Hall Berry, of New York; H. C. Spalding,

of Boston; J. W. Perry and D. T. Dickson, of Philadelphia, and E. B. Hatch and Herbert Luscomb, of Hartford.

THE E. T. BURROWES COMPANY, of Portland, Maine, had a display of car curtains that attracted a great deal of attention. The different styles of curtains were exhibited in a large revolving mahogany stand, which showed to good advantage the different patterns of curtain material and the different fixtures and holding devices. The Burrowes No. 3 curtain holding device is a very simple mechanism, and has a number of excellent features. A curtain equipped with it may be operated by pressing two small handles together, thus saving the bottom finish of the curtain from the wear of constant handling. The device is adjustable to varying widths of window openings without the use of tools. The spring tension on the bearing points may also be regulated by simply screwing the tips in or out. The curtain material manufactured by the E. T. Burrowes Company is known as Oakette, and is a durable material, which can be supplied at low cost, and possesses unusual wearing qualities. It may be washed with water and a sponge, and thus kept bright and new for years.

THE GOLD STREET CAR HEATING COMPANY, of New York, had an attractive location in one corner of the building and made a very interesting exhibit of its different types of

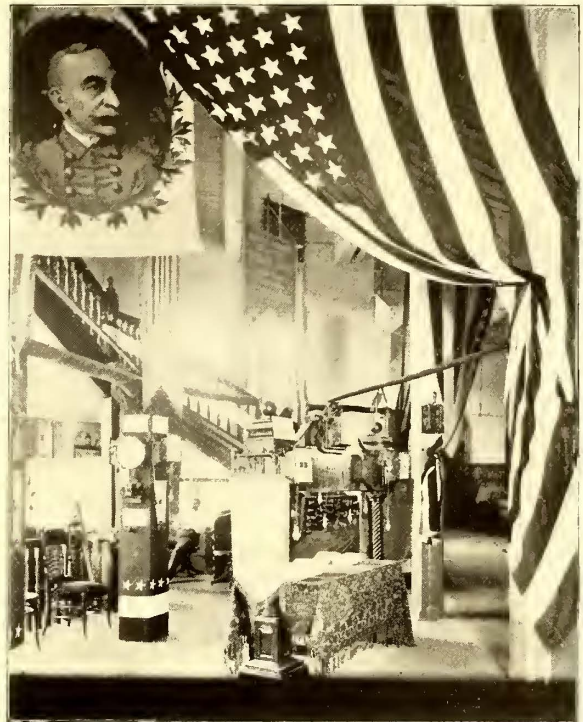


EXHIBIT OF NEW HAVEN CAR REGISTER CO.

electric heaters, the basis of which consisted of the Gold improved support, which has been described in the STREET RAILWAY JOURNAL. Also shown was a large blower heater, using about 2500 watts at the maximum heating point, it having three gradations of heat. The air is forced through this heater by a Lundell motor, and the heater discharges about 300 cu. ft. of air per minute heated 250 degs. It is adapted for heating waiting rooms, buildings, etc. The company also showed its three degree panel heater, large and small sizes, and an assortment of Gold standard heaters for cross seat and longitudinal seat cars, also a number of other types and ornamental heaters for room heating purposes. As a souvenir, the company presented a leather bound memorandum pocketbook. The interests of the company were well cared for by E. E. Gold, John E. Ward, H. E. Beach, E. H. Mossgrove and Fred D. Weston.

THE COLUMBIA MACHINE WORKS, of Brooklyn, N. Y., exhibited an extensive line of railway specialties which it manufactures. This included commutators for all types of motors and various commutators were shown in the exhibit. Adjoining the commutators were controller handles for General Electric and Westinghouse equipments, motormen's gongs, gears, trolley stands, bells, and a new type of overhead line anchor, which attracted much attention. The company also showed a Kilbourn sand box or feeder. This works on a somewhat novel principle, in

that the movement of the treadle moves a diaphragm back and forth. This forces the sand over a partition, which otherwise prevents the sand from going over by gravity. Another advantage claimed for the box is that it is all open so that the sand does not gather moisture or freeze; in fact, it is said that sand which is placed in the box wet will become dry and the spout can also be easily taken off. In the company's interests at the Convention were J. G. Buehler, W. R. Kirschner, James Grady, W. H. Kilbourn and E. H. Morgan.

THE WEBER RAILWAY JOINT MANUFACTURING COMPANY was represented at the Convention by Richard Devens, and its exhibit was a simple but striking one, consisting of three of its joints as actually applied to rail sections in common use. One was 9 in. girder joint, largely used by the North Jersey Street Railway Company (formerly Consolidated Traction Company of New Jersey), which is very similar to that used also on the Brooklyn Heights Railroad system. The second was a 6 in. girder

struction similar to that of an open car, except that they are bent into a curve such as to permit of the sides rolling up from the car sills into the roof above the ceiling. In these sides are windows of the usual size, but jointed in such a way as to conform to the path taken by the complete side as it rolls into the top. The car was 22 ft. 3 ins. in length of body and 31 ft. 9 ins. over all, with vestibules, and had sixteen seats, seating thirty-two passengers, with a center aisle 19 ft. in width. Its total loaded capacity is about eighty passengers. It requires but five minutes to roll the sides up or down, thus changing the car from closed to open, and vice versa. The company was represented at the Convention by O. W. Marshall, of the New York office. Mr. Briggs, of the Briggs Carriage Company, the builder of the car, was also in attendance, as also George Moore, the inventor of the duplex car.

THE CORNING BRAKE SHOE COMPANY, of Buffalo, N. Y., limited its exhibit to special types of shoes, as it was thought that the standard types were so well known as not to

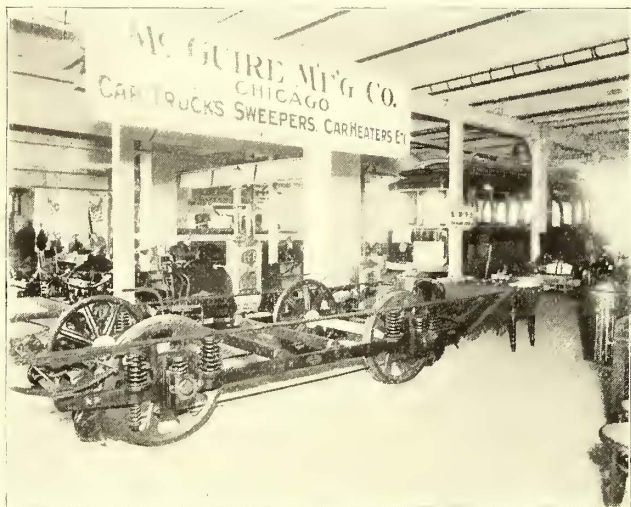


EXHIBIT OF M'GUIRE MFG. CO.

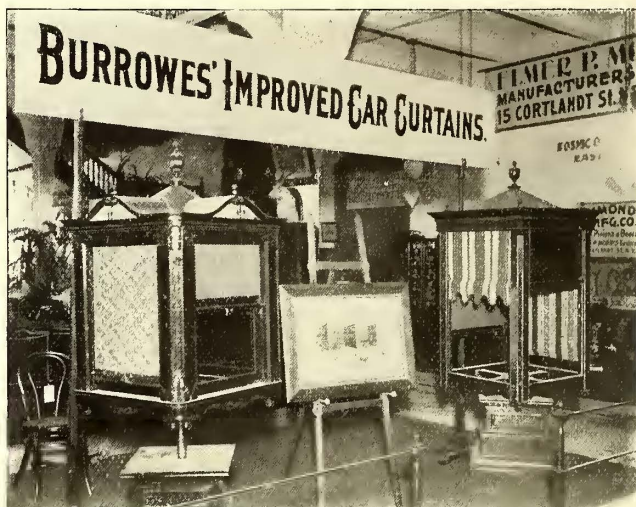


EXHIBIT OF E. T. BURROWES CO.

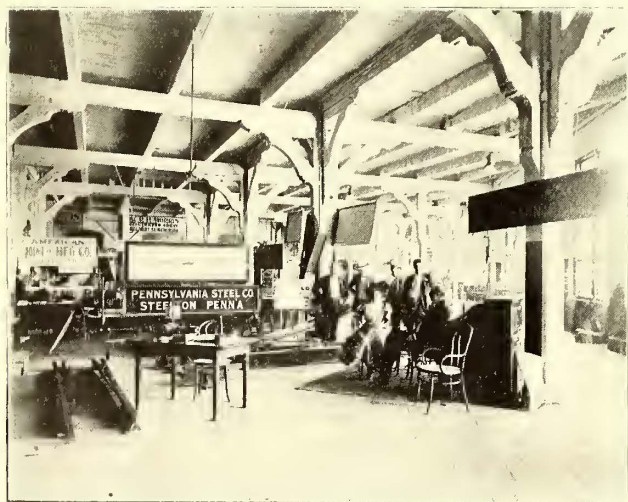


EXHIBIT OF PENNSYLVANIA STEEL CO.

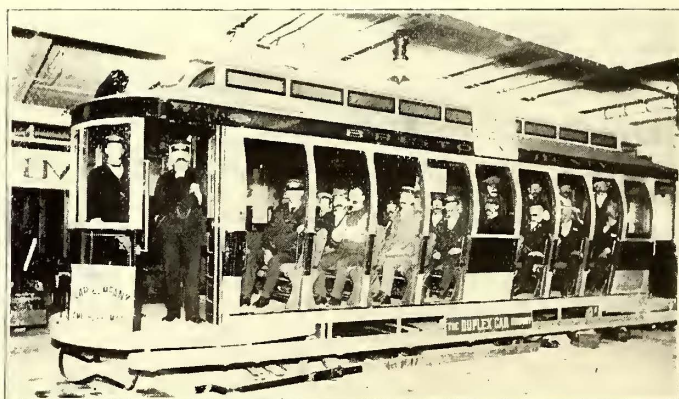


EXHIBIT OF DUPLEX CAR CO.

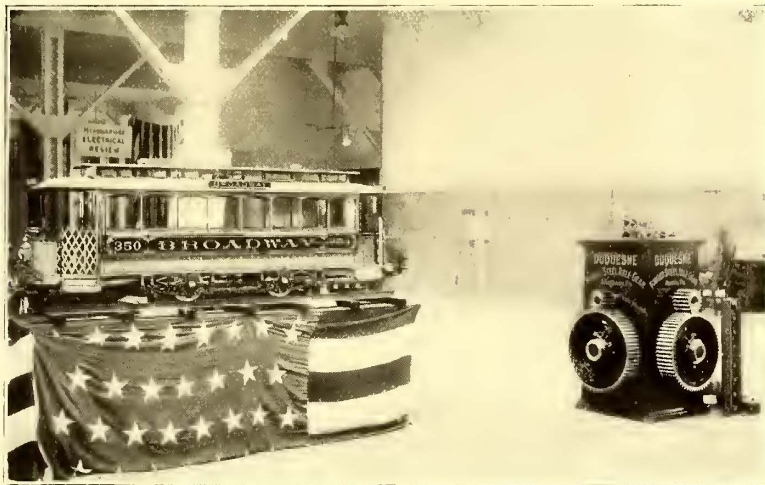
rail joint, used by the Lynn & Boston Railroad Company. The third was an 80 lb. T rail joint (A. S. C. E. section), adopted as a standard by the South Side Elevated Railroad Company (the "Alley L"), the Lake Street Elevated Railroad Company, and the Northwestern Elevated Railway Company, all of Chicago. Public testimony to the value of the Weber joint in street railway service has recently been furnished by not a few street railway managers, among them being D. F. Carver, assistant engineer of the Brooklyn Heights Railroad Company, in a paper before the New York State Convention, at Manhattan Beach.

THE DUPLEX CAR COMPANY exhibited its newest type of car, adapted for both summer and winter service, and one of a number just built for the Bibber-White Co., of Boston. These cars are made on the roll top desk principle, the side posts being of con-

quire any special attention. One of the special shoes shown was an interchangeable maximum traction shoe. This was so designed as to do away with the use of special right and left handed shoes. Another shoe shown was one made for the Meriden electric railway and having an extra deep lip. Another was one supplied to the Coney Island & Brooklyn Railroad for an inside hung brake. Another was a long shoe for increased friction made for the Albany Railway. The company also showed a standard Manhattan Elevated Railway shoe, which it manufactures. Upon a table in the exhibit were shown different styles of inset blocks in various sizes made of soft gray iron around which is cast the body of the shoe, which is chill hardened iron. The souvenir of the company was a pair of inside and outside registering calipers. Francis Granger, of New York, and H. T. Mercur, of Buffalo, were present in the interests of the company.

THE PENNSYLVANIA STEEL COMPANY, of Steelton, Pa., exhibited a switch, mate and frog, of its "Adamantine" cast steel, special work, from a layout of the Boston Elevated Railway Company. This company uses the "Adamantine" special work to a large extent on its system, and with very satisfactory results. There were also shown samples of built-rail special work, consisting of a 350-ft. radius "Carver" switch and mate, and a standard frog. A complete steel tie with drop forged steel brackets complete was an interesting feature of the exhibit. The Pennsylvania Steel Company reports large sales of these steel ties during the year, an indication of the gradual change to European practice in laying permanent track in concrete. There were also samples of brace tie-plates, and other track fixtures, and a spring ground throw for split switches, which has become quite a favorite with street railways for suburban lines. The Steel Company was represented by its Boston agents, Chas. S. Clark and Wm. C. Curtz; Stephen W. Baldwin, its New York agent; Chas. W. Reinaehl, traveling agent, and Mason D. Pratt, chief engineer.

THE JOHN STEPHENSON COMPANY'S exhibit occupied space near the center of the main floor of the exhibition hall, and consisted of a complete model of a Broadway cable car built to scale of one-sixth. The car was very carefully constructed with respect to finish and detail, and lacked nothing in equipment which goes to make up the most thoroughly modern cable car of the period. At one end of the car was shown a Sterling fender; at the other a fender of the Providence type. Minute Sterling sand boxes



EXHIBITS OF JOHN STEPHENSON CO. AND DUQUESNE FORGE CO.

and registers, Millen brakes and Pintsch gas lamps were interesting features of the car's equipment, and the whole was mounted upon a beautifully finished standard truck of Peckham's make. The car was certainly one of the most interesting features of the entire exhibition and received careful inspection from many street railway men. As an example of good workmanship and judicious advertising, it could hardly have been surpassed. The company distributed as a tasteful souvenir a leather bound memorandum book. The representatives present were J. T. Whittlesey, Elias Vander Horst, W. G. Howle, Percy Hodges Words.

THE COMPOSITE BRAKE SHOE COMPANY, of Boston, showed a full line of its brake shoes with cork insets, including some made for the Boston & Maine Railroad, which had run for over 32,000 miles, and, according to indications, were good for 50 per cent more life. Another shoe which had been in actual service on the Boston & Maine road and which was shown, exhibited black spots in the iron, showing that the shoe had been raised to a high heat, nevertheless the cork insets were not affected and did not seem even scorched. Among the street railway shoes exhibited by this company were some from Worcester, Providence, New Haven, Fall River and the Boston Elevated Railway. These all showed uniform wear. The object which attracted most attention in the exhibit was a sign on which it was stated that fully three-fourths of the street railways in New England were using the "Compo" brake shoes. As a souvenir, the company presented a small paper weight modeled in the form of a brake shoe. W. W. Whitcomb, president of the company, was present and explained the merits of the shoe to visitors. Frank Bruen, of the Sessions Foundry Company, of Bristol, Conn., was also present.

THE CREAGHEAD ENGINEERING COMPANY, of Cincinnati, as usual, had a very attractive exhibit of its overhead line materials. The Creaghead flexible bracket, which is so well known, was shown in a great many styles, covering every requirement for bracket construction of high speed interurban roads or for center pole construction on city lines. The company exhibited many photographs showing its brackets in use on many well-known roads. Its line of trolley and strain insulators is complete and attracted special attention on account of the strength and simplicity of design. Special merit is claimed in the design of its trolley wire hanger. This hanger does not shake loose on the line and the insulating material is distributed to give the greatest strength. The hanger is provided with solid metal cover, into which the insulating compound is moulded. This company manufactures all kinds of pole line fittings and construction material for overhead construction. Pole clamps, pole tops, malleable cross arm clamps for iron poles, eyebolts, turnbuckles, section insulators, crossings, trolley ears and other similar devices formed

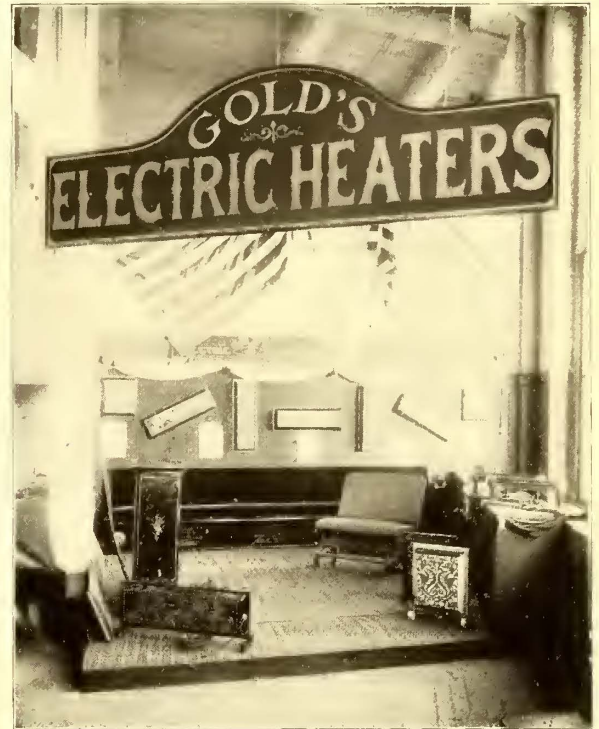


EXHIBIT OF GOLD STREET CAR HEATING CO.

no small part of this exhibit. The display was in charge of George R. Scrugham, superintendent. The souvenir of the company was a neat steel pocket rule in a leather case, and was in great demand.

THE MCGUIRE MANUFACTURING COMPANY, of Chicago, represented by M. G. Hubbard and W. J. Cooke, exhibited a number of Columbian heaters for use on the floor of cross-seated cars, and also styles to be set above the seat, for cars where the seats run along the side. A new solid steel truck, which is very simple and strong, was also shown. The company also exhibited its positive lock brake handles, which cannot slip, are practically noiseless, and have no springs in their construction. At the entrance of the exhibit hall was placed a McGuire combination sweeper and snow plow. The company is in possession of a number of letters testifying to the value of these plows. One of these is from Mr. Hall, of the Union Railway Company, of New Bedford, Mass., stating that he had rather attempt to operate a road in winter without all other appliances for removing snow than to be without a McGuire sweeper, because it will keep the road open in the worst of storms. He stated that the one he owned had paid for itself twice over in two winters. The catalogue which the McGuire Company issued describing its stoves was one of the neatest given out at the convention.

THE NEW YORK CAR WHEEL WORKS, of Buffalo, N. Y., had a very attractive exhibit of their standard "Machined" wheels for electric and cable service. These included all diameters from 12-in. wheels used under transfer tables to 36-in. wheels intended for sweepers and snow plows on electric roads. Their interurban type of wheel, weighing 425 lbs., especially designed for

roads running heavy cars at high speeds, is being widely adopted for this purpose, the single plate being found to take up the heat generated by the action of the brakes at high speeds very uniformly, owing to the even distribution of the metal. A most interesting and unique feature of the exhibit was the pyramid of electric tramway wheels ranging from 12 ins. to 36 ins. in diameter, weighing in all 2950 lbs., and suspended from a cast-iron test bar 1 in. square and 12 ins. between supports, made from the same metal as the wheels. A similar bar is cast by this company representing every wheel made, and this is broken in a regular testing machine, giving them an exact knowledge of the strength of the iron in the wheel before it is shipped. It is an excellent commentary on the quality of the metal that the bar stood this continued strain for so long a period as five days.

THE OHIO BRASS COMPANY, of Mansfield, Ohio, had a very tastefully designed booth in which were exhibited to good advantage the many different specialties which this company sup-

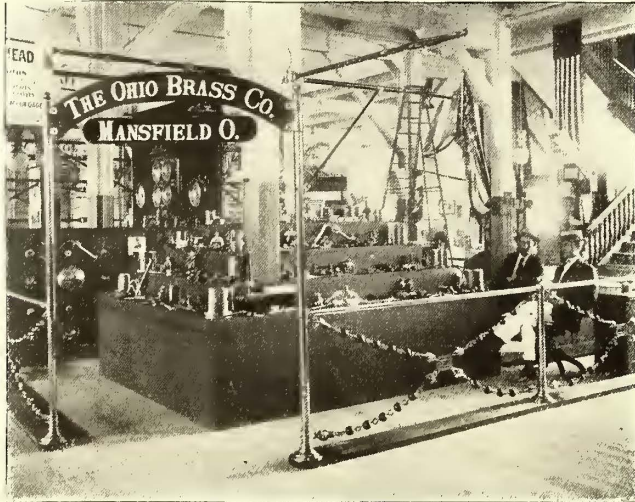


EXHIBIT OF OHIO BRASS CO.

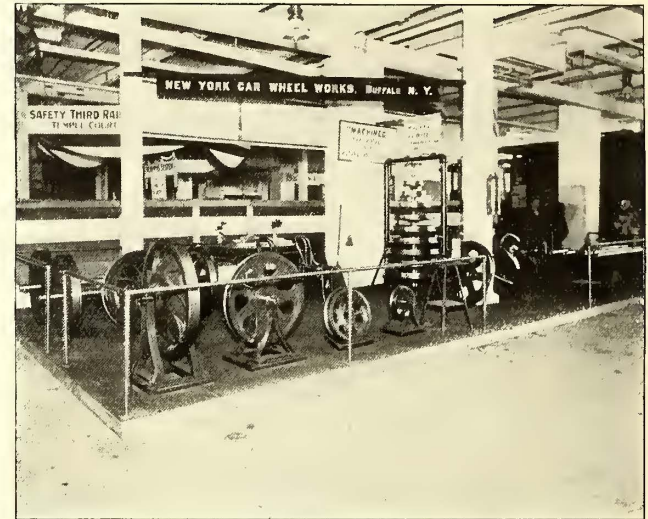


EXHIBIT OF NEW YORK CAR WHEEL WORKS.

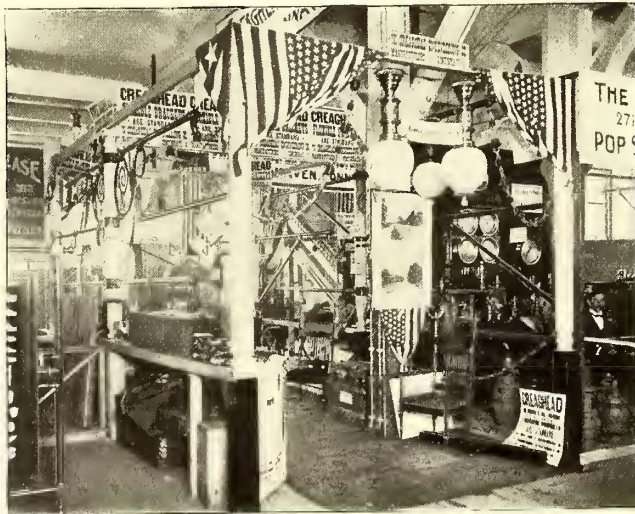


EXHIBIT OF CREAGHEAD ENGINEERING CO.

plies. The devices shown included samples of Globe, Mansfield and Brooklyn strain insulators, special designs for suspending and splicing figure eight trolley wire, special arrangements for double trolley wires over single track, strainers and insulators for curves, special wide-arm type D hangers which are provided with scalloped cap feeder wire splicers, swivel pipe bracket hangers, new washers for hangers, which prevent unscrewing, and new designs in cap and cone connections. This company also showed samples of its flexible pole brackets, motor bearings, headlights, gongs, canopy switches, Garton lightning arresters and track brushes and brush holders. One of the interesting features of this exhibit was the railing around the booth, which was composed of Globe and Brooklyn insulators. This company distributed to the delegates and visitors, a very neat souvenir in the way of a stick-pin, representing a miniature Walker trolley car. C. K. King, secretary of the company,

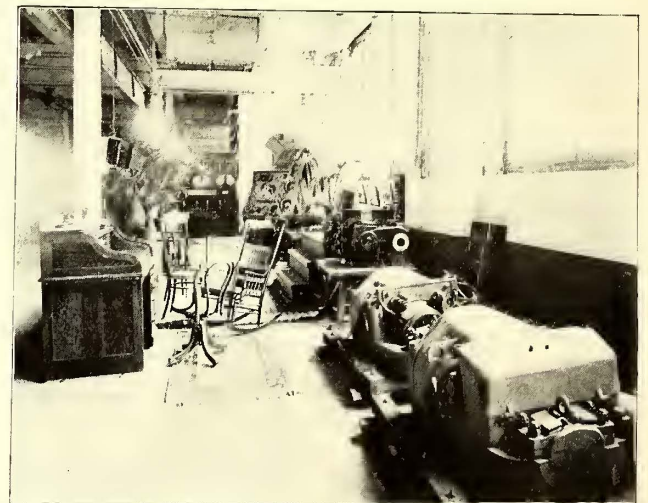


EXHIBIT OF WALKER CO.

and A. L. Wilkinson, special representative, looked after the interests of the Ohio Brass Company at the convention.

THE WALKER COMPANY, of Cleveland, made a very complete display of electric railway apparatus. About the only exception to railway apparatus shown was an exhibit of Walker inclosed arc 100-hour lamps. The railway apparatus shown comprised the following: A three-panel four-circuit switchboard of 1200 amp. capacity; a case of armature parts showing details of construction of armatures and commutator; a stand of armatures showing completely and partially wound armatures, armatures with commutator attached, and plain core; two "33-S" railway motors, 20 h.p., one open and one closed, with controller showing solenoid blow-out; two "15-L" railway motors, 75 h.p. each, with "S-11" controllers, solenoid blow-out and double h.p. equipment; underground conduit—a complete equipment for 60 ft. of track shown, with feeder hatch connections and regular Walker construction. Upon the track was mounted a

Peckham truck with a pair of "5-L" Walker motors. The company was very well represented, officials and agents being in attendance from New York City, Cleveland, Philadelphia, Baltimore, Pittsburgh, Buffalo and Boston. Among those were Professor Short, H. McL. Harding, C. F. Black, superintendent of the New Haven factory; H. G. Issertel, M. D. Law, F. W. Sawyer, H. B. Gay, R. A. Byrns, J. Holt Gates, A. T. Moore, W. G. Bain, J. N. Dodd and John D. Moore.

THE FORSYTH BROTHERS COMPANY, of Chicago, had a very attractive exhibit this year of curtains, materials, car curtains and curtain fixtures. This company displayed its well-known roller tip fixtures in a large revolving frame with curtains of different materials and patterns. It also showed its new open street car fixture, which works on an entirely new principle. It is held at

any desired position by a spring which forces the solid tips into contact with the bottoms of the grooves and uses tape or cable merely to keep the tips or guides within the grooves. There is no wear and no mere fraying and breaking of cable. The firm also showed a new feature in its roller tip fixtures, which it makes with an adjustable arrangement to meet any possible variation in width of window. On the first of July this company's factory was burned, but it is now in larger and better quarters, and, with a large addition of new machinery, is better equipped than ever for turning out orders. Among a number of recent orders that have been given this firm are 102 cars for Chicago City Railway Company, 80 cars for Brooklyn Heights, 20 cars for Cleveland City Railway, the new cars for Toledo Traction Company, Chicago and Milwaukee Electric Railway, Ottawa Street Railway Company, Van Brunt and Erie Street Railroad and Elyria Street Railway Company. W. H. Forsyth, with the firm's Eastern representative, George E. Pratt, were in charge of the exhibit.

THE CONSOLIDATED CAR HEATING COMPANY, of Albany, N. Y., made an attractive display of its regular line of street railway heaters, two of the heaters exhibited having been in use on the cars of the Albany Railway since 1893. These early styles are very similar to the regular type that the Consolidated Car Heating Company is now making, and are in nearly as good condition as when first installed. An interesting experiment was recently tried with these heaters to determine just what degree of efficacy, if any, they had lost. The two old heaters were connected up and two new ones were also connected up under exactly the same conditions, when it was found that the heaters that had been in use for five years consumed no more current than the new ones. The Consolidated Car Heating Company has recently de-

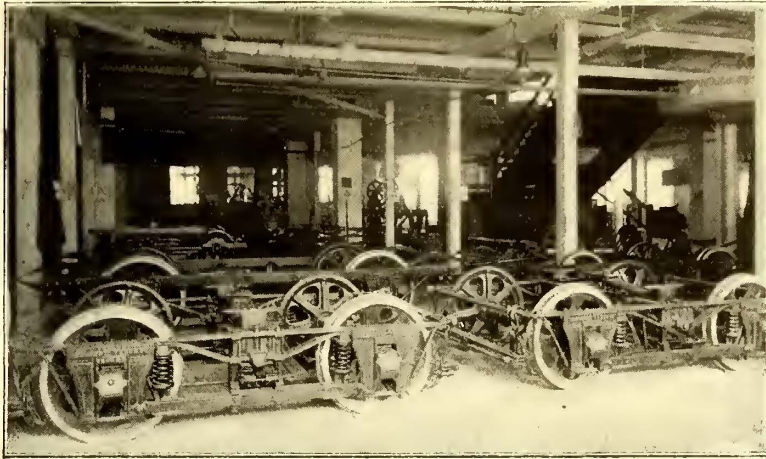


EXHIBIT OF TAYLOR ELECTRIC TRUCK CO.

vised a new form of heater which was also shown. In this type two coils are used, the advantage of this arrangement being in the fact that it is not necessary to have any cold heaters in a car when a low degree of temperature is desired. The increase in the number of sales of the Consolidated heaters is shown by the statement that on June 1, 1893, there were but 360 of these heaters in operation, and on Aug. 1, 1898, there were 31,396. The following gentlemen represented the Consolidated Car Heating Company at the convention: J. F. McElroy, consulting engineer; R. P. Scales, of the Chicago office; W. P. Cosper, of the St. Louis office, and H. N. Ransom, of New York.

CHARLES N. WOOD, of Boston, had probably the most extensive and elaborate exhibit at the Convention. As is well known, he represents in Boston a number of the prominent manufacturers of street railway supplies, and, in combination with them, made an exhibit which attracted widespread attention. One end of his space was given up to the exhibit of the R. D. Nuttall Company and the other end to that of the International Register Company, both of which are described elsewhere. In addition, Mr. Wood, as representative of the American Heating Corporation, showed a set of the well-known heaters that this company manufactures for ordinary domestic service and also for use on street cars. Another object which attracted universal interest was a patent trolley pole catcher of Wilson-Thomson & Co., of Brooklyn. A trolley pole of the standard size equipped with this catcher was shown in actual service and many favorable comments were passed on the certainty with which the device caught the pole when it was snapped up by the spring. Adjoining this pole was a panel containing an extensive line of drop forged commutator segments. These are manufactured by the Van Wagoner & Williams Hard-

ware Company, of Cleveland, Ohio, and attracted much attention. Those who prefer to purchase segments assembled paid greater attention to a set of assembled commutators, which formed part of the exhibit of the Frank Ridlon Company. These commutators were of various types used in practice.

THE TAYLOR ELECTRIC TRUCK COMPANY, of Troy, N. Y., exhibited its latest design of 7-ft. wheel base truck equipped with an equalizing brake, which has successfully and safely held cars on grades from 14½ to 15 per cent. This is being demonstrated in practice on the Quebec District Railway. The company also showed a single truck with extension trusses for long open cars. The notable feature of this truck is that it does not have to be disturbed or the trusses removed to take a pair of wheels out from the truck. This truck will successfully carry a ten-bench open car without any teetering. Another special truck shown was one with an 8-ft. wheel base, which has been in successful use for three years on curves of 30 to 35 ft. radius. The feature of this truck is that it is extra heavy, and it is designed to carry the largest single truck car bodies. In the line of double trucks the



EXHIBIT OF CONSOLIDATED CAR HEATING CO.

company showed a set of Empire State radial trucks, arranged to receive two or four motors per car. These trucks were connected complete with brake, ready for service. A special design of swing motion truck with equalizer bar, designed on the steam railway principle, was also shown. The swing motion was arranged so as to relieve any shock incurred in running short curves at a high rate of speed. The exhibit attracted considerable attention from delegates, and the merits of the different trucks were explained by John Taylor, manager of the company; G. A. Tupper and Robert Kasson.

THE CHRISTENSEN ENGINEERING COMPANY, of Milwaukee, exhibited its air brake apparatus as follows: One No. 1 compressor of 11 cubic ft. free air capacity per minute, operating one 7-in. brake cylinder through straight air valves, the pressure being controlled by an automatic controller set to carry a pressure between 60 and 70 lbs.; one No. 2 independent motor compressor of 20 cubic ft. free air compact per minute, operating through straight air engineer's valve, three 7-in. brake cylinders; one No. 4 independent motor compressor, 47.6 cubic ft. free air capacity per minute, operating through automatic engineer's valve, two 10-in. brake cylinders. The company issued as a souvenir a handsome pamphlet made up of engravings from photographs of systems where its compressors are in use, and fac simile letters from the users; some of these were from the Brockton (Mass.) Street Railway Company, Newpaltz & Walkill Valley Railroad Company, the Fox River Valley Electric Railroad Company, the Chicago Suburban Railroad Company, the South Side Elevated Railroad Company, Chicago, Baltimore & Ohio, Cripple Creek District Railway, Union Traction Company, Anderson, Ind.; Niagara

Falls & Lewiston, and others. The cars which carried the convention goes to the clam-bake at Nantasket Beach were also equipped with this company's system. The representatives present were S. W. Watkins, N. A. Christensen, F. C. Randall and W. J. Davidson.

THE SPRINGFIELD MANUFACTURING COMPANY, of Bridgeport, Conn., manufactures a large and varied line of grinding machinery. It exhibited at Boston its car wheel grinder, which is constructed to grind wheels on or off the axles, as occasion may require. After an experience in building grinding machinery of over fifteen years the company claims that too much

Brown has made an extended study of the subject of bonds, and his plastic bond is well known. Plastic material was arranged in the form of letters on the top of the glass case covering his exhibit, giving delegates an opportunity of handling it. He also had samples of all the different types of plastic bonds manufactured by him, as well as angle plates taken after two or three years' service to show the permanent character of the plastic material. In one corner of the exhibit was a hand-power flexible shaft grinder used by persons employing Mr. Brown's bonds for cleaning the rail before attaching the bond. This accomplishes in some two seconds' time what would take a very much longer time with a file. It is interesting to know that this plastic ma-



EXHIBIT OF INTERNATIONAL REGISTER CO.

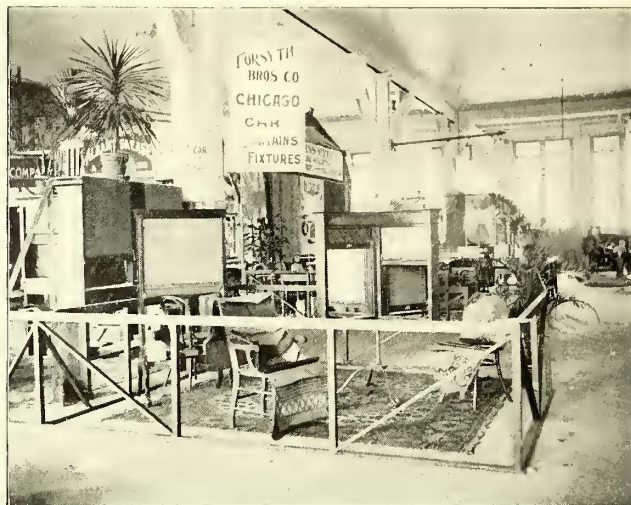
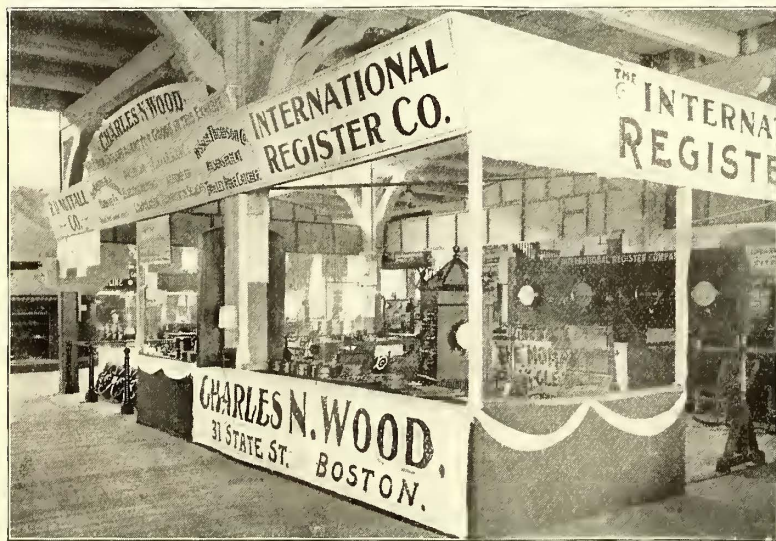


EXHIBIT OF FORSYTH BROS. CO.



EXHIBITS OF CHAS. N. WOOD AND R. D. NUTTALL CO.



care cannot be taken to avoid emery dust in the bearings. On that account the company manufactures its entire line of grinders with dust proof collars, and claims that it is much more preferable to grind the wheels dismounted than on the car. The machine exhibited was a solid machine, weighing 7000 lbs. It consisted of one solid base with tread and tail stock, and two compound slide rests, each having the Springfield pot chuck and emery rim. By the use of this chuck, it is claimed, much better results are obtained, from the fact that the same cutting speed is maintained throughout the life of the wheel, while when the grinding is done on the face of a regular wheel, as the wheel wears away and becomes smaller the cutting speed diminishes, and the work accomplished diminishes in proportion. The company also claims that by having the wheel shaft and centers on one solid base more accurate work can be obtained than in any other manner. In this machine the claim is also made that solidity is the prime factor in any grinding. The exhibit was in charge of G. W. Jackman, general manager, and Geo. E. Martin, mechanical engineer.

HAROLD P. BROWN, of New York, had, as usual, an attractive exhibit of the Edison-Brown plastic rail bond. Mr.

terial has not only been found of value for bonding rails, but also as a substitute for solder in making special connections. Thus the Bell Telephone Company, of Chicago, is using it exclusively in making contacts in special connections, believing it to be more reliable for the purpose than any other material. Mr. Brown had on exhibit a number of high testimonials from users of the bond, including the Paterson Railway Company, Niagara Falls & Lewiston Railway, and others, and as a souvenir, presented his visitors with a fac simile of \$1,000 first mortgage bond of the Up-to-Date Street Railway Company, with coupons of \$20 each, being six months' saving of running expenses due to the use of plastic bond on 400 ft. of track.

THE JOHN F. OHMER REGISTER COMPANY had one of the most interesting exhibits at the Convention, which consisted of its fare register, illustrated and described in the last issue of the STREET RAILWAY JOURNAL. The register shown will record ten different kinds of fares, but was mounted for eight, and was arranged to record three different classes of tickets, three different classes of fares, transfers collected and transfers issued. The register is made in three sizes. The smallest size is designed to



register from three to six fares, the second from six to ten fares, and the third from nine to sixteen fares. It might be thought by one unfamiliar with the register that it might be difficult to ring up various fares quickly, but Mr. Ohmer showed that this is a mistake, and that it was easily possible to ring up the different fares as rapidly as they could be collected. Another interesting statement made by Mr. Ohmer was that he would guarantee to keep office records for a road of fifty cars, using the register at one-fifth the present cost when using the ordinary register. This is possible by the recording feature of the register, as it keeps track entirely of all classes of fares registered on each trip, while relieving the conductor entirely of this work and the office of checking up the conductor's report. The register is equally adapted to double truck cars, and can be rung from either side of a single deck or either deck of a double deck car. It was constantly surrounded by interested delegates, who expressed them-

side is operated with cords. Both these machines have black dials with white figures and gold lettering, which, with the antique copper case, gives the register an elegant appearance. On the other side of the exhibition board was shown the double register as used by the Milwaukee Electric Railway & Light Company, with which the entire system is rapidly being equipped. The dial is of satin finished, pure aluminum, which has been a distinctive feature of the International machines in the past. This register is operated by two cords. Single registers, as used on the entire system of the Capital Traction Company, of Washington, D. C., were also shown. At one end of the car of this road a register with the inscription "Tickets" is used, and at the other end one marked "cash fares." The exhibit was well attended.

THE MEAKER MANUFACTURING COMPANY, of North Chicago, is a name long connected with the street railway busi-

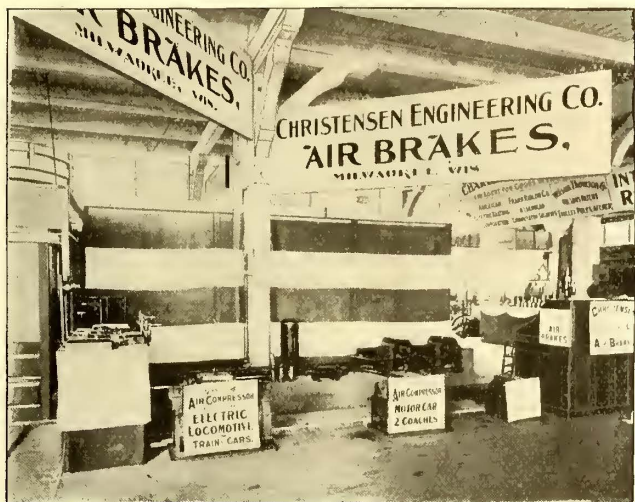


EXHIBIT OF CHRISTENSEN ENGINEERING CO.

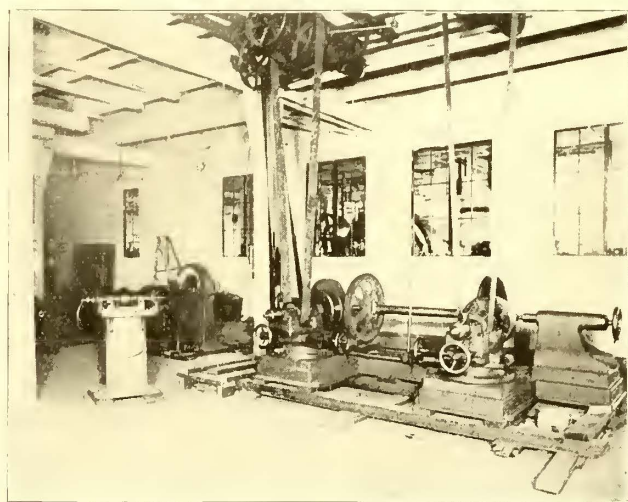


EXHIBIT OF SPRINGFIELD MFG. CO.



EXHIBIT OF MEAKER MFG. CO.

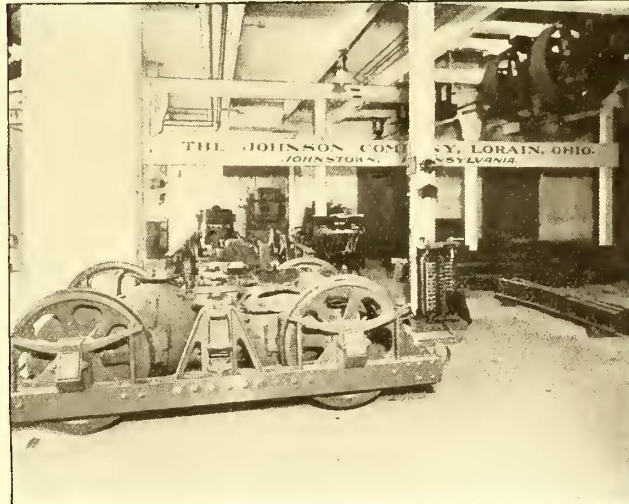


EXHIBIT OF JOHNSON CO.

selves in the highest terms as to the value of the invention. The company was represented by John F. Ohmer and Edwin Everett.

THE INTERNATIONAL REGISTER COMPANY, of Chicago, Ill., exhibited standard types of its single and double car registers; also the Pratt portable register, largely used throughout the West. The double register made by the company is now in great demand, the factory being much behind on orders for it, even after the pressure for summer equipment is over. Several different dials and operating arrangements for this machine were shown, conveniently arranged for operation, on a handsomely designed board. Among them were those used by the Brooklyn Heights Railroad Company, of Brooklyn, N. Y., registering cash fares and transfers from a single rod in closed cars, or a rod on each side in open cars; also the type of machine used on the East Boston cars of the Boston Elevated Railway Company, in which the transfer or "free" side is operated with rods, and the "cash"

ness, and the company's exhibit received a great deal of attention. The company's booth, well carpeted and decorated in the national colors, was one of the most handsome at the convention, but what attracted most attention was the new register which Mr. Meaker has just brought out. Quoting from the elegant new catalogue some of the claims for the superiority of this new register are as follows: "Nearly twenty years of experience and a careful study of the requirements of the service have enabled us to incorporate in these registers all essential features, and, in addition, a number of ideas which are entirely new. Our factory, equipped with special machinery, largely automatic, makes it possible for us to produce registers in larger quantities and, quality considered, cheaper than any one else." These new registers are practically without springs, only three being used. All motions are positive, absolute and beyond question, and the number of parts has been reduced to a minimum. A new departure is a combination of letters with figures, the former so arranged that they may be changed.

like a combination lock, making it impossible for any one not instructed to read the register. This is an additional check on the conductor; enables the checking of the bookkeeping of the office as well, and shuts out the general public from a knowledge of the company's business. The four figures employed, with a capacity of 10,000, are sufficient for daily use. Cumbersome numbers in bookkeeping are thus avoided, but all the advantages of a large totalizer are retained. A complete description of the new register, with illustrations, will appear in the STREET RAILWAY JOURNAL at a later date. The representatives of the company present were J. W. Meaker, president, and George Bean, vice-president of the company.

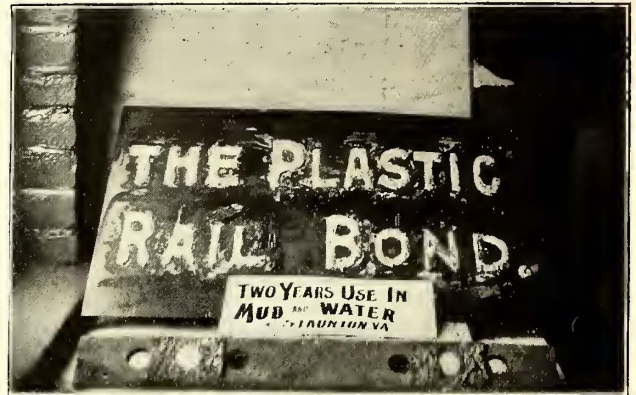
THE JOHNSON COMPANY, of Lorain, Ohio, and Johnstown, Pa., occupied a large space in the basement and were well represented by Daniel Coolidge, president, and H. C. Evans, of New York; W. W. Kingston, of Atlanta; R. Clitz, of Boston, and J. A. Rutherford and W. R. Hamlen, of the motor department at Johnstown. The rail exhibit was a particularly interesting one

parts. From the nature of the questions asked by the large number of visitors to the Johnson space, it was evident that more interest was manifested, with the view to obtaining direct information relative to motors and controllers, than at any previous convention, and, this being the case, the representatives of the company, were always ready and willing to make full explanations regarding what was on exhibition. A novel feature was the interest displayed by the motormen from the Boston roads, who were present in large numbers, examining and operating the controllers, which they pronounced very satisfactory.

THE BIBBER-WHITE COMPANY, of Boston, Mass., had a very popular exhibit located near the center of the hall in a corner space. The two back walls were fitted up with a complete line of samples, representing goods of this company's manufacture, and also "Cutter" circuit breakers, Forest City bonds and segments, New Haven fare registers, Hope double and single pole quick break switches, for which the Bibber-White Company is agent. Line material was shown manufactured in several different



EXHIBIT OF BARNEY & SMITH CAR CO.



PART OF EXHIBIT OF HAROLD P. BROWN

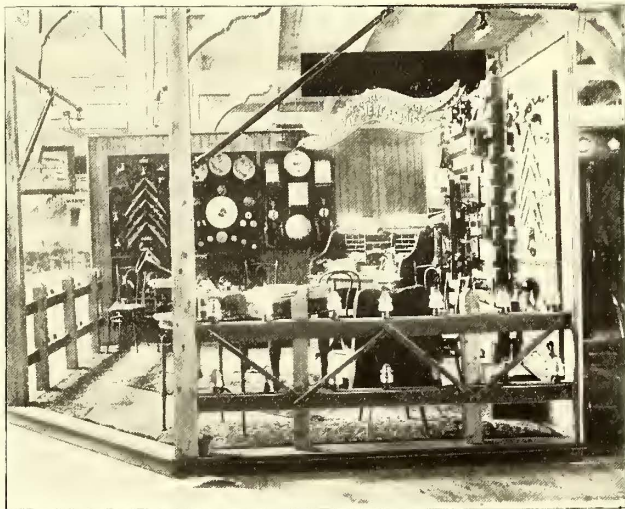


EXHIBIT OF BIBBER-WHITE CO.

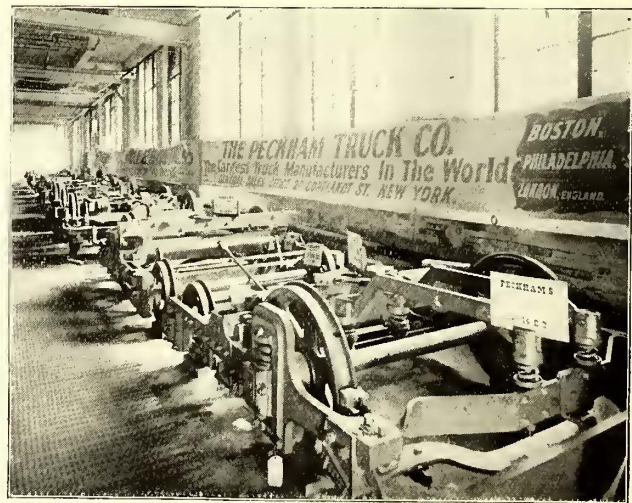


EXHIBIT OF PECKHAM TRUCK CO.

and included a solid steel steam and street railroad crossing made out of rolled billets, shaped and electrically welded together; also a Pennsylvania Railroad standard steam and street railroad crossing showing heavy forged knees to hold the parts together; also a 9-in. girder, standard single track crossing and a 9-in. crossing of guaranteed work; also a variety of tongue switches, mates, curve crossings, etc. The street railway motors exhibited in the space of the Johnson Company, comprised double equipments of 25, 30 and 35 h.p. motors. The latter two sizes were mounted on Du Pont trucks and were operated when desired. The requests made to have the motors move were many, in order that the new type controllers, to which connection was made, might be minutely inspected. The fact that no unfavorable criticisms were heard indicated that those who were interested and examined the motors and controllers were strongly impressed with the apparatus on exhibition. The 35 h.p. motors were mounted on supports with the pole pieces raised and lowered to show the accessibility to the

patterns, the cap and cone pattern being finished up in both japan and galvanized; the insulated bolt pattern finished up in bronze, japan, galvanized and agatized. This agatized material is something entirely new to the trade, and attracted a great deal of attention. By using this material a double insulation is secured, for the agate in itself is a perfect non-conductor. It is also impossible to wear off or rust. The company is also placing on the market a corrugated steel trolley pole. The object of the corrugation is to secure greater strength and less weight. That this point is obtained is clearly proven by a series of tests recently made at the Watertown Arsenal, where both transverse and compression tests showed greatly in favor of a corrugated tubing. The souvenir, which was given away to the trade, was an aluminum penholder, which represented the company's seamless cold-drawn corrugated trolley pole. The souvenir was complete with harp and wheel. The latter was of rubber, to be used as an ink eraser. The company also had on exhibition a phonograph machine,

which attracted a great deal of attention, and was heard all over the hall. A large illuminated sign over the booth was also attractive. The two side railings to the space were made of cross arms complete, with braces, pins and glass insulators. On each side of the entrance was an octagonal pole, and on each pole were attached the different styles of bracket arms manufactured by the company. The exhibit was in charge of H. W. Smith, the manager of the company's railway department. He was assisted by Chas. E. Bibber, president; E. L. Brown, treasurer; Thos. H. Bibber, general manager; David W. Dunn, Chas. F. White and Chauncey Hight.

THE BARNEY & SMITH CAR COMPANY, of Dayton, Ohio, exhibited three trucks, as follows: One class "G" standard street car truck with 6 ft. 6 in. wheel base, 4 ft. 8½ in. gage and mounted on 33 in. machined electric car wheels. These trucks are so arranged that they can be adapted to any kind of motor and all kinds of cars requiring single trucks. The arrangement of the frame, with the long spring bases and the equalizing end springs, gives steadiness and overcomes the pitching and oscillating motion so objectionable in single truck cars and produces an easy riding truck. Also shown was one of class "C" maximum traction trucks, which is designed to give the greatest amount of trac-



PART OF EXHIBIT OF E. P. MORRIS AND STERLING ARC LAMP CO.

tion, with two motors for double truck, long cars. It is claimed for this truck that 75 per cent more traction is obtained on a straight track and 60 per cent more on a curve than with the ordinary double truck. The pivot point of the truck is directly over the center of the large axle. The combination spring movement over the large journal box gives a uniform and easy movement to the body of the car. These trucks are in use in a number of the large cities and are giving excellent satisfaction. The amount of repairs on this truck is reduced to a minimum. The company also exhibited one of its class "H" double suburban motor trucks, which is so constructed that it can be made with any desired wheel base and for any style of motor. This is what is called a center bearing truck; the weight of the body is carried on the center plate located midway between the wheels. A slight clearance is allowed between the body and truck side bearing so as to allow the truck to swivel freely. The truck side bearing is provided with oil chambers for lubrication. The combination spring used on this truck gives an easy and uniform motion of the body equal to that of the standard swing motion trucks used in steam railway service. The side plates are made of soft steel, the brakes are inside hung, thereby avoiding the chattering so objectionable to brakes of the old style. The brake hangers are so arranged that all the wear of the brake can be taken up. The sample truck had a wheel base of 5 ft. 10 in. and was built with a 4 ft. 8½ in. gage and mounted on 33 in. double plate machine wheels. The company was represented by H. Tessayman and H. M. Esterbrook.

THE PECKHAM TRUCK COMPANY, of New York, had probably the most elaborate exhibit of any company at the Convention. It consisted of the entire system of Peckham single and double trucks. The single trucks have been in use so long and have established such a high reputation in street railway service that street railway managers in general are very familiar with their characteristics. This series of trucks is now complete, and includes trucks adapted for all classes of work for which a single truck is adaptable. The users of these trucks include the most prominent railways of the country, all of whom speak in the

highest terms of the great strength and easy riding qualities of the truck, together with the low cost of maintenance. Some of the double trucks shown by Mr. Peckham this year were new, and the fact that he is now in a position to supply double trucks for any character of service made the exhibit particularly interesting, and both styles were very carefully examined by the attending managers. Mr. Peckham does not believe that the same truck is suitable for all classes of work, but believes in selecting for use the character of truck best adapted to the service. For this reason he has completed his line of double trucks shown a year ago by several other forms, so that he is now in a position to supply railway managers with a light or heavy truck, a flexible or a swing bolster, a short wheel base or a long wheel base truck and an ordinary double, or maximum traction, truck. As a souvenir, Mr. Peckham presented delegates with an exceedingly tasteful pocket memorandum and card case in white leather, and no other souvenir was in greater demand. He also presented a series of very tasteful catalogues descriptive of his apparatus. The representatives of the company present at the Convention were E. Peckham, New York; J. A. Hanna and W. H. Gray, of Chicago; A. W. Field, of Boston; E. G. Long, G. H. Bowers and W. C. Rogers, of New York. The Peckham Truck Company occupied as its headquarters at the Convention a large parlor in the Hotel

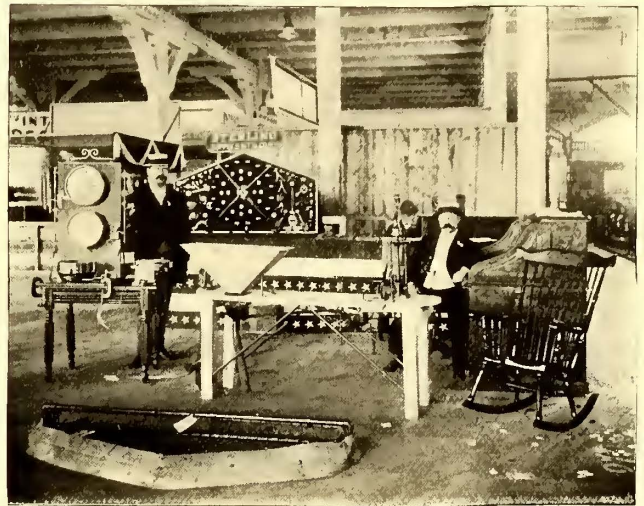


EXHIBIT OF STERLING SUPPLY AND MFG. CO.

Brunswick, where visitors were made welcome. The company had on exhibit here large-sized models of its various types of trucks, and showed to excellent advantage the character of construction. These models were made of aluminum and were perfect reproductions of every detail of manufacture of the large trucks themselves. They received the careful attention of a large number of delegates.

THE FALK MANUFACTURING COMPANY was ably represented by E. A. Wurster, secretary and treasurer; G. C. Smith, chief engineer, and Henry L. Prater, general sales agent. The company this year exhibited a number of its joints which have been in service for the past four years on different roads throughout the country. The condition of these joints proved that traffic under a headway of half a minute did not affect the rail at the joint any more than at the center. This company also exhibited the results of several tests made by different engineers, proving conclusively that bonding of the track is unnecessary where the Falk cast welded rail joint is used. As a souvenir, the company gave out a handsomely printed catalogue, entitled "After Four Years of Service." This stated some very pointed facts about the Falk cast welded joint, among which were the following: "744 joints were made on new rail on Capt. McCulloch's road in St. Louis, and of these but three broke the first winter, all of the others being still in use at this time, four years after the work was done;" "The cast welded joint made according to the best mode of the art, as practiced by the Falk Manufacturing Company, provides less resistance than that of the rail itself, and its value to any electric railway as a bond depends upon the number of copper bonds that such company would require, in order to provide a proper return circuit, if the Falk joint were not used," and "The cast welded rail joint was invented, developed and patented by the Falk Manufacturing Company. Every detail of the work, every machine and tool is the product of constant expenditure of money and study by this company. In order to protect ourselves, we have brought suit for infringement of our patents Nos. 515,040 and 587,718, and we feel confident, from the testimony already

taken, that the results will be favorable to us, and our right to this invention will be affirmed." Throughout the exhibit hall were numerous cards calling attention to the Falk exhibit, and these resulted in making it one of the most conspicuous there. All the representatives of the company were very much in evidence, both at the Convention and hotels, and were evidently received with a glad hand by street railway men. The company also exhibited an automotoneer just brought out by them, and tested by the Chicago City Railway Company, which test shows in dollars and cents the saving accruing by its use. This device can be easily applied, and was taken up by street railway men with a great deal of interest.

THE STERLING SUPPLY & MANUFACTURING COMPANY was represented by John H. Carson, president; F. A. Morrill and L. P. Nelson, and its exhibit was largely visited during the progress of the convention. The company has engaged extensively in the manufacture of street railway supplies, and each branch of its business was fully represented. The object which attracted most attention at the exhibit was undoubtedly a new double register just put on the market. This register is designed



EXHIBIT OF WESTINGHOUSE MFG. ELECTRIC CO.

to record both cash and transfers and is really two distinct registers enclosed in the same case. It is finely constructed throughout of steel, and of the high character of construction which has given the Sterling apparatus its substantial reputation. The register can be worked either by one rod with a push and pull movement, or by two rods or straps. It is equipped with two bells of different sound so that the record of one set of fares cannot be confused with the other. The register was shown both closed and open to give managers an opportunity of inspecting the character of workmanship contained within the case. Those who examined its interior construction noticed that it was on quite a different principle than other registers on the market. The mechanism can be enclosed in either a round or square case as managers may prefer. Altogether the company exhibited five registers. Besides the double register, it showed a new dial or clock-faced register in both polished and oxydized brass cases; also, a standard style No. 1 numeral and No. 3 dial register. Adjoining the register exhibit was one of brakes. The Sterling safety brake is extensively known, being in use on the Broadway cars of the Metropolitan Street Railway Company, and on several other important roads. The brake was mounted on a platform so that its construction and operation could be readily understood. The company also showed its standard sand box and fender, and a full line of overhead appliances and insulation material. The appliances made an extensive display, and were most tastefully arranged. The company also showed a line of drop-forged commutator segments and car and register trimmings, and among its overhead appliances was shown a patent insulated overhead crossing. As a souvenir the company gave a sterling silver pencil in the form of a 13-in. gun. The company's button was also worn by everybody; it showed the Sterling register, some representing the numeral and others the dial register.

ELMER P. MORRIS, of New York, had, as usual, one of the most extensive exhibits and probably one of the most popular. Mr. Morris's position, as agent of a large number of companies, enabled him to make an exhibit both elaborate and effective.

Commencing at the end nearest Huntington Avenue, the first apparatus which attracted the eye was a line of gears and pinions made by the Simonds Manufacturing Company, of which Mr. Morris is agent. The apparatus of this company has established an excellent reputation for durability, and the exhibit was examined with interest by the delegates and others present. Adjoining this was a full line of metals of the Ajax Metal Company, and adjoining this were three oil filters manufactured by the Kosmic Oil Filter Company. In front of the Morris exhibit were ten drawn steel trolley poles, arranged vertically, and manufactured by the Pittsburgh Steel Trolley Pole Company. Close to these were eight standard poles, from 4 ins. to 8 ins. in diameter and 30 ft. long, made by the Electric Railway Equipment Company. These poles had an aggregate weight of 70,000 lbs., from which an idea can be obtained of the elaborate character of Mr. Morris's exhibit. With the poles was shown a complete line of flexible and rigid brackets, both ornamental and plain, also made by the Electric Railway Equipment Company, as well as a complete line of overhead material and car trimmings. This was claimed to be the most complete line of pole fittings ever produced. In the way of lightning arresters, Mr. Morris showed the Garton-Daniels type.



EXHIBIT OF FALK MFG. CO.

and for rail bonds he exhibited Forest City and Harrington rail bonds, for both of which he is agent. Another interesting portion of the exhibit was that devoted to the Sterling railroad inclosed arc lamps. These were operated five in series on a 500-volt circuit. Also shown were a lamp for alternating current, one for direct current, and constant potential and constant current, seven different kinds of lamp altogether being shown, grouped together. In the exhibit of the Keystone Electrical Instrument Company, for which Mr. Morris is also agent, a set of switchboard instruments of different types were shown. These were mounted on a model of a railway switchboard, made up of feeder and generator panels and equipped with the Keystone instruments. A roof garden with coon orchestra and a Sterling X-ray exhibit, which was highly popular, completed Mr. Morris's line of attractions. Among those present in charge of this exhibit were Elmer P. Morris, John Jackson, R. J. Randolph, C. J. Harrington, J. F. Stevens, S. H. Harrington, John Dolph, J. V. E. Titus, George Wick, Samuel Weaver, Harlem P. Hess, J. H. Speer and Rupert Schafbauer.

THE J. G. BRILL COMPANY had a large exhibit, which contained several novelties, while displaying a line of its standard manufactures. The most striking thing exhibited by it was the Metropolitan closed car, which was on a closed flat at the entrance to the building. The great length of the car was particularly noticeable. It was 28 ft. in the body and 37 ft. 2 ins. over all, and had a seating capacity of thirty-eight persons. This is the type of closed car which the Metropolitan Road has adopted for all of its electric lines. The car was mounted upon Eureka maximum traction trucks. It was finished in "ivory" white ash and had spring roller curtains and sash with metal styles. This car was built with a truss plank on each side and had window trusses, as well as the longitudinal tie rods. Both features add greatly to the strength and stiffness of long cars. The convertible car which this company exhibited is intended to combine all the advantages of a closed or box car with those of the usual summer car. At the same time it is designed to be easily and quickly converted from

one to the other. As shown at the Convention, the car appears to be easily changed from one open to closed. The operation of the parts was quite easy, and only a few minutes were required to make the conversion from open to closed, or the reverse. Conductor and motorman working together would probably be able to make the change in three or four minutes. When closed the appearance of the car differed in minor details only from an ordinary box car. When open it seemed to be an open car of the usual style.

One interesting feature of the company's exhibit consisted of four full-sized trucks. There was one Perfect, or No. 27, truck, a Eureka maximum traction truck, an Ideal truck No. 21-E, and a No. 27-G, the latter a modified form of the No. 27. The Perfect truck is one with which most of the readers of the JOURNAL are familiar. This truck during the year has been applied to many new lines of service. The easy riding, due to the peculiar arrangement of the equalizers and the placing of springs within the links, makes the truck especially applicable to electric locomotives which are to carry a passenger car body. The Eureka truck is recommended not only for heavy city traffic, but for use in fast suburban service, where it has been found very satisfactory. Its points of

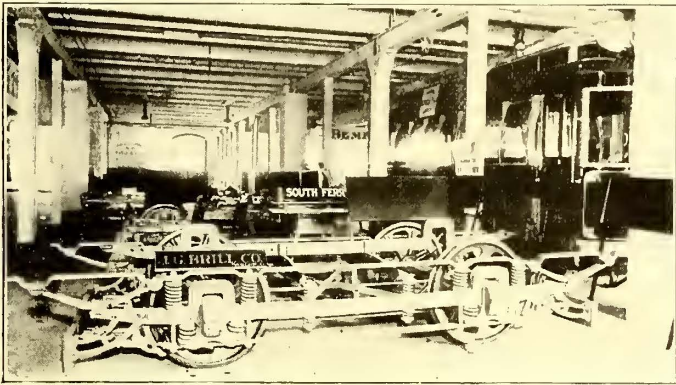


EXHIBIT OF J. G. BRILL CO.

advantage are that it carries the car as low as a four-wheeled truck and with a single motor gives great tractive power. The "Ideal" truck exhibited, known also as the No. 21-E, is of a type intended for four-wheeled cars, and has made a high record on many lines of this country. The last truck of the exhibit was the No. 27-G. This has all the good riding qualities of the Perfect truck, of which it is a modification, to adapt it to special conditions. The principles of construction are the same. The swinging links, containing springs and carrying the ends of the equalizer, are not changed, though the equalizer, in this case, takes the form of a half elliptic spring, which also acts as a body spring. This construction makes the use of a spring plank unnecessary. The journal springs are retained, but by hanging the motors outside the axles, the wheel base can be shortened to 4 ft. This also enables the car body to be brought down very low, while the shortest curves can be passed with ease. Curved angle iron end-pieces enable a very short truck side to be used, and at the same time make a very strong stiff frame.

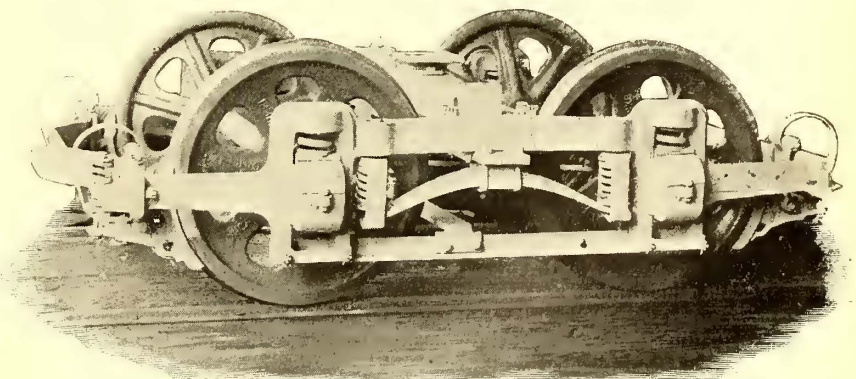
Among the smaller matters which were contained in the exhibit were the round and seat panels. This improvement consists of making the ends of open car seats round and then having the upper part of the metal conform to the curve. This improved form of panel seems to have had its value recognized everywhere. It was not only stronger, but was more easily and accurately fitted. It has become a favorite not only with passengers, who find it makes open cars more easy of access, but with car builders and street railway men generally. Dunning's draw bar, by means of a pocket at the rear and a latch controlled by a rod at the front end of the car, enables the draw head to be thrust back so as to have the whole front or buffer of the car clear without a projection beyond it. The mechanism is extremely simple, consisting, in fact, of a latch, and a rod controlling it. The Millen sign was another novelty, both simple and ingenious. It was shown on the Metropolitan car, as well as in the exhibit itself. It is the invention of Thomas Millen, the general master mechanic of the Metropolitan road, of New York. The idea is to provide simple means for operating box signs from the inside of the car or from beneath the hood. It consists of a pair of bevel wheels contained in a casing at the end of the sign. To one of the wheels the sign is connected; the wheel is, in fact, mounted on the axis of the sign. The axis of

the other wheel projects downward through the roof of the car, or the hood, and terminates in a hand wheel, which is marked with letters indicating each one of the four sides of the box sign. By turning the wheel, any one of the signs can be brought so as to face outward. The signs on the side of the car can be moved from the center of the car inside; those on the hood can be moved without leaving the platform.

The new Dedenda gong struck most street railway men who saw it as being both neat and efficient. The mechanism consists of a treadle and weighed hammer. The treadle when not in use can be locked down, so that the gong cannot be rung by accident, nor by the jolting of the car. The blow is delivered after the treadle has reached its lowest point and when the hammer is entirely clear from the treadle, so that the sound is always clear and distinct. The hammer does its work by inertia, and drops back after striking the gong, producing a clear musical note. In putting it up the only carpenter work needed is the cutting of a 3-in. hole through the platform and the setting of a few wood screws, or small bolts. Track scrapers have been made of almost every conceivable form, but the Littell scraper, as shown at the Brill exhibit, is certainly the simplest. It is put in operation by a mere touch of the motorman's foot, and it is said that more than once, in case of a person falling upon the track, it has been dropped so quickly as to prevent the body from going under the wheels, and thus has saved life. It is easily attached by bolting the plank on which it is mounted to the platform timbers. It does not in any way disfigure the car.

The Brill truck models, in parlor G, Hotel Brunswick, were pieces of workmanship which were greatly admired by those who saw them. There were three trucks, representing the Eureka, the Perfect, or No. 27, and the "Ideal," the latter being for four-wheeled cars. These models were beautifully made in brass on a scale of 3 ins. to the foot, each detail down to the smallest being accurately reproduced. The Eureka maximum traction truck model was double, and a frame represented the floor frame and platform of a car and was mounted upon the pair. The value of complete models of this kind is very much under-estimated. By means of them details of construction and operation can be more readily explained and understood than when a full-sized truck is presented for examination, in which the parts are so large as to hide each other. This advantage of the model over the truck was especially noticeable in the case of the Perfect truck. By the aid of the model the peculiar functions of the different parts were much more readily grasped than with the truck itself. The time, labor and money expended in producing these elegant specimens of model makers' work were, doubtless well invested. It may be noted in passing that all these models were produced in the works of the company without outside assistance.

THE GENERAL ELECTRIC COMPANY did not consider it necessary to make any special exhibit of its apparatus, as all the great dynamos now used to furnish current to drive the street cars of Boston were built in its works; many of the motors were of its manufacture, and with few exceptions, every switchboard and controller. The Boston Elevated Railway system has in use examples of the latest types of the electric railway machinery, built either at Lynn or at Schenectady, and, like the work of Sir



THE 27-G TRUCK

Christopher Wren in London, if inquiry were made for the monument of the General Electric Company, the visiting delegate had but to look around him. The company, therefore, decided to show in the Convention Hall not so much great facilities, as the world-wide use of its apparatus. Consequently, a huge globe representing the earth was built up of papier maché upon a frame work of wood, and placed at the end of the hall where nothing intervened between the floor and the roof. This globe rested upon a black pedestal picked out with gold. The continents and oceans

were plainly depicted by the scenic artist of the Tremont Theater. The globe was built in fifty-four distinct sections to a scale of 312 miles to 12 in.; was 25 ft. 2 ins. in diameter, and weighed 3 tons. The pedestal was 16 ft. in diameter, and the globe was placed in exactly the position occupied by the earth itself in the solar system, the north pole being indicated by an incandescent lamp of 100 c.p.. Two thousand, seven hundred square yards of papier maché, in nine layers of 300 sq. yds. each were employed in the construction of the globe, the building of which occupied just two months. Dotted over the globe, thickly in the United States, less thickly in Europe, and sparsely in the less civilized countries, were small incandescent lamps of different colors, each lamp representing the location of some city in which the General Electric company has some typical installation; 400 lamps were employed. So far as the number of plants was concerned, thousands of lamps would have been required to give an idea of the ramifications of the business of this company over the globe, but, as each lamp receptacle covered about 1 sq. in. on the globe, or what would mean on the earth's surface some 500 sq. miles, 400 lamps sufficed. Had the requisite number of lamps been employed, New England alone on this globe would have been covered with closely

occupying the plane of the elliptic, upon which once a minute traveled a miniature trolley car, labeled "world circuit." The globe will remain in place during the Mechanics' Fair, and will then be taken down and sent to Paris, where it will occupy a prominent position in the Electrical Building at the Exposition of 1900. The space behind the globe was set out with comfortable chairs for the benefit of visitors. Here also was set up a model plant to show the practical working of the Thomson car recording meter, consisting of a G. E. 800 motor, an R-11 controller and the necessary resistances, the car meter, fuse and a form M circuit breaker. The load was applied to the motor by means of a brake working on a pulley keyed to the armature shaft. Behind this plant was an instrument board, on which were exhibited the latest types of astatic volt and ampere meters, inclined coil switchboard and portable instruments, motor vehicle meter, and edgewise ammeter, all grouped around a type M station recording wattmeter reading to 8000 amps. On an easel a framed sign showed the railroads in the vicinity of Boston employing General Electric apparatus and the details of their equipment. Above the instrument board hung another illuminated sign—the complement of the globe—setting forth the railway record of the

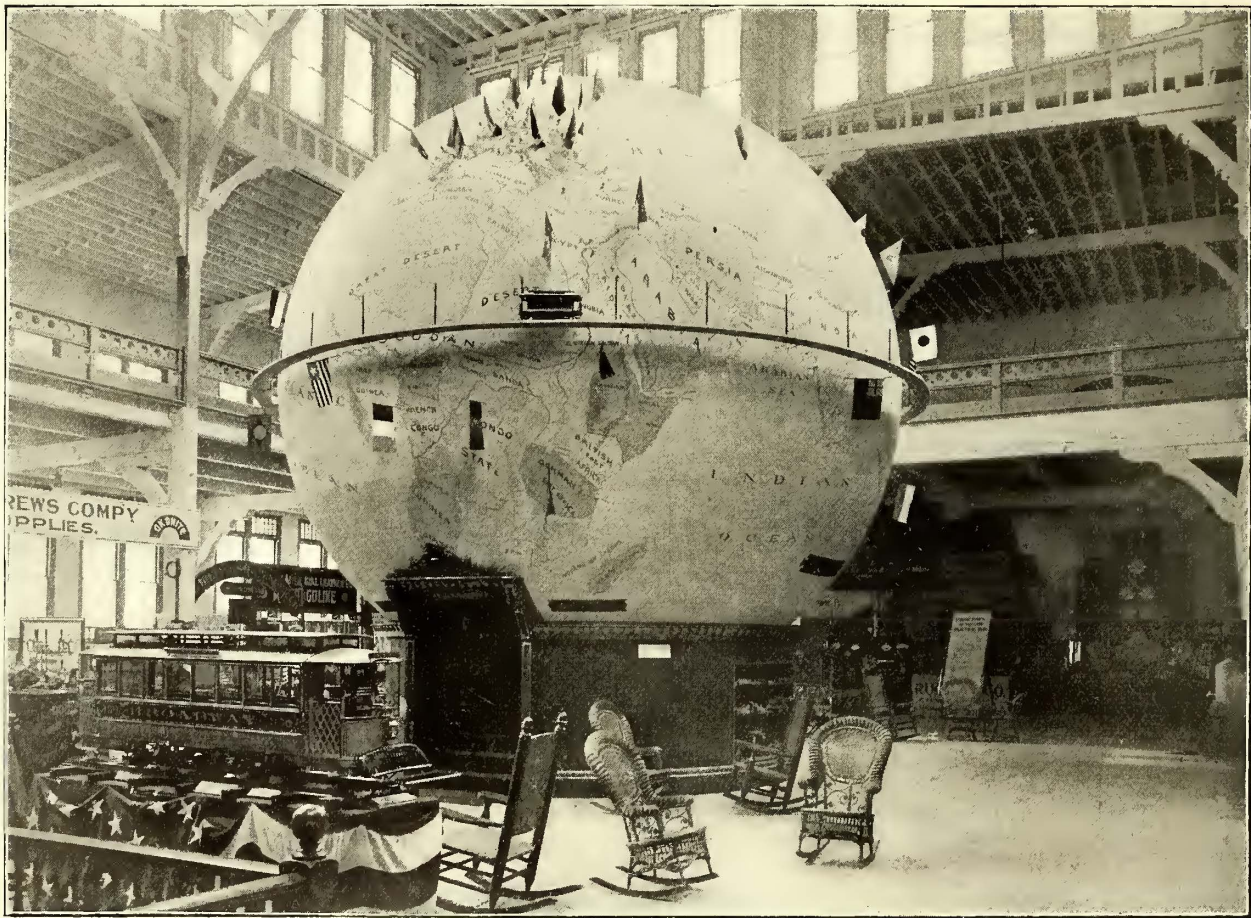


EXHIBIT OF THE GENERAL ELECTRIC CO.

set lamps, thirty to forty tiers high from the surface. The installations included those for street car propulsion, for mill or mine work, or for lighting purposes. No better idea of the extent to which American ideas on matters electrical have permeated throughout the whole earth could possibly be gathered than from a glance at this globe, and the mind reverted to the names of Edison, Thomson, Vandepoele, Sprague, Brush and others whose practical genius made this world-wide use of electricity possible. Each country was indicated by its national flag, and the Stars and Stripes fluttered not only over the United States, but also over Cuba, Porto Rico and the Sandwich and Philippine Islands.

The interior of the globe was richly upholstered, the decorative color scheme being worked out in pink and green. The air was kept cool by revolving electric fans, and the lighting of the interior was all indirect. An aurora borealis effect was secured over the north pole of the globe, both inside and out, by groups of small orange red lamps, and the southern polar light was represented by a row of lamps concealed between the globe and the pedestal. Indeed, the globe seemed to issue from the glowing mass below, in accordance with the beautiful theory of nebular generation. The course of the sun around the globe was marked by a small track

company, which has manufactured and sold up to Sept. 1, 1898, 2285 railway generators, aggregating 423,101 h.p.; 52,841 railway motors, aggregating 1,270,865 h.p., and 50,000 series parallel controllers. Let into the pedestal of the globe were two spaces fitted with shelves, on which were shown the most recent types of overhead material, circuit breakers, lightning arresters, etc. The entire convention hall was lighted from G. E. inclosed arc lamps. Headquarters were established in the Hotel Brunswick, where, in the Venetian room, several albums containing photographs showing the wide diversity of General Electric work and a fine collection of medals and diplomas were set on the tables. W. J. Clark, general manager of the railway department, had the interests of the General Electric Company in his care, and no complaint was heard of its hospitality. Mr. Clark was assisted by the following representatives of the company: C. B. Davis, F. M. Kimball, C. C. Pierce, C. D. Haskins, S. B. Paine, G. E. Steele, of the Boston office; R. H. Beach, T. Beran, J. J. Mahoney, T. A. Branion, W. G. Bushnell, of the New York office; Theo. P. Bailey, of the Chicago office; G. D. Rosenthal, St. Louis office; H. J. Crowley, Philadelphia office; A. D. Babson, Baltimore office; A. S. Heywood, Atlanta office. The supply department

at Schenectady was represented by J. R. Lovejoy, general manager; H. C. Wirt, engineer, and J. K. Aitken. The railway department, by W. B. Potter, chief engineer; F. E. Case, E. D. Priest, L. C. Batchelder and C. A. Barry; the patent department, by A. F. McDonald.

THE WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY furnished one of the most curious and interesting exhibit features which has ever been seen at a convention. The company's space was at the very entrance to the association's meeting room, and attention would first be called to it by a sharp and constantly increasing crackling sound of an odd character. This would soon become so insistent as to practically drown conversation, and eventually, perhaps, to cause more or less pro-

street car main switch, the new Westinghouse street car canopy circuit breaker, the K-11-A diverter, a new Westinghouse fuse block, a switchboard operating the exhibition plant, a rotary transformer switchboard, an alternating current motor, and an exciter connected with the rotary transformer. There were also a number of electric fans in operation in the exhibit, including the new Westinghouse direct current fans just put upon the market. A large variety of the Sawyer-Man electric lamps was also shown, together with a number of detail appliances of greater and less interest. The company had on exhibition in the basement, two No. 49 Westinghouse motors mounted on a Peckham truck.

The representatives of the Westinghouse Company present at the convention were fourteen in number, as follows: Frank H. Taylor, general sales manager; L. E. Imlay, W. M. Alexander,



GROUP OF VISITORS TO PLYMOUTH ON SEPT. 8

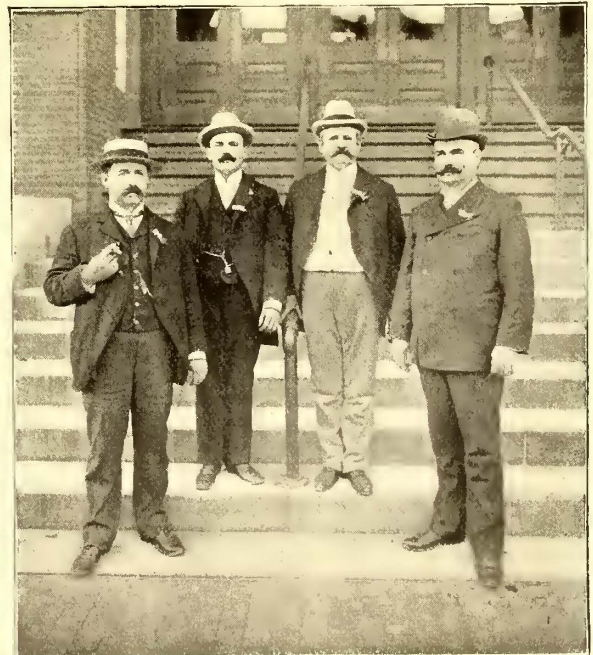
fanity. At this point, however, the crackling would cease, only to be repeated at comparatively frequent intervals on the formation of another group of curious investigators. There would then be seen at one side of the exhibit a large board, constructed of thick, heavy glass and bearing on the front, in metal letters, the words, "The Name of Westinghouse is a Guarantee." Those who pushed their investigation far enough found the back of the glass board was covered with large sheets of metal foil. Over in one corner was a rotary converter which obtained current from the Boston Electric Company's lines at 500 volts direct, and changed it into a 380-volt alternating current, which fed two transformers, whose effect was to still further reduce the voltage from 380 to 200. This 200-volt alternating current thence passed into a high tension transformer, from which a 60,000-volt alternating current issued. The wires from the high tension terminals of this transformer passed one to the metal letters on the board, and the other to the tin foil at the back. On starting the rotary transformer the voltage between the front and back of the glass board would be raised to such a point as to cause "lightning discharges" to pass over the surface of the glass between the letters and the tin foil, and as the voltage was increased these flashes would become almost terrific in their intensity, while the smell of ozone would penetrate to quite a distance from the board. As a matter of fact, the voltage used did not exceed 40,000 to 50,000 in producing these effects, as it was feared that the maximum voltage might possibly break through the glass itself and short circuit the transformer. It is interesting to know that about twelve apparent kilowatts were required to run this exhibit feature, though the actual power was but about 8 k.w.

Elsewhere in the Westinghouse Company's exhibition space were found a number of features interesting to railway managers. Perhaps the most novel one was a complete set of apparatus for operating power station switchboards by compressed air. This consisted of an upright post carrying the air valves, from which pipes were led on the one side to the new Westinghouse rotary air pump (in this case of 2½-h.p. capacity), and on the other to the cylinders which operated a heavy three-pole pneumatic main switch and an automatic circuit breaker. The post also carried an ammeter and apparatus for switching the station volt meter into circuit. In practice it is intended that these posts shall be grouped in a convenient place in the power station at any desired distance from the main switchboard, and the entire station can thus be put under the control of a single operator without the slightest personal danger from arcs or short circuits. There were also exhibited the Westinghouse No. 49 (35-h.p.) railway motor open, and with a separate armature, the Westinghouse 38 B. (50-h.p.) railway motor with parallel side bar suspension, the Westinghouse 12 A (25-h.p.) railway motor, several controllers, a tank lightning arrester, a Wurts lightning arrester, a street car choke coil, a

N. W. Storer, H. D. Murdock, Maurice Coster, of Chicago; Charles A. Bragg, manager Philadelphia office; Calvert Townley, manager Boston office; R. S. Brown, H. M. Southgate, of Boston; H. C. Farnsworth, manager Boston office Sawyer-Man Lamp Company; J. R. Gordon, of Atlanta; C. C. Frenyear, of Buffalo, and Thomas Ahearn, of Ahearn & Soper, Ottawa, Canada.

#### Veterans at the Convention

Among the familiar faces at the Convention were many who had engaged in the early electric railway work in Boston and indulged in reminiscences of the trials and vicissitudes which were common



FOUR VANDEPOELE MEN AT THE CONVENTION

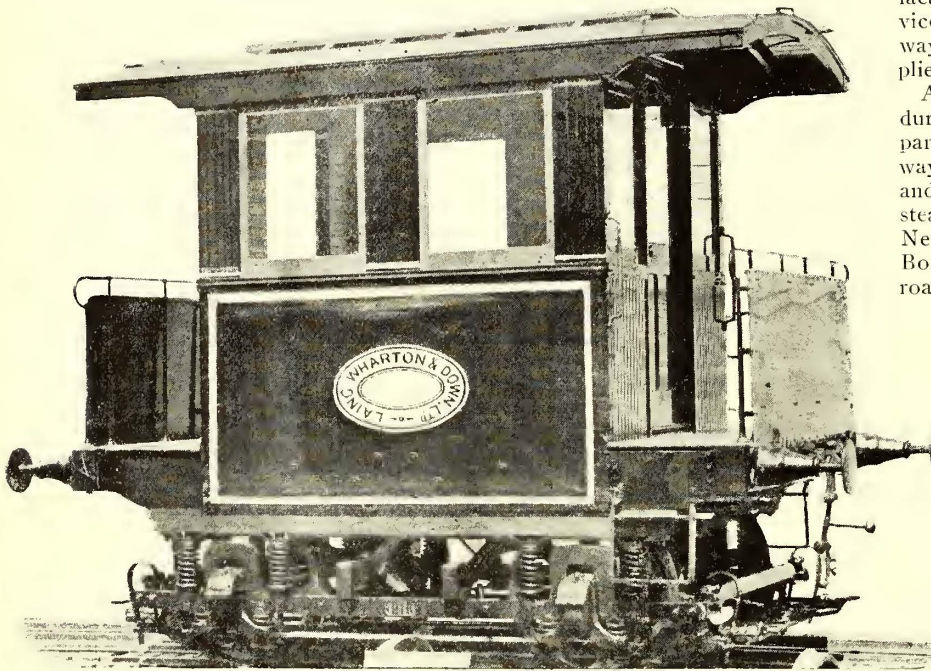
when that work was performed. Among the pioneers were four who had been associated with Vandepoels, and formed, so to speak, a corporal's guard of those who had engaged in the historic work on the first electric railways. The photographer of the STREET RAILWAY JOURNAL succeeded in catching a group of these

members of the "old guard" standing in front of the association building one day during the meetings. They are R. J. Randolph, general manager of the Sterling Arc Lamp Company; C. E. Flynn, general manager of the Carbondale Traction Company; Elmer P. Morris, of New York, and W. N. Sheaff, of Sheaff & Jaastad, of Boston. Mr. Randolph was the first selling agent of the Vandepoele Company, and Messrs. Morris, Flynn and Sheaff were engaged in the construction department of that company in 1881, and later, in 1885, assisted Mr. Vandepoele in his early electric railway work.

### An Electric Locomotive for Small Lines

In order to meet the demand for a medium and light service electric locomotive, Laing, Wharton & Down, Ltd., of London, have recently brought out a small electric locomotive, which is shown in the accompanying illustration. This particular pattern is the outcome of considerable experience in the designing and construction of electric locomotives, and it is believed that it will come into extended use for hauling light loads.

The entire weight of the locomotive is 4 tons, and it is designed to be able to haul a maximum load of 16 tons up a maximum



grade of 1 in 40 at a maximum speed of 6 miles per hour. As will be seen from the illustration, a comfortable cab is provided for the motorman, the front side of the cab having one single pane of plate glass, so as to give an unobstructed view. On the roof is a swiveling trolley of the usual type, the trolley spring being regulated so as to allow the trolley wheel to travel at a distance from the rail of from 11 ft. 5 ins. to 18 ft. Access to the roof is had by a set of permanent footholds and hand grips. The details of this type of locomotive have been worked out by Justus Eck, chief engineer to Laing, Wharton & Down, Ltd.

The particular locomotive shown will be used for hauling ordinary goods trucks on a private siding, over a mile and a quarter long, in the north of England, and will replace a team of about forty horses now doing the work on the public road. The locomotive will be mounted on a Brill No. 21-E solid frame truck, having a wheel base of 6 ft. Two "Whardown" No. 3 S 25 h.p. motors are used, designed to operate at 450 r.p.m., and employing from 500 to 550 volts. The truck used is secured by means of four diagonal braces and two face plates on either side to the buffer frame work of the locomotive body, in addition to the usual gripping bolts, to enable shunting in the ordinary way and to allow the coupling chains to become slack. The locomotive is further equipped with a Garton lightning arrester and two emergency switches of the "Whardown" pattern, one controller, two sand boxes, and emergency electric brakes on both axles, in addition to the regular wheel brakes.

### A New Car Fender

A new car fender which has been designed with the particular idea in view of making it as effective on uneven roadbeds as on smooth pavements, has recently been placed upon the market by

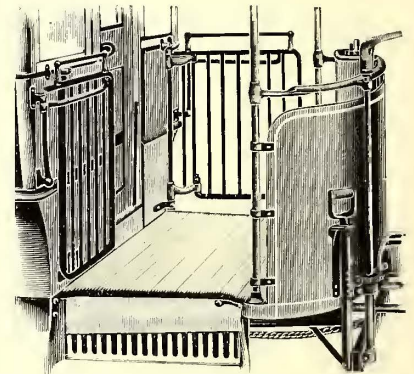
the Hipwood-Barrett Car and Vehicle Fender Company, of Boston. The lower part of the fender is divided into five pieces, each piece resembling an overturned scoop or shovel. These five parts are so adjusted by means of springs that when in action they will fall into any depression in the roadbed or will climb over any high places.

The fender, when in its normal position, is held about 4 or 5 ins. above the ground and is dropped into its operating position by pressing a large leather button on the front platform. Immediately behind the five pieces comprising the lower part of the fender is a large dashboard projector made of flexible steel bands. The different parts of the lower portion of the fender are so arranged that they will rebound for a short distance when they strike an object. This greatly reduces the shock to a person that is struck by the fender. The body or obstacle struck slides up the scoops and is met by the flexible upright bands. Guards are also provided to prevent the body from rolling off the fender.

### Patent Car Gate

The car gate shown in the accompanying illustration is known as Wood's patent gate and is manufactured by the R. Bliss Manufacturing Company, of Pawtucket, R. I. This device is designed for steam, electric and cable railway cars, and is shown in the engraving as applied to an electric car.

As will be seen, the device is light, strong and durable, and when closed fits closely to the end panel of the car, so that it is entirely out of the way. This gate has come into very extended use and has been adopted by a number of the largest steam and electric railway systems, including the New York, New Haven & Hartford Railroad, Boston & Maine Railroad, Maine Central Railroad, Chicago & Grand Trunk Railroad, Chicago



& Northwestern Railroad, Central Railroad of New Jersey, Boston Elevated Railroad, Consolidated Traction Company of Jersey City, the Brooklyn Heights Railroad Company, the Third Avenue Cable Railroad and the St. Louis & Suburban Railway.

### Annual Clambake of Well Known Electrical Works

The annual clambake tendered to the electrical fraternity by the American Electrical Works, of Providence, R. I., was given on Sept. 10, at Phillipsdale, R. I. These clambakes are now looked upon as one of the great events in the year in electrical circles by those who are fortunate enough to be among the invited guests, and the one given recently was even more elaborate and pleasing than any previous dinner given by this company. About 300 guests were present, and the weather, the splendidly appointed dinner and the souvenirs were all that could be desired by the most fastidious. The souvenir given to each guest of the company this year was a handsome pipe and a package of tobacco, which appeared to meet with the unqualified approval of all present.

At the annual meeting of the Union Traction Company, of Philadelphia, held Sept. 21, the old board of directors was re-elected in its entirety, consisting of Thomas Dolan, William L. Elkins, Alexander M. Fox, James McManes, John B. Parsons, William H. Shelmerdine, Alfred Smith, J. J. Sullivan, P. A. B. Widener, George D. Widener and John Lowber Welsh. John Lowber Welsh, president of the Union Traction Company, had refused to be considered a candidate for re-election as director, but on the personal appeal of one of the largest stockholders, who also held proxies for a very large number of small stockholders, he finally consented to re-election.



## Consolidation of the Westinghouse and Walker Companies

On Friday evening, Sept. 16, the final papers were signed for the consolidation of the Westinghouse Electric & Manufacturing Company and the Walker Company. In connection with this transaction the following statement has been issued by George Westinghouse, Jr., president of the Westinghouse Company:

"The election this day of Roswell P. Flower and Anthony N. Brady as members of the board of directors of the Westinghouse Electric & Manufacturing Company, to represent the interests of the former stockholders of the Walker Company, completes the union of the interests of the Walker Company, of Cleveland, with those of the Westinghouse Electric & Manufacturing Company. The purchase by the Westinghouse Company includes substantially all of the outstanding stock and all but \$850,000 of the \$2,500,000 of the 20-year bonds of the Walker Company, the \$850,000 remaining a first lien upon the property. The recent sale by the Westinghouse Company of \$3,000,000 of debenture certificates has erroneously been connected with this transaction. The entire proceeds of the sale of these debenture certificates were used in retiring the floating and other debt of the company, as previously announced.

"The increase in the total yearly fixed charges of the Westinghouse Company, due to the purchase of the Walker Company, will be but a little more than the sum that the Walker Company has been expending annually in defending patent litigation instituted by the General Electric and the Westinghouse companies. The acquisition of the Walker Company will, by reason of the agreement of March 31, 1896, between the General Electric and Westinghouse companies, put an end to this patent litigation and very large annual expenditure on both sides. The business of the Walker Company, as a controlled company of the Westinghouse Company, will be entitled to the protection of the patents of the Westinghouse and General Electric companies, and will in all respects be subject to the agreement between these two companies in relation to patents.

"The Westinghouse Company regards the business and good will of the Walker Company as a valuable acquisition, especially as the Walker Company brings with it upward of \$1,250,000 unfilled orders. The Walker Company has at Cleveland modern and extensive works, equipped with machinery capable of manufacturing the largest types of railway apparatus, and will, with the works of the Westinghouse Company at East Pittsburgh, constitute a manufacturing plant second to none in the country. The capacity and profits of the two companies will be increased by carefully harmonizing the manufacturing and selling operations, and the direct savings thereby effected should exceed the fixed charges incurred by the purchase of the Walker Company. The shipments of both companies, owing to the large orders on hand, have been increasing during the past few months, and exceeded \$750,000 for August.

"The total fixed charges of the Westinghouse Company, including those due to the Walker purchase and the dividends on its preferred stock, will be \$42,000 per month."

To George Westinghouse, Jr.—one of the most remarkable business men of this generation, combining, as he does, fine inventive and engineering ability, with strong practical common sense in financial and commercial matters—is undoubtedly due the credit for bringing about this consolidation at a time when the advantages to be derived from the removal of the Walker Company as a serious competitor in the field could best be realized. Large and valuable contracts for electrically equipping important elevated and surface railway systems are soon to be placed, and it has been well understood for some time that the Walker Company was in a position certainly to dictate the prices at which these contracts will be let, and also to bring important influence to bear toward the actual securing of them. At one stroke Mr. Westinghouse has removed this competition from the field, and at the same time has greatly improved the chances of his own company for securing these contracts. The entrance of ex-Governor Flower, Anthony N. Brady, James W. Hinckley and Perry Belmont into the Westinghouse directorate is an important feature of Mr. Westinghouse's plan, as they will doubtless influence contracts in many directions aside from the large markets in many cities, which they completely control.

Major J. W. Hinckley, president of the Walker Company, has had an important influence in shaping the latter's business policy, and has been a tireless worker in its behalf. Though a man of large and varied financial and business interests, this in the electrical field has been in many ways his favorite enterprise, and to its development he has given much of his time, and has secured for the Walker Company not a few important strategic and commercial advantages. Among the orders recently closed by the

Walker Company may be mentioned one for 500 Walker motors, placed in Paris a few weeks ago, and an order for 600 Walker motors and 600 Walker controllers, placed by the Brooklyn Rapid Transit Company early in September.

It is understood that the Walker Company will retain its separate commercial existence for the present, at least, and perhaps permanently, and that so far from reducing the force at the Cleveland factory, it may even be increased, as it has been well known for some time that the factory facilities of the Westinghouse Company are inadequate for their constantly increasing business.

Sidney H. Short, vice-president of the Walker Company and the man to whom the credit is due for building up its large line of successful apparatus, is a prominent figure in the electric railway industry to-day at home and abroad. The history of the Walker Company and a bare statement of the character and amount of original designing and construction work which has been done during the past four years, are interesting and well worth recollection.

The first product of the Walker Company was the Walker spring mounted, street railway motor brought out about four years ago. There were rapidly designed, built and placed upon the market, a complete series of this type of motor, ranging in size from 20 h.p. capacity for 31-in. gage track to 200 h.p. capacity for elevated and heavy railroad service. Thousands of these motors have been manufactured and shipped to all quarters of the globe, and it is claimed for them that not one has been returned to the shop for failure to do the work for which it was sold. Forty different sizes of generators, ranging from 25 k.w. to 3000 k.w. (the largest generator in the world, now under construction for the Boston Elevated Railway Company), have also been designed, built and put into service in this brief period. Nearly all of these machines have been of the direct connected type, and built for isolated and central lighting, power and railway stations.

On both generators and motors there has been introduced the new so-called "straight out winding," which is now a feature of modern electrical machinery, and which represents an enormous advance over previous methods of winding. The Walker dynamos and motors are noted for their high efficiency, simplicity of construction, and their sturdy ability to take heavy overloads without destructive sparking at the commutators. Many other detail improvements of great importance have also been introduced in the design and construction of these motors and generators, such as the sliding of the generating field frame lengthwise of the shaft of the machine, so as to uncover the armature and fields for inspection, cleaning and repair without disturbing any of the parts of the machine; the making of motor coils entirely of flexible conductors, avoiding soldered joints; the placing of motor bearings entirely outside the motor casing, thereby excluding oil from the interior of the motor; the hinging of the lower half of the motor in such a way as to permit it to swing down without disturbing the armature or the suspension; and the spring suspension of the motor over the axle, as well as at the side furthest from the axle.

Among the later work carried out by the Walker Company is the development of a full line of alternating current apparatus of the "rotary field stationary armature" type, of which about 15,000 h.p. in generators, motors and rotary converters is now under construction; the development of a full line of switchboard apparatus, and the introduction of the solenoid blow-out controller.

It will easily be seen what an immense amount of technical work is represented by these achievements. At the end of the first year after the introduction of the manufacture of electric apparatus into the Walker Company's shops, the gross sales of manufactured product were more than doubled, and at the present time, four years after this introduction, the annual business of the company has increased tenfold. One-half the factory output is shipped to Europe, and the company has come to be recognized all over the world as one of the three largest American concerns engaged in the electrical manufacturing business.

It is needless to say that this enormous development of business has required large additions to the capital invested, and in 1896 a reorganization was made, by which the Walker Company succeeded to the business of the old Walker Manufacturing Company. Cleveland capital was at first sought for and obtained, but eventually Messrs. Flower, Brady and Hinckley, who are, as has been previously mentioned, large purchasers of electric railway apparatus, were invited to become stockholders in the Walker Company, and finally obtained by purchase a controlling interest.

The Wabash Railroad Company brought some sixty or seventy delegates from Chicago alone on special cars attached to the Continental Limited, and never was a host more universally praised than N. C. Kceran, S. P. and T. A.

### Well Known Engines in Boston

The Rice & Sargent Engine Company, of Providence, R. I., equipped one of the principal stations of the Boston Elevated Railway Company with two cross compound Rice & Sargent engines of 1500 h.p. each. These engines are giving excellent service, and this station has one of the best records for economy of operation of any of the power houses on the system.

### Contracts for Another Long Distance Transmission Plan

The Westinghouse Electric & Manufacturing Company, of Pittsburgh, has recently been awarded the entire contract for equipping a station to be built for the Snoqualmie Falls Electric Power Company, at Snoqualmie Falls, Wash. The plant will be 45 miles from Tacoma and 31 miles from Seattle, and the current is to be transmitted to both of these cities. The contract involves the building and delivery of four three phase rotary armature generators having a normal aggregate capacity of 6,000 k.w. and which are to be directly connected to water wheels; two 75 k.w. kodak exciter dynamos, also to be direct connected to water wheels; high and low potential switchboards for main power station and substations at Seattle and Tacoma, involving seventy-six marble panels, with all necessary instruments, switches, etc.; high tension oil insulated static transformers having an aggregate capacity of 10,875 k.w.; rotary transformers with a total output of 2,700 k.w. and six type C motors developing 1,600 h.p., with adequate lightning protection at both ends of the line.

### The Bureau of Information

The Bureau of Information was one of the most popular innovations at the Convention. It was located near the entrance of the meeting hall and close to the headquarters of the STREET RAILWAY JOURNAL. Circulars were distributed early in the Convention, stating that a "Bureau of Information had been established for the comfort and convenience of all who attend the Convention." The booth was supplied with private telephone, stenographers, etc. It was also a popular resting place for the delegates during their trips around the exhibition hall. The bureau was in charge of Robert H. Derrah, of the Boston Elevated Railroad, who secured many new friends, as well as favored old ones, by his many courtesies during the duration of the Convention.

### Personals

MR. WILLIAM G. HOWELL, son of Admiral Howell, has just taken charge of the Chicago office of the John Stephenson Company, Ltd., of New York.

MR. ELIAS VANDER HORST, who has been for some time the New England representative of the John Stephenson Company, has just been attached to the New York office of the company.

MR. GEORGE W. KNOX, JR., electrical engineer of the Chicago Street Railway, was married Sept. 5 to Miss Meers, of North Evanston, Ill. The many friends of Mr. Knox offer him the congratulations of the occasion.

MR. FRANK R. FORD, of Ford, Bacon & Davis, engineers, of New York and New Orleans, was married Aug. 27 to Miss Donaldson, at Dingman's Ferry, Pa. Mr. Ford will make an extended wedding tour before his return to New York.

MR. D. B. DYER, of Augusta, Ga., was prevented from attending the Street Railway Convention, at Boston, through the death of the auditor of his road. Mr. Dyer, however, takes as great an interest in the association as ever and regrets exceedingly that he was not able to attend the meeting.

MR. E. A. STANLEY, formerly of the Jackson & Sharp Company, and now manager of the Electric Railway & Tramway Carriage Works, Limited, of Preston, England, has been in America for some weeks past purchasing wood working and other tools for the equipment of the company's new shops, which are to have a capacity of 600 cars per annum. Mr. Stanley sailed for England on Sept. 22.

COL. EUGENE GRIFFIN, whose regiment of Volunteer Engineers left for Porto Rico some weeks ago, was taken ill shortly after his arrival on the island with dysentery, and by order of the authorities was sent to his home on the Hudson, where he is now recuperating. He has lost nearly thirty pounds in weight during his illness, but is now better and is able to sit up, and intends returning to Porto Rico as soon as possible.

MR. GEORGE E. MARTIN, who has recently been connected with the Westinghouse Electric & Manufacturing Company, of

Pittsburgh, Pa., has severed his connection with that company, and has accepted a position as mechanical engineer of the Springfield Manufacturing Company, of Bridgeport, Conn. The latter company manufactures the well-known Springfield car wheel grinder.

MR. W. H. TAYLOR has resigned the vice-presidency of the Street Railway Publishing Company to accept the position as president and manager of "The Hub," a paper published in New York and devoted to the carriage interests. Mr. Taylor has been active and faithful in the service of the STREET RAILWAY JOURNAL, and, while in this field, has made many friends, who will wish him every possible success in his new venture. In entering the carriage industry he does so with most flattering prospects, and carries with him the most cordial well wishes of all his former associates.

MR. F. E. DRAKE has been appointed electrical adviser to Mr. Ferdinand Peck, the Commissioner General of the United States to the Paris Exposition of 1900. Mr. Drake has had a very extensive experience in electrical matters and his appointment to this position will be of great advantage to the American exhibitors and to the Commission. He began his connection with electrical interests as a railroad telegraph operator when but 14 years of age. After several years in the operating service, he was transferred to the civil engineering department, and served in several capacities, including that of assistant division engineer. Since 1890 he has been directly connected with the manufacturing industries, having acted as manager of the Standard Electric Company, a concern which played a most important part in the lighting of the World's Columbian Exposition, and in 1896 he formed a partnership with W. D. Ball, of Chicago, under the name of W. D. Ball & Co., electrical and mechanical engineers. This connection he severed in the early part of 1897 to accept the position as assistant to the manager of the Walker Company, where his former varied experience in electrical and mechanical matters has been of great service.

MR. ALFRED WISEMAN, A. M. I. M. E., of Birmingham, England, chief partner of the Electric Tramways Equipment Company, of that city, spent two weeks in this country last month, arriving Sept. 2, at Boston, and returning to England on the "Campania" Sept. 17. His company is a very prominent manufacturer of overhead line material in England, and has made a high reputation not only for standard appliances, but also for special material for contractors. Being engaged in engineering work, the company can follow technical specifications accurately and intelligently. The Electric Tramways Equipment Company, it is understood, will also engage extensively in the general electric railway supply business, and to this end has secured the agency of a number of prominent American manufacturers, notably the R. D. Nuttall Company. Mr. Wiseman's chief object in coming to this country at this time was to attend the convention at Boston, but he also found time during his trip to visit Providence, New York, Philadelphia and Pittsburgh. He expresses himself as greatly interested in the electric railway development which he has seen, and hopeful of a rapid advance in electric railway construction in Great Britain and Ireland.

MR. D. W. PUGH and MR. JOHN A. TACKABERRY, who have been associated for a long term of years with the John Stephenson Company, of New York, have severed their connection with that corporation. No persons have been identified in a more intimate way or for a longer period of time with the development of the street railway industry than these gentlemen, and none probably have a wider acquaintance in the street railway field. Mr. Tackaberry was connected with the designing and building department of the Stephenson Company and earned here a high reputation as a car builder. Undoubtedly a great part of the success and renown of the Stephenson cars are due to Mr. Tackaberry's thorough knowledge of street car construction. Mr. Pugh was engaged with the company in its selling department, in which he achieved a wide success. His record served to distinguish the company, which he represented as an energetic and thoroughly up-to-date factor in the manufacture of street cars, though conservative in the best meaning of that term. Messrs. Pugh and Tackaberry have not yet announced their plans for the future, but will have the best wishes of their friends in whatever undertaking they may engage.

### Obituary

LIEUT. WILLIAM TIFFANY, secretary and treasurer of the Sterling Supply & Manufacturing Company, of New York, died recently of fever brought on through hardship endured in the Cuban campaign. Lieut. Tiffany was the son of George Tiffany, the well-known jeweler of New York, and grand-nephew of Commodore Perry. On the outbreak of the recent war he enlisted as a private in the Rough Riders, and was soon promoted to the position of corporal and then to sergeant. His bravery on the battlefield before Santiago earned for him his position as lieutenant. At this place, however, he contracted fever, and was then

taken to Montauk Point, and later to Boston, where he died on Aug. 25. He was buried with military honors.

### AMONG THE MANUFACTURERS

THE MONARCH STOVE & MANUFACTURING COMPANY has secured as its Chicago representatives and for territory tributary to that city, the W. R. Garton Company, Chicago.

THE DUPLEX CAR COMPANY, of New York, reports that it is receiving numerous inquiries concerning the Duplex car and that a great interest is being taken in it, not only in America, but also in Europe.

THE CRANE COMPANY, of Chicago, Ill., has issued a complete catalogue containing 423 pages describing its entire line of goods. The catalogue contains dimensions, tables of screwed and flanged fittings and valves, and also considerable useful information for mechanical engineers. It will be sent upon request.

THE BERLIN IRON BRIDGE COMPANY, of East Berlin, Conn., has the contract for furnishing steel work for the Memorial Hall, being erected at Westerly, L. I. This building is to be fire-proof throughout, with steel floor beams and columns supporting the floor structure and steel trusses and beams for the roof.

THE WHEELER REFLECTOR COMPANY, of Boston, Mass., received a number of visits from delegates to the street railway convention, and took a number of orders for its headlights. This company makes headlights of various styles, and reports increasing activity in this department.

THE H. W. JOHNS MANUFACTURING COMPANY, of New York, through its New England agents, secured the order for all the overhead material to be used in the construction of the Portsmouth and Dover Street Railway, of Portsmouth, N. H., which is owned by the Boston & Maine Railroad.

THE MCGUIRE MANUFACTURING COMPANY, of Chicago, is having the usual rush at this time of the year. It reports orders for the month of August for 300 new Columbia stoves, 17 snow-sweepers and 260 trucks, and the officials of the company express the belief that this fall will see the best business the country has seen for several years.

THE DUFF MANUFACTURING COMPANY, of Allegheny, Pa., writes that the Circuit Court of the United States, Western District, of Michigan, Judge Severens, has granted a preliminary injunction restraining the Kalamazoo Velocipede & Car Company from manufacturing and selling the Barrett patent jacks as manufactured by the Duff Manufacturing Company.

THE MEAKER MANUFACTURING COMPANY, of North Chicago, Ill., has issued an extremely fine catalogue setting forth the merits of the new Meaker registers. The Meaker Company has had twenty years' experience in building fare registers, and its factory is fully equipped with special machinery for turning out devices of the highest possible character. The catalogue just issued contains a number of fine, highly colored plates describing the registers.

THE AMERICAN PEGAMOID COMPANY, of New York, manufactures an imitation leather which is particularly well adapted to making car curtains, covering for car seats, etc. The surface of this material is firm, but flexible, and has the advantage over real leather it can only be scratched with difficulty, and its wearing qualities are greater. It stands extreme heat and cold and the face will not peel off, nor does it become sticky. Pegamoid cloth can be washed and scrubbed even with soap and boiling water without injuring the fabric in any way.

THE WESTINGHOUSE MACHINE COMPANY AND WESTINGHOUSE, CHURCH, KERR & CO., of Pittsburgh, tendered a complimentary banquet to the delegates of the National Association of Stationary Engineers, at Pittsburgh, on Sept. 7. Before the banquet the shops of the Westinghouse companies were thrown open to the visitors, and the different tools and methods of this establishment were fully explained to the delegates and their friends. About 700 people partook of the dinner and were very enthusiastic in their expressions of appreciation of the way in which the Westinghouse companies had taken care of them.

J. G. WHITE & CO. have been at work recently upon a number of contracts, among them one upon the Buffalo & Lockport Railroad (described in the September issue of the STREET RAILWAY JOURNAL), where they built the overhead work and furnished the wire for both the trolley line and the transmission line from Niagara Falls to Lockport, as well as the track bonding and some work upon the track itself. As usual, with the work of this

well-known firm of engineers and contractors, it is almost beyond criticism, and is worthy of inspection as an example of the best modern construction methods.

EUGENE MUNSSELL & COMPANY, of New York and Chicago, importers and wholesale dealers in mica, report a very gratifying demand for its India mica. It carries a large stock at both its warehouses in New York and Chicago, and is therefore in a position to execute orders promptly. This concern was one of the pioneers in the preparation of mica for electrical purposes, having sold to the Edison Company at a time when that company was engaged in the manufacture of electrical apparatus to such an extent that it required but two armature winders, dating back in the eighties.

THE TRIUMPH ELECTRIC COMPANY, of Cincinnati, Ohio, supplied the special motor which drives the giant see-saw now in operation at the Exposition at Omaha, Neb. This see-saw is a very ingenious novelty, and was designed by C. H. de Zevallos, of Nashville, Tenn. It consists of a steel tower 100 ft. high, supporting a sea-saw cross beam which is 200 ft. long, and which in turn supports a swinging car at each end. The fact that the Triumph Electric Company was given the contract for supplying the electrical apparatus to operate this see-saw is a good testimonial of the reliability of the appliances manufactured by that company.

THE KINETIC MANUFACTURING COMPANY, of New York, has just established a new manufacturing plant at Riverside, Del., being between Wilmington and Chester, Pa. The plant consists of three brick buildings of the respective dimensions as follows: 241 ft. x 55 ft., 51 ft. x 60 ft., 33 ft. 6 ins. x 37 ft., and several frame buildings, all situated on a lot containing upward of five acres, and occupying the entire space between the main division of the Pennsylvania Railroad and the Delaware River. The company owns the dock of 80 ft. frontage, at which vessels drawing 16 ft. of water may lie in order to discharge cargo. These works are only 3 miles north of Wilmington, Del., and 24 miles south of Philadelphia, with numerous trains at all hours from either city.

THE LUDEWIG-THURBER MANUFACTURING COMPANY, of Pittsburgh, Pa., has recently moved its office and works to 565 Old Avenue, where it has an excellently equipped establishment. The company is now prepared to handle all classes of electrical repair work, and, as its works are fully equipped with modern machinery and skilled labor, special attention will be given to armature and field winding, refilling of commutators, etc. The company also buys and sells motors and generators and all electric railway and light apparatus, and is prepared to install complete electric light and railway plants. The officers of the company are J. L. Ludewig, president; William Ludewig, vice-president; J. B. McGinley, general manager, and G. P. Thurber, secretary and treasurer.

JOHN A. ROEBLING'S SONS COMPANY, of Trenton, N. J., has recently added to its large establishment a department for the manufacture of rubber insulated wire. The new rubber plant is located near the electrical wire department and is housed in a handsome three-story brick building, 60 ft. x 160 ft., with railway tracks immediately at the door. The best and latest machinery for manipulating the rubber and applying it to wires and cables has been installed and is now in successful operation, turning out large quantities of rubber insulated conductors, and this company is prepared to take orders for large or small quantities of all kinds of rubber-covered wire from the smallest size to the largest and heaviest lead-encased stranded conductors and armored submarine cables.

ADAM COOK'S SONS, of New York City, have received the following unsolicited testimonial from Adam Cole, engineer, Lower Brothers' Company, of Dayton, Ohio: "I beg leave to inform you that I have charge of an 18 in. x 42 in. Hamilton Corliss engine, making 72 r.p.m.; the thermometer in the engine room during the summer months registers 117 degs. The out-bearing became so hot on one of those days I thought to shut down would be the only way out of the trouble, having exhausted all known remedies, such as cylinder oil, three noted brands of grease and cold water. Having some of your grease at hand, I commenced using it, expecting to get the same results. I was somewhat amazed to get the required results; in one hour's time the bearing was back to its normal temperature. From this on I will always have some of your lubricant on hand."

THE WESTERN ELECTRIC COMPANY, of Chicago, Ill., has made arrangements for representing the Stanley Electric Manufacturing Company in the following territory: Michigan, Ohio, Kentucky, Tennessee, Alabama, Mississippi, Indiana, Illinois,

Wisconsin, Minnesota, Iowa, Missouri, Arkansas, Louisiana, Texas, Indian Territory, Oklahoma, Kansas, Nebraska, South Dakota, North Dakota, Montana, Wyoming, Colorado and New Mexico. A complete stock of transformers and other appliances to insure prompt shipment will be carried by the Western Electric Company in Chicago, and correspondence is solicited from intending purchasers of alternating apparatus for any purpose, single phase, polyphase, power transmission, transformers, switchboards, instruments, etc., and all orders and inquiries will have prompt attention.

THE HARRISON SAFETY BOILER WORKS, of Philadelphia, Pa., reports the following recent sales of Cochrane separators. Wm. H. Grundy & Company, Bristol, Pa., one 8-in. horizontal separator; Chicago Brass Company, Kenosha, Wis., one 4½-in. vertical and one 5-in. horizontal; Warren Electric Company, Ltd., Warren, Pa., one 6-in. horizontal; Thos. Evans, Providence, R. I., one 7-in. horizontal; Philadelphia Watch Case Company, Riverside, N. J., one 7-in. horizontal; J. B. Kendall, Washington, D. C., one 8-in. horizontal; Cincinnati (Ohio) Milling Machine Company, one 5-in. horizontal; Adrian (Mich.) Water Company, 3-in. vertical and two 4-in. vertical; F. W. Wolf Company, Chicago, 5-in. horizontal; Barr Pumping Engine Company, Philadelphia, 5-in. horizontal; Stockton (Cal.) Water Company, 5-in. horizontal; Collins White Lead Works, of the National Lead Company, St. Louis, 4½-in. horizontal; University of Kansas, Lawrence, Kan., 3-in. and 5-in. horizontal; Carnegie Steel Company, Carrie Furnaces, Rankin, Pa., 2-in. vertical, and 3-in. vertical and 3-in. horizontal; John Gund Brewing Company, La Crosse, Wis., 4-in. vertical, 3-in. vertical, and 3½-in. horizontal; Edwin S. Hartwell Lumber Company, 9-in. horizontal, and others.

THE SAFETY THIRD RAIL & ELECTRIC COMPANY, of New York, filed a certificate of incorporation on Sept. 22. This company has been formed to control the patents formerly owned by the Safety Third Rail Electric Company. An election was held on Sept. 23, and the following gentlemen were appointed as officers and directors: Emerson McMillin, president; William M. Keepers, vice-president; David F. Halsted, secretary and auditor; C. T. Scoville, treasurer; J. McLeod Murphy, electrical and mechanical engineer; E. V. Baillard, assistant electrical and mechanical engineer; W. F. Douthirt, assistant secretary; Louis Steckler, counsel; directors—Emerson McMillin, David F. Halsted, Henry B. Wilson, Louis Steckler, R. H. Beach, J. McLeod Murphy, C. T. Scoville, W. F. Douthirt, William M. Keepers. The capital stock of the company is \$1,000,000, half of which is preferred and half common. The same general offices will be continued at No. 5 Beekman Street, New York City. This reorganization is a very important move, as it brings the control of the patents of the Safety Third Rail Electric Company into the hands of Emerson McMillin & Co., the well-known Wall Street bankers and capitalists.

LAING, WHARTON & DOWN, of London, England, have recently made sales of "Whardown" track tools to the following companies: Hull & Barnsley Railway Company, track drill and rail saw; Lancashire & Yorkshire Railway, Pearson jacks; Lancashire & Derbyshire Railway, two track drills and section car; Finland State Railways, two track drills and two rail saws; Liverpool Overhead Railway, three track drills; Hull Corporation, two track drills and two rail saws; Manchester Corporation, eleven track drills; Huddersfield Corporation, Pearson jacks, two track drills and rail saw; Blackburn Corporation, track drills; St. Helen's Corporation, five track drills; Belfast Tramways, two track drills, rail saw and Pearson jacks; Dublin United Tramways, two track drills; Isle of Man Tramways Company, six track drills; Bristol Tramways Company, track drills and rail saw; Odessa Tramways Company, three track drills and one rail saw; Bucharest Tramways Company, three track drills; Paris Tramways, track drill; Dublin & Blessington Tramways Company, track drill; Rottingdean & Brighton Tramway Company, track drill; Siemens Brothers, Ltd., three track drills; The British Thomson-Houston, Ltd., three track drills; Mather & Platt, track drill; The Oerlikon Company, track drills; Charton & Byland, two track drills; Dick, Kerr & Company, four track drills; W. H. Hutchinson, track drills; A. S. Morgan & Company, track drills.

THE HAZELTON BOILER COMPANY, New York City, sole proprietors and manufacturers of the Hazelton or Porcupine boiler, have orders from the following concerns: 500 h.p. for the Morris County Electric Company, Morristown, N. J.; Brookline Gas Light Company, Boston, 750 h.p.; American Gas Company, Philadelphia, Pa., 200 h.p., for its plant at Port Chester, Westchester County, N. Y., in which there are already three boilers of the same type; Newark Gas Company, Newark, N. J., 300 h.p.; Rochester Gas & Electric Company, Rochester, N. Y., 500 h.p.

(tenth order), making 4500 h.p. of these boilers in that very complete plant. The Rochester company has also recently purchased a 500 h.p. Hazelton or Porcupine boiler from the Syracuse (N. Y.) Heat & Power Company, which will shortly be moved to Rochester. Other contracts are from the Oakland Gas, Light & Heat Company, Oakland, Cal., new steel jacket for 200 h.p. Hazelton boiler erected about ten years ago and now to be equipped with all the latest improvements; Wagner Palace Car Company, Buffalo, N. Y., steel jackets for five 150 h.p. Hazelton boilers, which were erected in circular brick settings about eight years ago; Gilbert & Bennett Manufacturing Company, Georgetown, Conn., steel furnace casings; Goodyear's India Rubber Glove Manufacturing Company, Naugatuck, Conn., 300 h.p. (third order), and South Middlesex Street Railway Company, South Framingham, Mass., 150 h.p. (third order). All of these boilers are to be equipped with the new brick-lined steel jacket, with square furnace and square grate surface, lately introduced by the Hazelton Boiler Company. Such an array of orders clearly indicates the high opinion of this boiler held by steam users.

### New Publications

Painting of Metal, with Specifications. By A. H. Sabin. 96 pages. Illustrated. Published by Edward Smith & Company, of New York.

This book deals with the subject of the best method of painting iron and other metals in buildings, bridges and structural work, in order to prevent corrosion and rust. Much of the matter has been submitted in manuscript to the criticism of numerous eminent engineers in all parts of the country before publication.

### Trade Catalogues

Fare Registers. Published by Meaker Manufacturing Company, of North Chicago, Ill. Illustrated. 23 pages.

Catalogue of the Crane Company. Published by the Crane Company, of Chicago, Ill. Illustrated. 423 pages.

### Special Correspondence

Albany, N. Y., Sept. 3, 1898.

EDITORS STREET RAILWAY JOURNAL:

It is not our purpose to say anything against electric heaters made by our competitors, since we believe that the efficiency of electric heaters has been and can be determined by street railway officials whenever they care to go into the matter of electric heating; but we do desire to correct some of the facts implied in an article on "Electric Heaters," on page 582 of the STREET RAILWAY JOURNAL for September, 1898.

In that article you state that "the Gold Car Heating Company has occupied a very high position as a manufacturer of heating apparatus for railway cars," immediately after which occurs the following:

"Upon the general adoption of electricity for propelling street cars the company took up the electric heating problem and devoted its long experience in car heating to the subject. As evidence of its ability to take hold of this subject, it might be said that over 10,000 cars and locomotives in this country are equipped with Gold heaters, not to mention 5000 in England and numberless more in numerous other quarters of the globe. It is not remarkable, therefore, that the Gold Company should manufacture an electric heater which has been widely adopted. In Chicago, for example, the South Side Elevated Road has in use 3000 Gold standard electric heaters for cross-seat cars."

The clear implication of this is, that the Gold Car Heating Company has equipped with electric heaters 10,000 cars, 3000 Gold heaters of which are in use on the South Side Elevated Railroad in Chicago. The fact is, that the 10,000 cars refer to steam heating apparatus.

The 3000 heaters in the cars of the South Side elevated road in Chicago were placed there by the Gold Company, but they embody the exact features of the heaters made by the Consolidated Car-Heating Company, and are a positive infringement. The court has so declared it, and has granted a preliminary injunction against the Gold Company restraining them from manufacturing the same. After this injunction was granted, the Gold Company produced a new heater sometime early this summer, which it has advertised widely by circulars and illustrations in the papers, particularly in the August issue of the STREET RAILWAY JOURNAL, but since there has been no cold weather, we are not aware of its having been put into practical service.

CONSOLIDATED CAR-HEATING COMPANY,  
By C. SHELDON,  
General Manager and Treasurer.