Street Railway Journal.

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PROCEEDINGS

OF THE

FIFTEENTH ANNUAL CONVENTION

OF THE

AMERICAN STREET RAILWAY ASSOCIATION,

HELD AT

ST LOUIS, MO., OCTOBER 20-23, 1896.

FIRST DAY, TUESDAY, OCTOBER TWENTIETH.

The Fifteenth Annual Meeting of the American Street Railway Association was held at the Auditorium Building, St. Louis, Mo., Oct. 20-23, 1896, President H. M. Littell, of New York, in the chair.

The meeting was opened with an invocation of divine guidance, by Rev. P. G. Robert.

PRESIDENT LITTELL: Gentlemen, I take pleasure in introducing to you Mr. Charles Nagel, acting Mayor of St. Louis, who will deliver to you an address of welcome.

The address by Mr. Nagel followed.

PRESIDENT LITTELL: Mr. Mayor, in behalf of the members of the Association, I thank you for your very cordial welcome.

The President announced the next business to be the calling of the roll, which was accordingly done, and it was found that seventy-five companies were represented. The Butte (Mont.) Consolidated Railway Company and the Buffalo & Niagara Falls Railway Company acquired membership in the Association.

The next order of business was the reading of the minutes of the last meeting, but on motion of Mr. Baumhoff, the minutes were approved as printed.

The address of the president being next in order, President Littell read the following:

PRESIDENT'S ADDRESS.

Gentlemen of the Association:

I have to thank you for the honor you have done me in electing me your president.

For the second time, after eleven years of absence, the convention meets in the city of St. Louis—the metropolis of the upper Mississippi—and it receives to-day the same cordial welcome, the same generous hospitality and the same courteous and marked consideration that distinguished our meeting here in 1885; and our first duty is to thank the members of our Association in this city for their active and successful efforts in providing for the entertainment of their guests.

I desire also to thank the supply men, in the name of the Association, for their very liberal display of exhibits, more space having been taken for this purpose this year than at any convention which has hitherto been held by the Association.

The Association is to be congratulated upon the fact that during the past year no deaths have occurred in its ranks. We meet here again this year the same in numbers as at our last gathering, Papers of great value and interest will be read.

I will not dwell upon the statistics of street railways during the past year for the reason that these are amply supplied by the street railway press. I have however, thought it advantageous to lay before you some general considerations on the present and future of street railway interests in the United States, the dangers and difficulties that beset them, the way in which these difficulties are to be met, and the prospect and hope of brighter conditions for the future.

Among the most serious difficulties with which we have to contend to-day is the growing disposition of the government, whether state or municipal, to increase our burden of taxation. This disposition has increased of late years, and even within the last year, to a marked degree. The extraordinary prejudice against corporations, among people otherwise intelligent, causes them to be regarded as legitimate objects of attack and spoliation. Those who have once become affected with this prejudice seem to be unable to understand that a corporation is simply a collection of persons, by means of which individual resources, which would otherwise be frittered away in individual enterprises, are brought under one direction, making possible the success of large undertakings requiring an aggregation of capital. Of all corporations those which suffer most from this prejudice are those which exercise a public franchise, and the street railway franchise seems in particular to be a favorite object of restrictive legislation. With the arbitrary limitation of the rates of fare and the obligation of conforming the roadbed to every change in the street through which it passes, on the one hand, and the imposition of direct burdens of taxation in the way of personal taxes, taxes on roadbed, license taxes, franchise taxes, taxes on gross earnings and taxes on dividends, on the other hand, the financial limits within which the workings of a railroad are confined have become exceedingly narrow. Sometimes it almost seems as if the legislative agencies in our various states would not stop until they had brought the burden of taxation to a point where roads could no longer run.

For such a state of things it seems to me that the only remedy is to be found in that gradual enlightenment of the public, by which it will be induced to keep the imposition of financial burdens within reasonable bounds, and such a broadminded and conciliatory management of the roads as shall in time do away with the last vestige of popular prejudice. Any successful business corporation manages and controls forces far greater than those which are at the command of a single individual, and its very power makes it an object of jealousy and attack. But I for one do not believe that the intelligence of the American people will in the long run go astray on this question any more than on any other. I believe that it is beginning to recognize, and will recognize still more clearly as time goes on, the necessity for combination and co-operation in all departments of business, and that if a proper spirit of moderation is shown—and this I consider of the first importance—by those in whose hands this extraordinary power is placed, the community at large will discover that the benefits which it derives from transportation corporations far exceed any subject of complaint which it may have against them, and will meet them upon the footing of a common interest without

regard to the corporate character of the agency by which the power is exercised.

Another, and one of the severest strains to which street railway corporations are subjected, consists in the penalties imposed by courts, for the negligence of their employes. Recent years, and especially the last two years, have seen a great increase in the number of negligence suits and in the size of verdicts. There is a marked tendency at the present time, on the part of juries, to fix a higher scale in estimating damages for personal injuries. Cases where formerly verdicts of $2,500 were rendered, now often result in a judgment for $5,000, and others in like proportion. The state of New York has recently removed the limit of $5,000 in cases of death, so that now a verdict of $20,000 in a death case is by no means unusual. The doctrine of contributory negligence, which in theory and as duly expounded by the courts, in charges to juries, would preclude any recovery in cases where it is shown, seems only to be considered by juries—if considered at all—as a slight makeweight against the plaintiff in determining the amonnt of damages. Probably no class of cases exists in which it is so difficult to meet false testimony as in these, even when its falsity is perfectly apparent.

I do not mean to suggest for a moment that street railway companies are without fault in the matter of accidental injuries, but I do say that, profoundly as we must sympathize with the suffering and the unfortunate, we ought not to be compelled to pay the penalties of negligence where the negligence was due to the sufferer himself, nor should a case be sent to a jury where this fact is disclosed by the plaintiff's own statement. As was well said some time ago by the General Term of the Supreme Court of New York,

"To leave it to a jury to say that such acts under such circumstances do not constitute negligence, would be to throw away the best understood legal standing, and substitute in its place any whim which might chance to flit through the minds or run in the emotions of uninstructed and unbridled jurors."

Whatever may be the ultimate result of existing tendencies in courts and juries, we may still hope for improvement in the matter of accidents, as people become more accustomed to the high rate of speed in their streets, which they now exact from street railways. No community which has had the benefit of rapid street transportation would ever be willing to go back to the old five or six miles an hour rate of horse cars. It must learn and it will learn that it cannot have this benefit without a certain element of danger, and whether it runs the risk of this danger in traveling as passengers on the cars or in walking or driving in the roadway, it will come in time to take those precautions by which the great majority of accidents could readily be avoided.

For those accidents which no ordinary precaution on the part of the sufferer could avert, I believe there is one remedy and only one, and that lies in the hands of the management of street railways. That remedy is to be found in *the discipline of the force*. If discipline is slack, accidents will be frequent. If discipline is high and well maintained, accidents will be reduced to a minimum. As in every other great organization, the spirit which controls at the top penetrates through all the branches of the system, and the means by which it penetrates is the discipline maintained over the force by its head. In this one element of discipline, I believe, lies the secret of preventing the ruinous losses which follow from damage suits.

The last two years have seen the introduction of an unlooked for competitor in street, and especially in suburban transportation, and that is the bicycle. In some places where its use is peculiarly advantageous, it has undoubtedly cut down earnings very heavily. I do not believe, however, that in the long run the street railway business is going to suffer on that account. Anything to my mind that promotes in our American people the habit of locomotion, particularly of rapid locomotion, is beneficial to street railways. No doubt the bicycle has come to stay, and no doubt upon some suburban routes its competition has been serious, but it is still to a great extent a novelty, and when the effects of novelty have worn off, and the use of the bicycle is limited to those who will habitually make use of it all their lives, I think there will still be found quite enough people who prefer street cars as a means of locomotion, even in places where the bicycle can be used.

In spite of the disadvantages of which I have spoken, under which street railways suffer, and in spite of the financial difficulties which have prevailed for the last three years, and which have told as heavily upon street railways as upon any other interest, I believe they have before them a bright and prosperous future. In their prosperity every man, woman and child in our city communities and in many rural districts is directly interested. They have been of enormous benefit in spreading out population over a larger area, in relieving densely populated districts in cities, and in making possible suburban homes, where the man who pursues his business in the heart of the city can live with his family at a distance from his office, and with them enjoy the benefits of space, of sunlight, of fresh air, of trees and gardens and of rural surroundings. This is especially true of the more modern forms of rapid transportation by which the time of transit is reduced. The luxury of such a home as I have described, to those of moderate means, who hitherto have been crowded into small and unwholesome flats or tenements, is one of the many blessings which the modern street railway has bestowed upon the community, and those who have reaped the benefits of it are not likely to forget it.

In conclusion, I desire to congratulate the Association upon the large number of its members who are present here to-day, and to express the hope, in which I am sure all of you will join me, that this meeting will be the most harmonious, as well as the most interesting, that we have ever held.

Mr. Green, of St. Louis: I move that one thousand copies of the address of the President be printed separately and that it be spread upon the minutes of the Association, and that the thanks of the Association be given to the President. Carried.

Mr. Baumhoff, of St. Louis: Mr. President and gentlemen.—This meeting marks a new era in the history of the American Street Railway Association. Fourteen years ago, Mr. H. H. Littell, then general superintendent of the Louisville City Railway Company, and now vice-president and general manager of the Buffalo Street Railway Company, conceived the idea of the benefits which might accrue to street railway managers by the formation of an Association of this character, and after a conference with a number of his friends, it was determined to call a meeting for organizing what has since developed into one of the grandest Associations in this country. (Applause.) Accordingly, invitations were extended to representative street railway managers throughout the country to attend the initial meeting in the city of Boston, in the month of December, 1882. What more fitting place in our great country could have been selected than the great "Hub City," for, like the spokes extending from the hub of a great wheel, this Association has spread throughout our great land, extending from ocean to ocean, and from the Gulf on the South to British America on the North, and has even invaded Canada, where our last meeting was held. We are in a new era, because we have eliminated the discussions of the care and feed of horses, the construction and ventilation of stables, and other sundry annoyances which at that time tended to make the life of a street railway manager anything but pleasant. It is a new era, because, for the first time in the history of this Association, you have met again in a city before honored with a convention and we proudly point to the fact that in this city we have transformed the last animal traction road to one operated electrically.

Mr. President, I have a pleasing duty to perform, the more so, because the request comes from Chicago. (Applause.) To such of you as are, perhaps, unfamiliar with that name, I will state that Chicago is a little hamlet over in the state of Illinois, extending from the western boundary of Indiana on the east to the great father of waters on the west (laughter and applause), and from the great lakes on the north to Egypt on the south. Chicago, as you all know, was an applicant for this convention. In fact, it is a a cold day when Chicago is not an applicant for something. (Laughter.) But, as usual, St. Louis carried off the prize. (Applause.) Chicago, however, desired to have a finger in the pie, and determined to be heard, and now, Mr. President, in behalf of the Chicago City Railway Company, I present to you this handsome gavel, made of the hardest and most durable wood, enclosed in a box made from the sill of a car which has for many years done service on the Chicago City Railway. May this convention, as it is called to order by the rappings of this gavel, pass into the annals of history as one

of the most pleasant and beneficial gatherings of this character. (Applause.)

PRESIDENT LITTELL: This, gentlemen, is indeed a very agreeable surprise, and I hope that it will be sufficiently large to preserve order. I thought when I was elected president of this Association that my position would be such that I would look down upon all of you, but I find, upon entering this hall, that you all look down upon me. The fact is, I think you have got me in a hole. (Applause.) I am pleased with the prospect that, with the assistance of my friends, it will be possible for me to preserve order with this beautiful gavel. I thank the Chicago City Railway Company on behalf of the Association. (Applause.)

MR. BEAN: Mr. President, as Mr. Baumhoff has pleasantly reminded us of the Boston meeting, in 1882, I would ask that every gentleman present who was at that meeting will rise for a moment.

Messrs. Green, of St. Louis, Smith, of Troy, H. H. Littell, of Buffalo, Rugg, of Boston, and Bean, of St. Joseph, Mich., arose.

The secretary then read the report of the Executive Committee, which consisted of the minutes of the three meetings held by the committee during the year, together with a report of membership, and was as follows:

REPORT OF THE EXECUTIVE COMMITTEE.

Minutes of the first Executive Committee Meeting held in St. Louis, Dec. 9, 1895.

The members present were President Littell and Messrs. Jackson, Morgan, Markle and Kelley. Secretary T. C. Penington was also present. Letters were read from Messrs. Granville C. Cuningham, Joel Hurt, Prentiss Cummings and C. G. Goodrich, regretting their inability to be present.

Captain Robert McCulloch, of St. Louis, was invited to meet with the committee and take part in its deliberations. Captain McCulloch addressed the committee, stating that the local street railroad people had formed an organization for the purpose of helping this committee to make the meeting of the Association to be held in St. Louis next October a great success. The speaker had been elected chairman of that organization and as such stated:

"I will be very glad to help you in every way possible and carry out any plans that you may have made or may advise for the meeting. What we would propose to do is to take care of everything locally for you and rid you of the care and burden of that work. For instance, we will provide the place for holding the sessions and we will also provide a place for the exhibits. We want the exhibits to be a prominent feature of the meeting and we will provide a good place for that purpose without tax to the Association. You will not have anything to pay for hall rent, meeting place or anything of that kind. We will guarantee that you will not have to spend any money for these things and we will make them creditable to you in every respect."

Mr. Littell stated that many of the manufacturers who had never heretofore made an exhibit would exhibit in St. Louis at the coming convention, that he was satisfied that it would be the largest, best and most complete exhibit of the kind ever given, and that he would suggest that every street railroad man constitute himself a committee of one to see the manufacturers and urge them to make an exhibit. In this way a very large revenue could be raised and the majority of them will be very glad to come in and take space.

On motion of General Jackson it was decided that "it is the sense of this committee that we cannot do without the revenue which has been heretofore derived from the letting of space to exhibitors and while we thank the St. Louis Committee for its very liberal offer, we should follow the usual custom in this matter."

Mr. McCulloch stated that the local people desired the Executive Committee to understand that they were not trying to run the convention, but were simply to act as an auxiliary to the Executive Committee and that anything they might propose or any plans they might make would be subject to the approval of that committee; that they had no cranky notions or "isms" of any kind and that he hoped the members of the committee would not hesitate to criticise anything they saw fit.

On motion of General Jackson this matter was referred to the president and secretary of the Association with the suggestion that the St. Louis Committee act under the instructions of those gentlemen, as to what was to be done.

Captain McCulloch stated that he had appointed committees in the local organization (the names of these committees have already been given) and that other committees would be appointed as the necessity for such action arose; but that any and all of their proposed actions would be first submitted to the approval of the president of the Association. Any suggestions he might make or any changes he had to recommend would be cheerfully attended to. The local people did not want to be the Association, but merely wanted to help the Executive Committee run the convention.

Mr. Littell said; "Of course we want to make sure that there will be no advance in hotel rates." To this Captain McCulloch replied, "Mr. Lewis has posted on the inside of each room the rates for that room and he assures me that these rates will be strictly maintained and will not be advanced in any part of the house."

The secretary then announced that he had prepared a financial statement and that if the Executive Committee would fix the secretary's salary, he would be able to make an approximate report for the year.

On motion of Mr. Morgan it was decided that the salary of the secretary should be fixed at $1500 per year, this sum to include all expenses for help, and that there should be further added $35 per month for rent, fuel, etc., of the office, and that the Association would pay the salary of the stenographer at official meetings.

The secretary then read a report of the financial affairs of the Association to Dec. 1, 1895. After the reading of the report the committee discussed the various outstanding liabilities of the Association and upon motion of General Jackson, the president and Mr. Morgan were authorized to settle the bill of Messrs. Richardson and Hook upon the best possible terms and the president and secretary were authorized to settle all other outstanding liabilities as enumerated in the secretary's report, upon the best possible terms.

Following the report, the secretary read communications from various persons. In regard to the communication from Montreal relative to the Association's indebtedness there, it was decided that these matters be left to the discretion of the president and secretary, it being the sense of the committee that any one employed without the authority of the old committee, or any obligations incurred without such authority be not paid.

In connection with communications read from exhibitors who are indebted to the Association for space at the previous conventions, it was decided that any exhibitor who is in arrears for past dues should not be permitted again to exhibit until those dues are paid up.

The secretary was instructed not to accept the draft of Mr. Jackson, but to return it, together with the bill of Mr. Watts.

Mr. Littell presented a letter from Wm. J. Hammer, chairman, asking the Association to send a delegate to the convention of the National Electric Light Association, to be held in New York City, on Jan. 15, 1896. On motion of Mr. Markle, John A. Seeley, of Lock Haven, was appointed by the committee as its delegate to this meeting.

President Littell stated that the prime object of this meeting was to select subjects for papers to be read at the next convention.

General Jackson read a telegram from Joel Hurt, of Atlanta, requesting Captain McCulloch, of St. Louis, to act in his place on this committee, and the committee unanimously ratified Mr. Hurt's recommendation.

Upon motion of different members of the committee, M. K. Bowen, of Chicago; John N. Akarman, of Worcester; C. D. Wyman, of Milwaukee; B. Willard, of New Orleans; Richard McCulloch, of St. Louis, and W. F. Kelly, of Columbus, were invited to read papers at the convention of 1896.

The secretary was instructed to draw up a programme for the work of the convention and submit it to the Executive Committee at their next meeting, and upon motion, the committee adjourned, subject to the call of the president.

Minutes of the second Executive Committee Meeting held in New York, Sept. 9 and 10, 1896.

The members present were President Littell and Messrs. Morgan, Markle and Kelly; Secretary Penington was also present.

The president stated that Mr. Frank R. Ford had been substituted in place of Mr. John A. Seeley, as the delegate of the Association to the joint conference of electrical, insurance and allied interests, held in New York City, Mar. 18 and 19.

The secretary stated that the entire 30,000 ft. of space at the St. Louis Exposition had been taken, and arrangements were being

made to provide more space. A statement of the finances of the Association to Sept. 1, and a list of members in arrears for dues and deficit fund was presented. A thorough discussion then ensued concerning the affairs of the Association and the arrangements for the forthcoming meeting, among other things including the advisability of discontinuing the annual banquet and devoting the money heretofore spent for that purpose to advancing the interests of the Association in other directions.

On motion of Mr. Morgan the following resolution was adopted:

"Whereas, a large portion of the revenue of this Association has each year been expended in an annual banquet, and

"Whereas, the funds so expended can be used more advantageously in the promotion of the active work of the Association,

"Resolved, that it is the sense of this committee that no banquet be given at the next annual meeting in St. Louis."

A letter was read from Mr. Granville C. Cuningham, of Montreal, who stated his inability to be present and requested that the claims of Messrs. Jackson and Watt for services in connection with the Montreal meeting be paid.

On motion of Mr. Morgan the Committee declined to pay the bills referred to by Mr. Cuningham, on the ground that the Local Committee in Montreal had exceeded its authority in incurring those obligations.

The treasurer was authorized to make payment to the Windsor Hotel, of Montreal, of the balance of $97.75 on account of the banquet.

After a discussion of the amendments to the constitution and by-laws recommended by the Executive Committee at Montreal, Mr. Kelly offered the following resolutions:

"Whereas, the Association is now out of debt, and has a surplus in the treasury, and

"Whereas, the prospective income for the ensuing year is, in the judgment of the Executive Committee, sufficient to meet all legitimate expenditures, be it

"Resolved, that the Executive Committee recommends that there be no change in the existing constitution and by-laws."

The resolution was unanimously adopted.

A letter from Mr. Frederick Nicholls, of Toronto, Can., president of the National Electric Light Association, relating to the matter of the consolidation of the two associations, was read, and the secretary was instructed to notify Mr. Nicholls that the Executive Committee would be willing to have Mr. Nicholls appoint three representatives of the National Electric Light Association, engaged exclusively in the lighting business, to confer with three representatives of the American Street Railway Association, engaged exclusively in the street railway business; and that these gentlemen consider the subject fully."

On motion of Mr. Markle, all papers to be read at the next meeting of the Association were referred to the secretary to report to the Executive Committee, at the next meeting of the committee in St. Louis, as to whether or not they contained any objectionable features.

Mr. Hook was invited to meet the committee, but refused to do so.

On motion of Mr. Morgan it was decided that the settlement of the Richardson and Hook matter be left to the president, with power to employ counsel and take such steps as he deemed necessary for the adjustment of the same.

The meeting was adjourned to meet at the Southern Hotel, St. Louis, Oct. 19, at 10 A.M., unless called before by the president.

Minutes of the third Executive Committee Meeting held in St. Louis, Oct. 19, 1896.

The members present were President Littell and Messrs. McCulloch, Morgan, Markle, and Kelly; Secretary Penington was also present.

On motion of Mr. Kelly, the following resolution was unanimously adopted:

"Whereas, the local committee in St. Louis, having incurred obligations relative to giving a banquet at the St. Louis meeting, and as such obligations cannot be canceled without embarrassment to the local committee,

"Resolved, That the former resolution that a banquet be not given is hereby rescinded.

The secretary read a letter dated Oct. 8, from Mr. Granville C. Cuningham, first vice-president, tendering his resignation of such office. On motion of Mr. Markle, the resignation was accepted.

On motion of Mr. Markle, Robert McCulloch, of St. Louis, was elected first vice-president.

The secretary read a letter from W. H. Watt, secretary of the Montreal Street Railway Company, withdrawing that company from membership in the Association.

The secretary read a letter from Frederick Nicholls, president of the National Electric Light Association, stating that he had appointed W. S. Barstow, of Brooklyn, N. Y., Charles E. Stott, of Bristol, Pa., and Henry Clay, of Philadelphia, Pa., a committee of three to confer with a committee of three from the American Street Railway Association on the consolidation of the two organizations. On motion of Mr. McCulloch it was ordered that President Littell be one of the members of this committee representing the American Street Railway Association, and that the other two members should be selected by him from places convenient to New York and Philadelphia, in order to ensure their attendance at the meeting for conference and to save expense of traveling long distances.

On motion of Mr. Markle the secretary was instructed to issue two banquet tickets to each member company of the Association when there are two or more official representatives; one only when but one such representative is present; and none to companies not represented at the convention.

It was decided that the sessions of the meeting at St. Louis, with the exception of the first, be executive sessions; that none but delegates be admitted to the meetings, and that the secretary give out such information to the press as may be proper, in his judgment.

Report of Membership.

Number of members October, 1895, 173.

New members admitted during the year:

- St. Louis & Suburban Railway Company, St. Louis, Mo.
- Omaha & Council Bluffs Railway & Bridge Company, Council Bluffs, Ia.
- Union Traction Company, Philadelphia, Pa.
- Findlay Street Railway Company, Findlay, O.
- Houston Electric Street Railway Company, Houston, Tex.
- Meriden Electric Railroad Company, New Haven, Conn.
- Schuylkill Traction Company, Girardville, Pa.
- Richmond Traction Company, Richmond, Va.

Loss by consolidation:

- People's Passenger Railway Company, Philadelphia, Pa.
- Electric Traction Company, Philadelphia, Pa.
- Brooklyn, Queens County & Suburban Railroad Company, Brooklyn, N. Y.

Withdrawn:

- Montreal Street Railway Company, Montreal, Can.

Suspended for non-payment of dues:

- Sandusky Street Railway Company, Sandusky, O.
- Hoosac Valley Street Railway Company, North Adams, Mass.
- Central Crosstown Railroad Company, New York City.
- Central Railway Company, Peoria, Ill.
- Colorado Springs Rapid Transit Company, Colorado Springs, Col.
- McKeesport & Reynoldston Passenger Railway Company, McKeesport, Pa.
- Paterson Central Electric Railway Company, Paterson, N. J.
- Canton-Massillon Electric Railway Company, Canton, O.
- Metropolitan Railroad Company, Washington, D. C.
- Citizens' Electric Street Railway Company, Mansfield, O.
- Columbia Electric Street Railway Company, Columbia, S. C.
- Atlanta Traction Company, Atlanta, Ga.
- Miami Valley Railway Company, Piqua, O.

Present membership, 164

The committee concludes its report with the following statement:

Financial Condition.—At the beginning of the year, we found the Association about $6000 in debt. Through the generosity of the members in subscribing to cancel this, and with rigid economy in the administration of the affairs of the Association during the past year, we are now virtually out of debt (a few small disputed bills remaining unpaid), and have the sum of $1,765.94 to turn over to our successors.

In this connection we take pleasure in calling the attention of the members of the Association to the efficient and economical administration of the secretary's office during the year.

The committee is pleased to know that, with the amount received from the exhibit at St. Louis and the annual dues for the year 1896-97, the incoming Executive Committee will have at its disposal about $6500, after paying all expenses at St. Louis. It is believed that with this amount it will be possible, without any amendment to the constitution and by-laws, for the secretary to enlarge the scope of the work of the Association, and it is contemplated that a monthly bulletin shall be issued, containing information of value to the members.

We have to thank the local committee at St. Louis for its hard work in relieving us of all local matters, and its splendid efforts in furnishing the Association with a place of meeting and hall for exhibits, and in arranging an elaborate programme for our entertainment during the meeting in its city.

MR. HAMILTON: I move that the report of the Executive Committee be received, approved and spread upon the minutes, and that the recommendations therein be concurred in; that this Association hereby expresses its appreciation of the able manner in which the affairs of the Association have been conducted during the past year, and its thanks are hereby extended to its officers for their very efficient services in its behalf. Seconded and carried.

The secretary then presented the following report:

REPORT OF THE SECRETARY AND TREASURER.

1895-96.

RECEIPTS:

Deficit fund	$4,785.00	
Dues	3,958 32	
Membership fees	300.00	
Decisions	69.50	
Miscellaneous	705.48	
Space in exhibit hall, 1895	1,380.50	
" " " " 1896	846.00	
		$12,044.80

EXPENSES:

Rent	$ 180.00	
Printing and stationery	849.42	
Salaries	1,500.00	
Convention, 1895	1,683.89	
Executive committee, 1896	425.70	
Deficit fund	4,698.34	
Decisions	165.75	
Miscellaneous expenses	378.59	
Office expenses	30.17	
Postage	183.00	
Convention, 1896	85.25	
Furniture	98.75	
Cash on hand	1,765.94	
		$12,044 80

ASSETS.

Cash in bank	$1,765.94

DUES UNCOLLECTED.

York Street Railway Co., York, Pa	$25	
Eckington & Soldiers' Home Ry. Co	25 (withdrawn)	
Duquesne Traction Co., Pittsburgh, Pa	25	
Lackawanna Valley R. T. Co	25 (out of business)	
City Elec. Ry. Co., Port Huron, Mich	25	
Allegheny Traction Co., Pittsburgh, Pa.	25	
Quincy & Boston St. Ry. Co., Quincy, Mass.	25	
Dubuque Street Ry. Co., Dubuque, Ia	25	200.00
Office furniture	100.00	
Space, St. Louis convention	846.00	946.00
		2,911.94

LIABILITIES.

S. Jackson, Montreal	$121.80	
W. H. Watt, Montreal	50.00	
Richardson & Hook	210.00	381,80
Net assets		$2,530.14

Due for space at Montreal, which cannot be collected.

James Steel	$15.00	
Morris, McCurdy & Smith	7.50	
St. Lawrence Machine Co.	15.00	
A. W. Glasyone	7.50	$45 00

In addition to the amount subscribed at Montreal the following members have paid sums as follows:

Dry Dock, East Broadway & B. R. R. Co. New York	$25.00
Waterbury Traction Co., Waterbury, Conn	25.00
Vincennes Citizens' Ry. Co., Vincennes, Ind	10.00
Ft. Wayne & Belle Isle Ry. Co., Detroit, Mich	25.00
Lowell, Lawrence & Haverhill St. Ry. Co., Lawrence, Mass	25.00
Metropolitan Street Ry. Co., Kansas City, Mo	175.00
	$285 00

The secretary desires to thank the street railway and electrical press for their courtesy in publishing all notices sent out by him, and furnishing the secretary's office with copies of their journals for the year.

T. C. PENINGTON,
Secy.

MR. SEELY, of Lock Haven: I move that the report of the secretary and treasurer be received, filed, and spread upon the minutes. Carried.

The secretary read letters of regret of their inability to attend the meeting from Messrs. H. H. Vreeland, president Metropolitan Traction Company, New York City, John N. Akarman, general manager Worcester Consolidated Street Railway Company, Worcester, Mass., and Benjamin Willard, general superintendent New Orleans City & Lake Railroad Company, New Orleans, La.

THE PRESIDENT: The first paper on our list is that by M. K. Bowen, superintendent Chicago City Railway Company, on "Track and Track Joints: Construction, Maintenance and Bonding." (This paper will be found on page 697.)

THE PRESIDENT: What disposition will you make of Mr. Bowen's paper.

MR. SEELY: I move that a vote of thanks be extended to Mr. Bowen for his valuable paper, and that it be printed and spread upon the minutes. Carried.

THE PRESIDENT: We would like to hear from other members of the Association in regard to track construction, track joints, etc.

MR. ROBERT MCCULLOCH, of St. Louis: There is one important matter in connection with Mr. Bowen's paper—I do not wish to criticise it, but merely wish to give my own experience with regard to the carrying of the current over a welded track without bonds. We have one piece of track which is thirteen miles long and all welded together, the most of it being of sixty foot rail. We have not an ounce of copper nor a bond of any kind on the entire track. We have made tests of all sorts, with delicate instruments, graded to the thousandth part of a volt, tested in as long and as short lengths as possible, sometimes a mile and sometimes a single joint, and have found in most instances that the carrying capacity of the joint was greater than that of the rail at any other place. We have found no necessity for bonding; our contact is perfect at the extreme ends of the rail, and I do not believe it is necessary to bond a welded track.

MR. HARRY SCULLIN, of St. Louis: Has the gentleman found any difference in the carrying capacity of the rail, after the weld has been in use some time?

MR. MCCULLOCH: All the tests we have made have been on track that was laid about ten months since. The tests were made about two months ago, so that the oldest joints that we tested were about six or eight months old.

MR. T. J. MINARY, of Louisville: Were the tracks welded by electricity or were they cast welded?

MR. MCCULLOCH: They were cast welded.

MR. SEELY: I ask Mr. Bowen whether it is necessary to own a plant for repairing purposes in case the joints are broken? How do you repair joints after the welding plant is taken down? I know that when we weld a mile or four or five miles of track, it is not expensive to run a cupola,

but it might be in the case of repairing a few joints now and then.

Mr. Bowen: For a small road it would be better to let the contractors repair the broken joints. For a large system it would, probably, be better to keep a cupola You are always building more or less track and doing a considerable amount of repair work. A large system is generally building new track, and you could use a machine and make it pay for itself.

Mr. Dodge, of New Haven: You spoke of something like 200 joints, out of 1700, which parted. How soon after the casting of these joints did they part? Was it very soon after they were welded?

Mr. Bowen: We lost the joints on account of contraction, due to very cold weather, in midwinter. With the first cold snap, the contraction of the rails pulled 154 joints apart. The joints were then repaired, and since then they have gone through the summer the same as the other joints.

Mr Dodge: Were they cast in the winter?

Mr. Bowen: No, sir, in midsummer, during the night hours.

Mr. Scullin: I ask Mr. Bowen if most of the joints were examined, or simply those found broken? I want to ascertain if the joints were not loosened as well as broken—some of them loosened, in some way or other, to an amount not perceptible until they were closely examined.

Mr. Bowen: There were 154 remade. When they do part it is for two or three inches, so that you can see them readily. If there is any oxidation between the joint and the rail, I hardly imagine it would do any harm, unless it was sufficient to loosen the cast iron from the rail proper. In that case it would come apart three inches, due to the contraction of four or five blocks of steel.

Mr. H. H. Littell, of Buffalo: What kind of a job do you make in repairing a rail with a space of three inches?

Mr. Bowen: We saw a piece of rail and cut it in, and recast around the entire two joints in that case.

Mr. E. G. Connette, of Nashville: I ask what is the average cost of the joint?

Mr. Bowen: It is about what the contractor can get out of it. I do not know whether it is a trade secret or not. The joint requires one hundred pounds of cast iron, so that you can make your own calculations.

Mr. C. D. Wyman, of Milwaukee: As it is possible that some other gentlemen here may be as interested in the answer to the question I am about to propound as I am, I ask it here instead of after the meeting. Mr. Bowen says that he uses the bond in order to be absolutely certain of obtaining conductivity in the rail. Will he kindly tell me how he uses it. Does he use it around the weld or beneath the weld?

Mr. Bowen: We simply bond the track after we cast the joints.

Mr. Wyman: You use a long bond around the weld?

Mr. Bowen: Yes, sir.

Mr. Wyman: You said just now that when one of those welded joints pulled apart, as they do naturally, they would pull apart two or three inches.

Mr. Bowen: Yes, sir.

Mr. Wyman: Do you allow for that in your bond?

Mr. Bowen: When the joint pulls apart, in all probability it ruptures the bond. If it does, we put in a new bond. I am not sure that the practice of bonding will be continued with us after the next year or two.

Mr. Goff: May I ask what trouble you have in the summer time? I have in mind a track which I think was bonded in the winter and cast welded in the winter, and in the summer it seems to be out of line all the time. The car has a waving motion over the track. Do you have any trouble of that nature?

Mr. Bowen: That comes from the casting. Mr. Littlefield, of the Johnson Company, told me that the rails usually delivered to consumers are not sawed square on the ends, but are sawed with the ball on the bias; in other words, that the ball of the rail comes together, and the flange of the rail does not. I have noticed that in laying rails. You will find as you put your mould on to cast the joint that the rails have contact at the ball and not at the flange at all. If you are not careful the rail will do two things—it will go *out* and it will go *up*. On account of the larger part of the iron being underneath the rail, the contraction in cooling will push it up and push it out. In order to prevent that we put a clamp on the rail when casting the joint and push it in a quarter of an inch, and down a quarter of an inch.

Mr. Goff: Did you have this trouble before you cast the track in the manner you just mentioned?

Mr. Bowen: We cast straight joints now. We used to cast crooked ones.

Mr. Goff: What temperature do you find gives the best results? Do you take the season of the year when the temperature is cool, or can you do it equally well in the summer or late in the fall?

Mr. Bowen: I should advise the majority of joints to be cast at night so that the temperature will be lower. I advise a medium temperature, a little cooler than the medium temperature for your climate, whatever it is. We like to cast at a temperature of between 40 degs. and 50 degs.; somewhere about 50 degs.

Mr A. Langstaff Johnston, of Richmond, Va.: In the examination of the broken joints by contraction, did you find that the rail pulled out of the cast iron?

Mr. Bowen: Occasionally, but more often not, on account of our driving two pins through the last two holes of the fishplate. We have supplemented the joint with them. We find then that it tears the casting apart.

Mr. Johnston: Then the cast metal is in the mass, but still it is not a homogeneous mass?

Mr. Bowen: It is not in spots. There is a spot on each side which shows amalgamation.

Mr. Johnston: That is something important, because if there are no spots where it is amalgamated to the steel rail you would not have a good electrical connection.

Mr. Bowen: I have cut off many joints, and I have found some places where the amalgamation has taken place, and some where it had not.

Mr. Johnston: Have you allowed a time test as to the amalgamated metal carrying the return current through the joints?

Mr. Bowen: In welding your rails you would have to be careful to clean the rails, or you would not get a good electrical connection.

Mr. Albion E. Lang, of Toledo, O.: What is the lightest weight of girder rail you have used in making these cast welded joints, and have any of those rails been placed on chairs?

Mr. Bowen: The sixty-three pound, 4½ in. rail was the lightest we have used, and this we used on chairs. The heaviest is a seven inch, eighty-three pound rail. We have used no chairs on the nine inch construction.

Mr. Lang: What kind of chairs did you use on the rails you speak of.

Mr. Bowen: Steel chairs. In the nine inch construction, we use in our electrical work malleable iron chairs, but this happened to be a steel chair that was used.

Mr. Littell, of Buffalo: Do you use the single bond or double bond?

Mr. Bowen: It depends, of course, on the proximity of the power station, and how many cars are on the line.

Mr. Littell: What size of wire?

Mr. Bowen: No. 0000.

Mr. Littell: These are not cast in?

Mr. Bowen: No, sir, they are placed around the outside of the cast welded joint.

Mr. Harrington: Do you observe any particular proportion in the metal used in making up the casting?

Mr. Bowen: Yes, sir; I gave it in the paper.

Mr. Harrington: Is that proportion observed throughout?

Mr. Bowen: Yes, sir.

Mr. W. W. Bean, of St. Joseph, Mich.: I would ask if Mr. Bowen has bonded any T rail?

MR. BOWEN: No, sir.

MR. G. A. W. DODGE, of New Haven, Conn.: I will say that in New Haven there are about 1500 joints which have been cast on fifty and sixty pound T rail. Some one inquired about the cost of these joints. I understand that the man who is putting them in at New Haven on the fifty and sixty pound T rail is getting $3.25 a joint, the railroad company having to pay the freight to and fro on the apparatus necessary.

MR. LITTELL, of Buffalo: I ask Mr. Bowen, or any gentleman present, if there has been any trouble or experience with the pulling apart of the rail itself, not at the joint, whether welded joint or put togetherwith splice bars, but of pulling the rail itself in two by the contraction?

MR. BOWEN: I think that there were one or two such cases on our road. Instead of the fracture being just at the joint, it was some little distance back, probably where the difference between the extreme heat and the ordinary temperature of the rail left a partial fracture; there were only one or two cases.

MR. LITTELL: If the members of the convention will give me the time, I am going so tell a little story—I do not ask you to believe it, but it is a fact. We have no welded joints in Buffalo. We have the ordinary track laid with nine inch rail, ninety-four pounds to the yard. Summer before last we put down some nine inch rail in hot weather, forcing the rails just as close as we could, leaving them uncovered until the morning, In the morning we drove the rail back by means of a lot of men with heavy timber. We drove the rails up as close as we could, and put them together with a twelve bolt splice bar and one inch bolts. We got along very nicely for a time, but winter before last we had one of the rails pull in two, thirteen feet from the joint—a thirty-two foot rail, nine inches, weighing ninety-four pounds to the yard!

MR. SEELY: We have had some experience in that line, ninety pound girder rails pulling in two on a grade of about five per cent. We have this occur every winter; the rails break right in the center. The joints are driven too close together, and the rails are bound to expand in some direction. We also find that with the high carbon rails we are using, it is almost impossible to cut them with the ordinary tools; we require special devices for sawing rails in two. In sawing rails, if you have to turn them over, they will crack all the way down the center, and we are compelled to handle them with the greatest of care.

MR. SCULL: What does an indicator car cost?

MR. BOWEN: I have no idea; it was built in our shops. The cost is a nominal sum outside of the framing of the car. It is a few wheels and strings. There is no patent on it, and I will be glad to furnish anybody with the details if they apply for them, or will lend them the car.

MR. DODGE: In the cases where you mentioned the rail as being forced up, breaking your joint, did you break that in pieces and make a new joint?

MR. BOWEN: That was not the fault of the casting, and we corrected those cases and have only a few left; we pushed them down and recast them. It is faulty work.

MR. DODGE: This foreign concern which is doing this work in New Haven follows this plan; when it is thrown up in that way—and I saw quite a number—they start back two or three feet and grind it down with an emery iron across that joint.

MR. BOWEN: We do not do that. We file down, but merely for the purpose of getting the proportions of two rails alike, when they are of different heights or something of that sort. We wont allow a joint to be cast and leave it high now. It is necessary with every joint to smooth it off, and we are careful to smooth it off so that it has a perfect surface. You cannot tell it from any other part of the rail. We do this because a joint which once begins to pound is half worn out.

MR. HARRINGTON: Are you doing this work yourself?

MR. BOWEN: We are doing this work ourselves.

MR. MCCORMACK, of Brooklyn: In answer to Mr. Littell's inquiry about the experience with cast welded joints, our company in Brooklyn put in 2000 cast welded joints on the ninety-four pound, nine inch girder rail and out of that number there was only one which pulled the rail apart. The rail broke about four inches from the end. They have given us very good satisfaction, at least we think so. We had some on our old six inch rail that broke, but we thought that was due to the kind of rail.

MR. HEFT, of New Haven: I would ask Mr. Dodge if he would recommend this cast welded joint from his knowledge of it in New Haven?

MR. DODGE: I stated before, when speaking about it, that it was not done on our road; it was on another road in our city. I have had no personal experience in regard to it; I am simply telling about it.

MR. HEFT: You have not followed the matter up?

MR. DODGE: No sir.

MR. SCULL: Are you, Mr. Bowen, paying the Falk Company a royalty?

MR. BOWEN: Yes, we have 32,000 joints in, and pay so much royalty for each joint.

MR. LITTELL: On the street where this particular rail parted we have four curves. At two points on this street the special work pulled apart at the curve, and in one instance the joint only of the rail separated—the rail pulled apart at the joint. On examining this joint we found that the trackmen had slighted it. They had relaid the track, and when they connected up that joint they put in some small bolts, so as to connect it up, and when they put in the new rail they left in some ¾ in. bolts instead of using one inch bolts. It could not be drawn up tight.

MR. DAVIS: Do you have any trouble in the application of the cast joint in connecting special work with the girder?

MR. BOWEN: If we have a track switch or something of that sort, we have special moulds made for those cases but we do not make the special work with the cast welded joint. I think the Johnson Company and the Wharton Company make such work, and others, where they cast the joint in that work.

MR. DAVIS: I am speaking of the union of the girder rail with the special work.

MR. BOWEN: Yes, we do that.

MR. HEFT: I ask, Mr. Bowen, why you use a copper bond with a cast welded joint; is it done as a precautionary measure?

MR. BOWEN: I adopted that method because I did not know just what to do. We cut off probably ten or fifteen joints, just taken at random along the track, and out of that number I found several in which we failed to have any amalgamation in these little spots I have described with the rail. I will say that that was in the first part of our work, probably a year ago. Then to prevent the possibility of tearing up a granite pavement which we were putting down on that line of road, I thought it was cheaper to bond and be sure of results than not to bond and be sorry. I am waiting now for the development of that matter. I think Mr. McCulloch has made some researches in that direction, and I am down here principally to hear from him on this subject.

MR. HEFT: Then you do not feel safe in the present state of the art without using the copper bond?

MR. BOWEN: That is my position.

MR. DODGE: About that polishing up of the side of the rail, you were particular in getting the surface bright?

MR. BOWEN: Not so bright, as we were using the joint with a bond.

MR. DODGE: The Falk Manufacturing Company, which has been doing the work in New Haven, polished the joints by an electric motor, and the motor gave out, so that they could not use it. I was looking over their work and saw a man polishing the joints with a file. I I asked him if it was not necessary to have it brighter, and he said, "That is just as good."

MR. BOWEN: Are they using it without a bond?

MR. DODGE: They were using it without a bond.

MR. BOWEN: Then they will burn some coal. (Laughter.)

MR. DODGE: It struck me that way.

On motion the meeting then adjourned until nine o'clock Wednesday morning.

SECOND DAY, WEDNESDAY, OCTOBER TWENTY-FIRST.

President Littell called the meeting to order and announced the first business to be the reading of the paper on "Trucks," by John N. Akarman, superintendent of the Worcester Consolidated Street Railway Company, Worcester, Mass., who was unable to bepresent.

Secretary Penington read the paper, which is given in full on pages 710-712.

Mr. Bean moved that the paper be received and spread upon the minutes. Carried.

The president announced that at two o'clock cars would leave the Southern Hotel for the Fair Grounds, and all persons in attendance upon the convention, with their ladies, were invited to accompany the party; there would be music, luncheon, etc.

Vice-President McCulloch took the chair.

The paper on "The Modern Power House" was then read by Richard McCulloch, civil and electrical engineer, Citizens', Cass Avenue, and St. Louis Railways, St. Louis, Mo. This paper is given in full on pages 701-706.

Mr. Baumhoff: I move that the paper just read by Mr. McCulloch be received and spread upon the minutes, that a vote of thanks be extended to Mr. McCulloch, and that advance sheets of that paper and all other papers read before the Association be sent by the secretary to the various member-companies. Carried.

The President: It is now in order to discuss the valuable paper just read by Mr. McCulloch on "The Modern Power House." Is there any gentleman who desires to ask any questions or make any remarks regarding the subject?

Mr. Rossiter: I ask if any of the members have had occasion to use the storage battery; and if so, with what success?

Mr. Richard McCulloch: There is one installed somewhere in Pennsylvania, and the Union Traction Company, of Philadelphia, has one installed at the end of one of its long lines for the purpose of regulating the voltage at that point; but there is a storage battery in operation in parallel with the dynamos, I think, at Easton, Penn.

Mr. Bean: I see Mr. B. J. Arnold, of Chicago, is here. He is considered a competent authority on storage batteries. I would like to hear from him. He represents some road.

Mr. Arnold: I had not expected to say anything before this convention, but the subject of storage batteries has come up, and as I have had considerable experience with them, I will venture to answer the gentleman's question. Before answering the question, I beg to express my appreciation of the very exhaustive and excellent paper we have just listened to. I think Mr. McCulloch has gone into the questions which enter into the construction of a power house more completely than I have ever heard them entered into before, and his conclusions seem to be in almost every instance as nearly correct as we can get them with our present knowledge of power house construction. Certainly, St. Louis has all of the conditions necessary for obtaining information on power house construction, and the paper shows the use of these conditions and careful preparation.

In regard to storage batteries, during the last year I have had installed in the Chicago Board of Trade plant, as the consulting engineer for that corporation, a battery auxiliary. In my opinion, the work of the plant is more severe, if anything, than electric railway work, because it operates electric elevators in conjunction with constant potential arc and incandescent lights. The elevators take a starting current varying from 0 to 800 amperes, and back again almost instantly, corresponding in abruptness to the load on an electric railway operating three or four cars. In the Board of Trade plant the battery auxiliary acts as an equalizer and takes the surplus load delivered into the bus bars, when the demand on the line is less than the capacity of the generator, and takes three-quarters of the overload when the pull comes. The result is that with a seventy-five kilowatt generator, running from seven in the morning, until eleven o'clock at night, at its absolutely normal economical load, it produces sufficient energy to operate 52,200 c. p. arc lamps, 600 incandescent lamps, four thirty horse power electric elevators, and six ten horse power motors, all running from this one unit, and the unit constantly loaded. That is my experience with the battery, and it is working perfectly satisfactorily, having been running nearly a year and has cost practically nothing for repairs. We have increased the plant by putting in additional plates, because we required additional capacity, but there was no charge for repairs, and I am convinced that the battery auxiliary, when there is sufficient lead installed to do the work is an eminent success for regulation work and economical operation of power stations operating on variable loads. I do not take this stand without having gone into the matter pretty thoroughly, and I feel sure of my position. You must get lead enough into the battery to do the work, and having that, you will get good results that you can rely upon and base your calculations for economical operation. That, so far as I know, answers the question.

Mr. H. H. Littell: What type of battery did you use?

Mr. Arnold: A battery made by the Electric Storage Battery Company, Philadelphia—Manchester type of positive plate. That is another thing you gentlemen should be careful about in your investigations—the type of plate used. It makes all the difference in the world if the plate is built for regulation or for slow discharge. This particular type is for regulation, and also performs the function of slow discharge, if necessary. The engines and generators stand idle from eleven o'clock at night until seven o'clock in the morning, and the battery does the work through the night. That enables the engine to operate sixteen hours a day, with two shifts of labor, at its economic normal load and shut down at night until morning. That can be effected in a large number of electric railway plants in this country with success, as I see them. It is only a question whether the increased economy will be more than the interest on the investment of the cost of the battery. I am installing now three different stations, part railroad and part lighting, in which it is my idea to use batteries, by which I will find it necessary to put in one-third less capacity of engines and generators than would be otherwise necessary.

Mr. Hawken: What is the life of the plate under constant use?

Mr. Arnold: I cannot tell you; the plant has not been running very long—about a year. It is guaranteed at 7½ per cent per annum. On that basis I figure out a marked economy and feel sure that we are safe, because the company behind the battery will stand up to the guarantee. If we pay 7½ per cent to maintain the battery, we will have a large economy. As a matter of fact it has not cost one per cent this year; probably it will cost something next year, and so on each year, but the battery company stands behind it.

Mr. Harrington: What is the construction of the two plates, the positive and the negative?

Mr. Arnold: The negative plate is what is known as the chloride negative. It is cast lead containing square pellets of spongy lead, originally peroxide of lead and reduced to spongy lead. The positive plate is a lead grid containing antimony, so as to make it hard, and has round pellets, which consist of strips of corrugated lead, coiled on themselves like a spiral, the lead being cast around it, or the spirals passed into plate and afterwards converted into peroxide of lead by an electrolytic process, and the plate when thus completed is called the Manchester plate. It is porous and gives a quick discharge on a heavy pull, and it does not buckle and fall out, as some battery plates have done in the past. One thing I will speak of which may be of interest, that is, the method of charging the battery. By running the electric elevators and the battery auxiliary

in parallel with the shunt winding of the generator, and by running the lights in the building on a separate set of bus bars off the compound winding of the same generator, so that the variable load on the elevators is taken care of entirely by the shunt winding and the battery, while the compound winding works constantly on the lighting load, I get the best regulation, so that the fluctuation of the voltage is not noticeable in the building. There is a slight variation of from two to eight volts under extreme conditions, which seldom occur, but it is good enough in practice, so that one unit does the work without serious fluctuation in voltage.

We use a booster in the station which consists of a motor generator to charge the batteries, if it ever becomes necessary, while the generators are running on the lines, because then the voltage must remain constant at 125 volts. Then if we wish to charge the batteries we use the auxiliary booster to charge the end or regulating cells, while the shunt winding of the generator is working in parallel with elevators and about sixty of the cells. The elevator service is such as to allow the battery to be charged and discharged in about equal proportions through the day, so that it is practically fully charged at the end of the day's run, and at night if they are slightly discharged we charge them up with the booster by placing the generator end of it in series with the main generator and at eleven o'clock shut down the engines and run the lights until morning with the batteries. In a railroad power station it would be necessary to use the booster to increase the voltage on the long feeder. If the battery was located at the end of the line it would be necessary to use the booster to overcome the pressure at the battery, or else run a separate high voltage generator.

MR. HARRINGTON: I understand from the experience of a large number of railway engineers that with the ordinary size plant, running from 200 to 250 cars, where the load constantly changes, the standard forms of multipolar generators flash from brush to brush, by reason of trouble on the line, and cause a great deal of trouble in the commutators of the machine. This is a common occurrence in the Philadelphia Traction Company's plant. We have had it in our own plant, with both Westinghouse and General Electric machines. The storage battery would be an excellent thing to avoid that form of breakdown or delay, due to the burning of the commutator. I would like to know if any one here has had the same experience in the stations operated by the gentlemen here.

THE PRESIDENT: The next business will be the reading of a communication from the Engineers' Club of St. Louis, inviting the members to attend a meeting of that club, to be held this evening. The secretary will read the communication.

The secretary read the letter.

MR. KELLY: I move that the secretary be instructed to return the Engineers' Club our thanks for their kind invitation. Carried.

MR. H. H. LITTELL: Mr. President, I move you, sir, that the rules be suspended and the privileges of the floor be granted to Mr. Seiryo Mine, Electrical Engineer to the Japanese Government, who is present. Carried.

THE PRESIDENT: We will now proceed to the consideration of the paper, "How Can the Revenue of Street Railways be Increased, Taking Into Consideration the Collection of Fares, Method of Registry, Transfers, Use of Tickets or Cash Fares, and Attractions Along the Line of the Road," by C. D. Wyman, general manager of the Milwaukee Street Railway Company.

Mr. Wyman read the paper, which will be found on page 706.

MR H. H. LITTELL: I move that the thanks of the convention be tendered the gentleman for the excellent paper just read, and that the same be spread upon the minutes and printed in the proceedings. Carried.

MR. SEELY: I ask the author of the paper whether he found any opposition to the issuing of this pamphlet by the trade unions of the city? You were going into the advertising business when you solicited advertisements, and I believe there has been some objection to that by threatening a boycott.

MR. WYMAN: As far as advertising went we only had a very few advertisements, and they were from very strong firms, whom I do not presume any trades union would have any effect upon. We had, perhaps, half a dozen. The cost of the paper was very little—for the 1500 or 1800 copies which were issued monthly about $15 or $20, so that it amounted to little or nothing. It was, however, stated when the first issue came out that the object of the paper was to disrupt the union. We had at that time a union, which has now passed away, and there was some talk about the paper being intended to disrupt the union. In one issue of the paper I suggested the formation of a benevolent society, and that caused a great disturbance among the men, but that did not make any difference to us. We went right on just the same, and after a while, inasmuch as the paper only covered the ground intimated, simply giving information concerning the operations of the road, and perhaps mentioning some employe of the road that did something worthy of notice, all that trouble died out, and we had nothing further of that sort. At first the union looked at it somewhat askance, and I believe advised its members not to read it, but that soon passed off and every issue of the paper was freely taken by the men.

The president here announced that cars would leave the Southern Hotel promptly at two o'clock for the Fair Grounds, and all in attendance at the meeting were invited to accompany the party.

THE PRESIDENT: The next business is the appointment of a nominating committee, to nominate officers for the ensuing year and to report upon a place for the next meeting.

MR. WYMAN: I move you, Mr. President, that such a committee be appointed to report at this session or to-morrow morning, at whichever time the president desires; and that the scope of that committee be the presentation to the Association of the names of persons nominated to fill the official positions, including the Executive Committee for the ensuing year, and also to present a recommendation as to the next place of meeting. Carried.

THE PRESIDENT: I will appoint on that committee Mr. C. D. Wyman, of Milwaukee; Mr. D. G. Hamilton, of St. Louis; Mr. C. G. Goodrich, of Minneapolis; Mr. B. Van Horn, of Buffalo; Mr. E. G. Connette, of Nashville; Mr. A. E. Lang, of Toledo, and Mr. M. K. Bowen, of Chicago.

The meeting then adjourned until ten o'clock Thursday morning.

THIRD DAY, THURSDAY, OCTOBER TWENTY-SECOND.

President Littell called the meeting to order at 10:40 A.M. The secretary announced that the following companies had joined the Association:

Street Railway Company of the Federal District of the City of Mexico.

Atchison Railway, Light & Power Company, Atchison, Kan.

MR. H. H. LITTELL: Mr. President, I feel safe in saying that the exhibit made by the manufacturers and dealers in railway supplies at this meeting is the largest, finest and most complete that has ever been shown at any meeting of this Association. I do not know of any better way to show our appreciation and to encourage the efforts put forth by our friends in the trade than to take a recess for the purpose of examining in a body their goods and wares. I move that before proceeding with any other business we take a recess until 12 o'clock to inspect the display of street railway supplies. Carried.

The meeting was accordingly adjourned, and the delegates reassembled at 12 o'clock.

The president announced that at 2 o'clock cars would be in waiting at the Southern Hotel to take the attendants to the Anheuser-Busch Brewery, and that the annual banquet would take place at 8:30 o'clock in the evening.

THE PRESIDENT: The first order of business is the reading of the paper on "Modern Overhead Electric Con-

struction," by B. Willard, general superintendent New Orleans City & Lake Railroad Company, New Orleans, La.

The paper was read by Mr. Blake in behalf of the secretary, Mr. Willard being unable to attend the meeting, and will be found on page 712.

Mr. Scullin: I move that this paper be accepted, that a vote of thanks be extended the gentleman and the paper be spread on the minutes of the meeting. Carried.

The President: We will now receive the report of the Nominating Committee.

Mr. Wyman: Mr. President and gentlemen of the Association, on behalf of the committee I wish to say that we found ourselves when assembled to confer together regarding the nominations, in the position of a man embarrassed with riches. There were so many devoted laborers and adherents and assistants in this Association, whom it would have been the pleasure of the committee to name as nominees for official positions, that it was a very difficult task to make a selection from among them. I am prepared to present, however, a report covering the results of our deliberations and best judgment, and we trust that the same will be found acceptable to the convention.

REPORT OF THE COMMITTEE ON NOMINATIONS.

Mr. President and gentlemen of the American Street Railway Association, your Committee on Nominations, by its chairman, submits the following report:

For President, Robert McCulloch, vice-president and general Manager Cass Avenue & Fair Grounds Railway Company, St. Louis, Mo.

For First Vice-President, Charles S. Sergeant, general manager West End Street Railway Company, Boston, Mass.

For Second Vice-President, D. B. Dyer, president Augusta Railway Company, Augusta, Ga.

For Third Vice-President, C. F. Holmes, general manager Metropolitan Street Railway Company, Kansas City, Mo.

For Executive Committee, H. M. Littell, vice-president and general manager Metropolitan Street Railway Company, New York City; H. P. Bradford, general manager Cincinnati Inclined Plane Railway Company, Cincinnati, O.; Charles H. Smith, superintendent Troy City Railway Company, Troy, N. Y.; Harry Scullin, vice-president and general manager Union Depot Railroad Company, St. Louis, Mo.; George B. Hippee, general manager Des Moines City Railway Company, Des Moines, Ia.

For Secretary and Treasurer, Thomas C. Penington, treasurer Chicago City Railway Company, Chicago, Ill.

Mr. Bean: I move that the report of the committee be accepted and the secretary be instructed to cast the ballot of the Association for the gentlemen nominated. Carried.

(The secretary duly cast the ballot.)

The President: We are pleased to announce that the vote for the officers nominated is unanimous.

(Calls for McCulloch followed.)

Mr. Robert McCulloch: Mr. President and gentlemen: I cannot make a speech, and I will only say that if I had constituted the entire nominating committee, or been the returning board, or if I had carried the electoral vote in my pocket, you would have had a different standard bearer for the ensuing year, but for fear you may think I am not appreciative, I will not criticise your action. I thank you for the personal compliment you have paid me, and the courtesy you have extended to the City of St. Louis, and all I promise you is that while I sit on the executive throne of the Association your banner shall not be trailed in the mire. (Applause.)

Mr. Wyman: The Nominating Committee also beg leave to report that after due consideration they have named as the expression of their best judgment for the next place of meeting, Niagara Falls. (Applause.)

Mr. Lang: I would like to add a word to the report, because of the criticism that I have heard since it has become known that Niagara Falls was the place recommended by the committee for the next meeting. Some of the material men have said that they thought there might be a lack of facilities for getting their heavy machinery and cars in and out, and discussing this matter this morning with Mr. Van Horn, of Niagara Falls, he assures me that it will be most convenient to get cars and the machinery in and out owing to connections they propose to make, not only with the street railways, but also with the steam railroads, so that we can assure the builders of cars and other supplies that they will have no difficulty in handling their material.

Mr. Bean: I move that the recommendation of the committee be adopted, and that Niagara Falls be the next place of meeting. Carried. (Applause.)

Mr. Seely: Mr. President, I beg to offer the following resolution:

Whereas, Suggestions and propositions have been made looking to the consolidation in one body of the American Street Railway Association and the National Electric Light Association,

Resolved, That in the opinion of the American Street Railway Association such union is not called for. (Applause.)

The president put the question on the resolution, which was adopted.

The secretary read the following cablegram from Mr. W. J. Carruthers-Wain, of London, England:

"Much regret invitation too short to enable president and myself to attend; best wishes for overwhelming success."

The secretary read the following letter:

To the American Street Railway Association:

Gentlemen.—I would respectfully ask that a committee of five be appointed to consider the propriety of this Association adopting a standard code of rules and regulations for the government of employes—something similar to the practice of steam roads.

I fully appreciate the objections which this will meet with, but believe it is in the line of advancement, that any road can adopt the rules in their entirety or in part. Local conditions would make it necessary for changes in a large number of the rules that would probably be adopted, but in the main the instructions to conductors and motormen about reporting, conduct, etc., would apply to all. It would be valuable to have this class of employes educated, so that their principal duties would be the same on all roads.

Owing to the opening of a new line it is necessary for me to leave here at noon to-day, which is my reason for addressing this to the convention in writing.

Respectfully yours,

Ira A. McCormack,
Gen. Supt. Brooklyn Heights R. R. Co.

Mr. Littell: I move that the suggestion of Mr. McCormack be carried out and the committee appointed. Carried.

The President: The chair will announce the committee later in the day or to-morrow.

Mr. Bean: I move that this meeting adjourns until 10 o'clock Friday morning. Carried.

FOURTH DAY, FRIDAY, OCTOBER TWENTY-THIRD.

President Littell called the meeting to order and announced the first business to be the reading of the paper on "The Selection and Management of Employes," by W. F. Kelly, general manager of the Columbus Street Railway Company, Columbus, O.

The secretary read the paper, which is published on page 714.

Mr. Bean: I move that the paper just read be received and spread upon the minutes, and the thanks of the Association returned to the writer. Carried.

Mr. Hippee: I move that the paper be published and furnished to the press of the city. Carried.

Mr. Scullin: I would say that in connection with that part of the paper which relates to the furnishing of reading rooms, lavatories, and a sort of reception room for the men, our road took that step about a year ago when we were building a new shed. Some of the men suggested it, and I thought it was a good idea. We formerly had no waiting room for the men except a little cubby hole, where the men were crowded in in the morning. The result was that instead of their remaining at the depot they would hang around saloons. We put in a nice waiting room for them, with a library containing a few standard works, and subscribed for some of the magazines. We also

put in a gymnasium for them, not an expensive one, but provided with a punching bag, lifting machines, etc. In this way we can always find the men. When we want an extra man he is on hand, as there are always a number of them reading or exercising in the waiting room. We also provided a bath room, with a shower bath, and in every shed we are now putting in these rooms. It is a splendid move and the men appreciate it; but as Mr. Kelly says, it is not an act of charity—it is a duty we owe to our men. The street railway men will never regret having taken this matter up.

In relation to taking a man off, and making him lose a great deal of time, I have given considerable thought to this subject. I find that if you take a man off, and let him lose two, four or six days, or whatever the case may be—that man is not a millionaire, is not making a great deal of money and has got a family to support, and the chances are that he can just make both ends meet. If you take the man off, you take part of his livelihood away from him, and he is going to get it if he can. A better practice is to reprimand a man, and not take him off, reprimand him once or twice—show him that you mean what you say—and the second or third time let him go, if he does not believe you or take notice of what you say to him, but do not keep his wages away from him, whether he is a conductor or motorman. If you do he will try to make it up.

MR. ROBERT MCCULLOCH: We have three or four different gathering places for our men, and we have three rooms at each of our different places, which we have equipped very nicely for the comfort and convenience of the men. One of them in particular is eighty feet square; it is heated by steam and lighted by electricity. The men have built a very nice stage, and have organized amongst themselves, among other things, a sort of Thespian corps, and they give remarkably good performances of a theatrical character from talent among themselves. They have a piano and a dancing master who comes there, and they have dancing classes, and bring their wives and daughters to the hall. The hall is also much in demand for the giving of entertainments by church organizations in the neighborhood. We give it to them free. The hall has done a great deal of good to keep the men out of the saloons, and to furnish them a place where they may have any kind of gatherings which they may desire. We exercise a control over their organization by having some of our officials members of it, and prohibit any discussions relating to the affairs of the company or the relation of the men to the company. They may debate any question they choose of a general nature. We allow no liquor to be served there in connection with their entertainments or with those that are given by others. We have kept the character of the place respectable and it has been running now about six years, and it has done a great deal of good. A great many of our men do not appreciate these things, but we do not feel that we have wasted any money.

MR. MAHONEY: I would like to get the views of some of the gentlemen present as to the custom in charging employes with trivial accidents, breaking wagons, etc., whether they are to blame in the matter or not. I would like to hear an expression of opinion as to whether it is good policy to charge the employes with these trivial accidents. With our company we have not been doing it. If you charge a man for the breaking of a vehicle, and you have not money enough retained in the office to meet these demands, he may be on the eve of quitting and may do much mischief.

MR. H. H. LITTELL: I do not think two cities of any size can be governed alike in these matters in all respects. The question of making a motorman pay for damages to vehicles, etc., is probably a very serious one. On our system in Buffalo we sometimes make them pay a proportion of the cost when we are convinced that it was the carelessness of the motorman that caused the accident, but in a great many cases if after investigation we find that he is not to blame, we pass it over. I think if they are careless and break a vehicle or injure the car, and you charge them with it, it is not so liable to occur again; but if a man continues to have accidents of that nature, it is a good thing to dispense with him, before something serious happens. When we discharge a motorman for breaking a wagon or causing an injury to the car we do not deduct anything from his pay

In regard to rooms, I think that all well regulated street railway companies should have closets for their motormen and conductors, some place where they can hang up their rubber coats and put in their overshoes and heavy gloves, where they can change their clothing, if they desire, and these closets or wardrobes should be thoroughly ventilated. We have ours with a wire screen in front, and the different closets are separated by slats 3 ins. × 17 ins. separated by inch spaces. It enables the air to circulate, and if anything is damp or moist, it will dry out. I think it is positively necessary to have a good place where the men can congregate and read, play games of cards (so long as they do not play for money) smoke, and have chess and checkers, and any amusement that will keep them at the proper reporting place. We have nine such places; we have lavatories at all of our buildings and all the necessary conveniences.

MR. MUSSER: I ask Mr. McCulloch if they pass their employes free to and from their place of amusement at all times?

MR. MCCULLOCH: Our employes ride free on their badges at all times.

MR. BENDURE: I find it a good plan to retain some of the wages of the employe to cover minor accidents. Before I did that there was trouble all the time with the men getting too near buggy wheels. I made it a rule to retain $15 from each motorman, and $10 from each conductor to cover damages to the property of the railway or the public, if they were to blame, and damages to trolleys under overhead switches. I have had the rule in practice now for ten months, and I have not had to deduct a dollar for these damages. They have almost entirely ceased. We run six cars, and in my brief experience I find it a good thing to do.

MR. LANG: I do not know that I can add much to what has been said with respect to the government of employes. I will say, however, that we make it a practice to require the men to meet the expenses of accidents occasioned by their gross carelessness; if there is any doubt in the matter, we decide it in favor of the employes. I think if this system is carried out with discrimination the result will be very good. With respect to the furnishing of reading rooms and conveniences for the men, we do it as far as we possibly can. It is our intention to enlarge upon this plan, and it is very interesting to know from those who have entered upon that experiment that it is beneficial to the company and the men alike. I certainly think we must get nearer to our men, and while the experience with these matters is sometimes very discouraging, owing to the fact that some men do not appreciate these things, yet if we can reach eighty per cent of our men in that way, we have done ourselves good and also the men.

MR. MCCULLOCH: The question of fining a man or making him pay for a damage is a very serious one. We have not done that. If I think a man ought to pay for a damage or deserves punishment I discharge him. We have in many instances offered a gripman or motorman the alternative of paying for a damage or giving up his place. That would be where a man had several small accidents. In some instances they have declined to pay and have given up their places; in others they have accepted the condition, paid the damage and retained their places, and we have very seldom had another accident from that same man. We have never both discharged a man and made him pay for a damage.

MR. SCULLIN: I would like to hear some of the gentlemen present say something as to the methods of laying men off or reprimanding them. I believe it is an important subject, and I would like to hear some of the gentlemen give their views as to how they handle them; whether they reprimand them and discharge them or lay them off and fine them.

MR. JONES: In that same connection I would like the gentlemen to say what they do with reference to bulletining men when these damages are charged to them and when they are discharged; whether they put up a bulletin and notify the employes that such and such a thing has been done.

MR. H. M. LITTELL: I will say, in the company I am connected with, all reports regarding accidents, dismissals, and suspensions are put on the blackboard. When a man has been reported four or five times he is then warned. We have a book in which we make the entry of the date of a man's employment, and any record in regard to his references is kept in another book. Every time a report comes in against him it is entered in this book; it does not make any difference what it is. When there are eight or ten reports against him the book is then handed to the superintendent, who calls the man, reprimands him, and enters in red ink "warned," with the date. Another eight or ten will come along and he is warned again. Probably that man's page will be filled up before he is warned three or four times, and then he is discharged. When he is discharged we never re-engage him.

As to accidents on our cable and electric roads, when a man has an accident he reports it at the end of the trip. He walks into the station and dictates the report to a stenographer. When he gets back on the next trip the report is written out and he signs it. He does not lose any time. This report is then sent to our claim department, and, if the claim agent thinks it necessary to talk to this man, he sends for him to come to the office. When he leaves the station the foreman gives him a card reading for instance like this: "John Smith left the station at 9:10 A. M." He goes to our claim department, recites his case, and the claim agent then endorses on this card; "Retained until 3:10 P. M.," or whatever time he was kept at the office. This goes back to the division superintendent who O. K.'s it. If the man has been five hours away he is paid for it; if he loses one hour he is paid for it; if he loses a day he is paid for it. In that way, we believe, we get our men to report all accidents, even the most trivial. It is the small accidents which give us the most trouble—accidents about which the conductor or gripman or motorman would think, "Well, that is not worth reporting," and he would say nothing about it. But the railroad company may hear of it in a month or two, or, possibly, in a year or two, and these are the most difficult cases we have to defend, because we have no report and no witnesses. The conductor has gone or the gripman has disappeared. We talk to our men and try to impress upon them the importance of reporting everything. It does not make any difference if a man stubs his toe on the car, we want a report of it, if the conductor knows about it. If a a man falls off a bicycle alongside the track and a car is approaching, we want a report. If a man stubs his toe on the street crossing and falls while a car is passing, we want a report of that. As I said before, we try to get reports of accidents of every kind and nature which occur on our cars or adjacent thereto.

With regard to rules, we have rules; but we believe we can do more with our men by getting them together and talking to them. Our gripmen and conductors have a club, called the Metropolitan Club, with such a large membership now that we have recently been compelled to increase the size of their quarters. We finished, a few days before I left home, a room 120 ft. long by 30 ft. wide. They have a stage and piano, and the room is well lighted. We have in this room controllers, grips, and other appliances, miniature cars and tracks with the conduits exposed and broken grips. If a man should have an accident with the cable, or if the cable should break, we bring in the piece and show it to the men, and tell them how to overcome the trouble. We believe we can do more by talking to them than by trying to reach them through a book. They have their toilet rooms, etc. We do not put them together. We have a conductors' room, a drivers' room, a gripmen's room, and a motormen's room. They do not associate together at all. You will rarely see a conductor in the motormen's room, or a motorman in the conductors' room. They have their own lockers in the separate rooms, and have checker boards, tables, chairs, and all that kind of thing.

About discharging men, I have a report come to the office every week, giving the number of men discharged on each division, and if I find that the division superintendents are discharging too many men, I send to the stations and get the records of the men and find out the reasons. I am quite positive that a great many men have been discharged unjustly. Our foremen are as liable to make errors as are the men. If a man is discharged we require that his complete record be sent to the main office —sometimes it takes a sheet of paper typewritten a yard long. It makes our foremen careful, and they are not going to discharge a man for some trivial offence. We do not like to change our men. If a man does something which is not exactly right, we talk to him, and we try to make it pleasant for him and keep him in our employ. The men are paid more wages the second year than they are the first. We believe that is some inducement for the men to stay with us.

MR. H. H. LITTELL: Our road is not as large as the one represented by the president, but we make a record of every complaint that comes in against either a conductor or motorman, but we do not wait until there are four or five complaints against him—we call him down on every complaint. We either send for him when he is off duty, so that he shall not lose any time, or send a man to him to call his attention to the fact that he is reported as doing something which is either in violation of our rules, or is, in our opinion, a violation of good judgment. I think it is due to the man that he should be told, if it is possible to do so, every time that he is reported. We punish our men in a little different method, I think, from that pursued on most roads. I find that if we have a man who has been on the road for some months, and he gets a little careless, it is a very excellent punishment to put him for one or two days on some other route, with some old motorman or conductor, as the case may be, and let him "sub it," as we call it. It is the most effective punishment we have yet introduced. We apply this remedy for slight offenses, such as omitting to announce streets, failing to keep the platform clear when it can be done, etc.

(There was some further discussion on the subject of transfers, children's fares, and methods of checking conductors' collection of fares, but being in executive session, it was not issued for publication.)

MR. GOFF: I move that a heartfelt vote of thanks be extended to the people of St. Louis, especially the ladies of the Entertainment Committee, for the very kind, courteous and hospitable manner in which they have entertained us, and for their labors in our behalf. I think they set their aim high, and you will all agree with me that they overtopped the mark. This is one of the best meetings of the Association we have ever had; and in leaving you, I leave you with the toast, "Here's to your good health, and your family's; may you live long and prosper."

The president put the motion, which was unanimously adopted by a rising vote.

MR. SEELY: I move that we thank the Local Committee. These gentlemen have worked night and day, and we are under great obligations to the Local Committee.

MR. GOFF: I move that the secretary be instructed to send to the St. Louis Local Committee a letter conveying our assurances of esteem and appreciation. Carried.

MR. SCULLIN: I move that a vote of thanks be also tendered to the supply men for the magnificent exhibition they have given us in St. Louis—one of the grandest ever gotten up of street railway supplies of all kinds. They have worked hard and spent a great deal of money. I do not know whether they are going to get just returns or not; I hope they will. They have helped us greatly and shown that they are with us body and soul; and I think we should thank them heartily. I move that we tender them our thanks.

MR. H. H. LITTELL: I take great pleasure in seconding that motion. When you take into consideration the disturbed financial condition of the country, the display they have made here is perfectly wonderful; and I heartily second the motion. Unanimously carried.

MR. BEAN: I move that a vote of thanks be extended to the president, vice-presidents and members of the Executive Committee for the efficient discharge of their duties and the able manner in which they have conducted the affairs of the Association during the past year. Carried.

THE PRESIDENT: I will appoint as the Committee on Rules for Conductors and Motormen, Messrs. W. F. Kelly, Columbus, O.; M. K. Bowen, Chicago, Ill.; E. C. Foster, Lynn, Mass.; Ira A. McCormack, Brooklyn, N. Y.; H. H. Vreeland, New York City.

THE PRESIDENT: I will appoint Mr. Lang and Mr. Bean a committee of two to escort the newly elected president to the chair.

MR. LANG: Gentlemen of the convention, it is hardly necessary for me to say a word in introducing our new president, Mr. Robert McCulloch. His name is as well known to you as his face; and I bespeak for the coming year a very successful and pleasant era in the history of the Association, and hope that we will all meet together again at Niagara Falls. (Applause.)

PRESIDENT LITTELL: Captain McCulloch, I am delighted to have the pleasure of turning over to you the president's gavel; and I trust that in occupying this position you will find it as pleasant a duty as I have found it. (Applause.)

PRESIDENT MCCULLOCH: Gentlemen, all that I can say is that if you will give the new executive administration the same support as you have in the past, we will prosper as we have done in the past. I hope our relations will all be pleasant, and that we shall have as successful a meeting at Niagara Falls, and our intercourse as pleasant as it has been in St. Louis. (Applause.)

MR. H. H. LITTELL: Before we close I want to say that the next meeting will be held at Niagara Falls. Buffalo is twenty miles away, and I expect to be in Buffalo up to that time and probably a little longer. Our office is at the disposal of any of you gentlemen, and if there is anything I can do for you in relation to the next convention, I should be glad to have you write me, and I will look after your affairs as well as I can, and certainly will reply to any inquiries you may make. When you are in Buffalo I want you to make our office your headquarters; come and see us and stay with us.

PRESIDENT MCCULLOCH: A meeting of the Executive Committee was held last night, and the committee desires that the members shall write to the secretary making suggestions for titles of papers for the next meeting, and if desired the persons to prepare them. We cannot promise to adopt all the suggestions which may be made, but we will do what we can in that direction.

MR. SEELY. I move that a vote of thanks be extended to the steam railroad managers and the steam railroad associations, both of the Eastern and Western sections, for their courtesy in enabling us to return to our homes for a one-third fare. Carried.

Mr. Davis offered the following:

Resolved: That the secretary be instructed to obtain from the members of the Association information and copies of municipal legislation relating to the imposition by their cities or municipalities of taxes or license fees upon the company's property, franchises or receipts. The resolution was referred to the Executive Committee.

Mr. Goff moved that the meeting adjourn, to convene at Niagara Falls the third Tuesday in October, 1897. Carried.

Social Happenings at the Convention.

The arrival in St. Louis of the delegates and others in attendance at the Fifteenth Annual Convention of the American Street Railway Association was the signal for the commencement of a programme of entertainment, arranged by the Local Committee and its sub-committees, which filled up every moment of time not given to the work of the convention, from Monday morning until Friday night, and which in variety and pleasure-giving qualities has hardly been equalled at any convention, in spite of the many pleasant remembrances of good times in the past.

The first matter to be attended to by the visitors was the registering of names and the decoration of coat lapels with the beautiful little solid silver convention buttons given by the Local Committee to the gentlemen in attendance, while a gold button, arranged in the form of a pin, was given to the ladies. These buttons and pins served as passes upon all of the street railway lines of the city during convention week, and it was interesting to note the cordial and appreciative smiles of the conductors on seeing the buttons in use. Along with each button was given a little celluloid tag bearing a number, and it was the original intention of the Local Committee to issue, as soon after the opening of the convention as possible, a complete list of all the names of those in attendance with their corresponding numbers and hotel locations, the idea being to make it possible to recall the names of newly formed acquaintances as well as to more easily find the hotels and rooms of any wandering delegates who might otherwise find it difficult to "find themselves" if lost to sight or to consciousness in the labyrinth of streets of the great Western metropolis. It was rumored, moreover, that the entire police force of St. Louis had been given instructions, at the instance of the Local Committee, to exercise a paternal care over all numbered men who might be suffering from convention festivities, but this rumor was not verified, nor was there apparently any need of its verification, for seldom has there been a convention where revelry was more subdued than in St. Louis. As it happened, however, the Local Committee was reluctantly forced to give up this plan of issuing a printed list of those in attendance on account of the fact that the registration was not completed until late Tuesday night, and because also a sufficient number of red, or manufacturers' tags had not been provided to take care of all those in attendance.

The first social event of the formal programme issued by the Local Committee was a trip to Forest Park on Tuesday afternoon, to which all ladies attending the convention were especially invited, while the gentlemen were also made welcome. A start was made from the Southern Hotel at 2 P. M. by the Broadway and Fourth Street cable cars, and at a point on Washington Avenue Lindell cars were in waiting to convey the entire party to the park. On their arrival refreshments were served in the Lindell Pavilion, after which came an entertainment by a local troupe of minstrels, and this in turn was followed by dancing in the pavilion, to the music of a piano which had been set up for the purpose. While this was going on two four-horse tally-hos and a number of open carriages drew up at the pavilion, and were soon filled with merry passengers, and started off for a drive around the park, returning to the hotel through Portland and Vandeventer Places, Lindell Boulevard, and the fine residence section of the city. This was one of the most enjoyable events of the convention, and was in charge of the Ladies' Committee of Entertainment. The weather was delightful, though a little cool, and all the ladies expressed themselves in the warmest manner regarding the attentions which had been paid them and the attractiveness of the St. Louis park and residence districts.

On Tuesday evening a reception was tendered by the Local Committee to all visitors at the convention, to whom special engraved cards of invitation had been issued on their arrival at the hotel. The reception was given in the beautiful parlors of the Southern Hotel, which had been dressed in green with tasteful floral effects for the occasion. The headquarters of the General Electric Company were freely offered for the use of the committee, and the scene in the parlors was exceedingly bright and attractive, the number of ladies in attendance at the convention being far larger than has been usual in times past. An elegant little

dinner was served in the Ladies' Ordinary on the parlor floor, after which came dancing on the floor of the main dining room, which had been cleared for this purpose. This completed the entertainment programme for the first day.

At 2 o'clock on Wednesday afternoon the delegates and others in attendance, with their ladies, to the number in all of about four hundred were taken on twelve cars of the Citizens' Railway Company to the Fair Grounds and the Jockey Club, which was thrown open for their use and from whose windows and verandas they were able to see some of the races going on at the time, these races forming a prominent feature of St. Louis' outdoor life during the summer and fall. A lunch was served in Floral Hall at the Fair Grounds and photographs of the party were taken at the Jockey Club. On the return trip the party stopped at the Cass Avenue power station for a few minutes, and arrived at the hotel late in the afternoon. The weather was exceedingly pleasant and all had a most enjoyable afternoon.

The Local Committee had reserved 150 orchestra seats for Wednesday evening in the new Century Theatre recently opened, where a performance of "In Gay New York" was the attraction of the week. These tickets were placed at the disposal of all ladies and others who cared to attend, and a number of theatre parties were formed. The comedians had been warned beforehand of the character of the audience which might be expected and were prepared with a number of special "hits," which were received with considerable amusement. After the theatre the General Electric Company and the local car manufacturing companies held a reception, which was quite largely attended.

In the meantime those of the gentlemen at the convention who were members of the Masonic Order of the Mystic Shrine were invited to the local lodge to witness the initiation of Capt. Robert McCulloch as a member of the Order. It was understood that at the ceremony Captain McCulloch was pretty thoroughly "inoculated," as one of the members expressed it, and that it would be an evening long to be remembered by him and by others.

The social event of Thursday afternoon was a trip to the Anheuser-Busch Brewery by the cars of the Union Depot and Southern Electric Railway Companies, and over four hundred availed themselves of the opportunity to see perhaps the largest and finest brewery in the world. Officers of the company acted as guides through the brewery, and the visitors were finally taken to a grand "carnival hall," where they were invited to partake of all the beer which they could dispose of, and were given souvenirs of the occasion, consisting of corkscrews made in the form of beer bottles. A fact not generally known is that the officers of the Anheuser-Busch Company had been told by the Local Committee that about 250 guests would be present and had prepared a lunch at the brewery for this number, but the larger number who availed themselves of the invitation made it impossible to carry out this part of the programme, much to the disturbance of the company's officers, who said they would have gladly provided for one thousand guests had they only known so many might be expected.

In the evening came the annual banquet of the Association at the Southern Hotel, and this was one of the most successful, from every point of view, in the history of the association. The immense dining room of the hotel was beautifully decorated with flowers, palms and vines. All but one of the tables were arranged lengthwise of the hall, and at right angles with the head of the table, at which were seated the officers of the Association, the speakers and the specially invited guests. The seating arrangements were nearly perfect, each delegate being given a numbered ticket corresponding to the seat assigned to him, and every facility being given beforehand for making up groups as desired. There were nearly three hundred guests at the banquet, President Littell occupying, of course, the post of honor, with Captain McCulloch at his side. A noticeable feature of the banquet was the excellent attendance and the clockwork-like precision with which the dishes were removed and new dishes brought on through the several courses.

J. H. Stedman, of Rochester, N. Y., acted as toastmaster, and was particularly happy in his introductions, "getting off" with considerable éclat a number of tombstone and other stories. The regular speakers, who were all residents of St. Louis, were forceful and effective in their oratory, and this feature of the banquet was a decided pleasure. The first speaker was Acting Mayor Charles Nagel, who responded to the toast, "The City of St. Louis," in an appropriate way. Next in order came F. N. Judson, responding to the toast, "Welcome to Our Guests"; Smith P. Galt, who treated the subject of "The Street Railway in the Courts" in a brilliant and witty manner, and, it is safe to say, in a way which a solemn subject of this kind has never before been treated; F. W. Lehmann, one of the leaders of the Sound Money Democratic movement in Missouri, who answered to the toast, "The Street Railway as a Social Factor"; and William Marion Reedy, who delivered an unusually fine oration on the subject of "The Press," and was heartily applauded. After these regular toasts of the evening came one on the subject of "The Technical Press," which was briefly responded to by Edward E. Higgins, who thanked the Local Committee in behalf of the press and the visitors in general for the courtesies which had been extended to them on every side. The evening closed with the singing of "Auld Lang Syne" by those in attendance, but informal singing and other features of entertainment were kept up until the middle of the night.

Friday morning was a busy one at the different hotels and at the convention hall, for the plans of most of the visitors made it necessary for them to take noon and evening trains, but in spite of this fact, special parties were made up in the early afternoon for excursions to De Hodiamont and Webster on the cars of the Suburban Railway, and to Shaw's Garden on the Market Street cars. The Ladies' Committee of Entertainment did not relax their efforts to make it pleasant for the visiting ladies until the last one had departed for home, and the universal sentiment among the latter was that nothing could exceed the generous hospitality which had been extended to them by the ladies of St. Louis, while expressions of gratitude were heard on every side.

The details connected with registering and the issuing of convention buttons, invitations, banquet tickets, etc., were in charge of C. N. Duffy, secretary and treasurer of the Cass Avenue & Fair Grounds Railway Company, and James Adkins, secretary of the Lindell Railway Company, and their uniform patience and courtesy were heartily appreciated by all.

The names of the sub-committees of the general Local Committee having in charge the management of the convention deserve to be recorded because of the exceptionally careful and thorough way in which everything was attended to. They are as follows:

General Committee.—Robert McCulloch (chairman), Robert Lehmann (secretary).

Entertainment Committee.—Harry Scullin (chairman), Arthur S. Partridge, George D. Rosenthal, Jos. Franklin, Jr., Scott Blewett, Richard McCulloch, Col. E. D. Meier, J. R. Whittemore, Thos. W. Murphy, Ben Blow.

Committee on Ways and Means.—B. C. Maffitt (chairman).

Committee on Exhibits.—George W. Baumhoff (chairman), Winthrop Bartlett, Thos. F. Snead, H. R. Conklin, Otto Schmidt, Thos. W. Murphy, Richard McCulloch, A. P. Richardson.

Transportation Committee.—Frank J. Duffy.

Committee on Halls, Hotels and Depots.—Jos. Minary (chairman), John C. Allen and Messrs. Brown, Fish, Ewing, Woerell, Maxy, McCready, Higginbotham and Franke.

Committee on Information —Robert Lehmann (chairman).

Ladies' Entertainment Committee.—Mrs. Robert McCulloch (chairman), Mrs. J. S. Minary, Mrs. Claude Kilpatrick, Mrs. Arthur S. Partridge, Mrs. George D. Rosenthal, Mrs. Robert Lehmann, Mrs. F. R. Henry, Miss Ella Hudson, Mrs. Harris, Mrs. J. W. Blow, Mrs. Q. Ebanues, Mrs. O. Enders, Mrs. J. B. Padfield, Jr., Mrs. James Adkins, Mrs. E. Strasberger, Mrs. E. D. Meier, Mrs. Harrison, Mrs. John Scullin, Mrs. Harry Scullin, Miss Leonora Scullin, Mrs. Scott Blewett, Mrs. C. W. Duffy, Mrs. F. B. Brownell, Mrs. M. J. Brady.

ATTENDANTS AT THE CONVENTION.

Representatives of Street Railway Company Members.

Alton, Ill.—Jas. Duncan, Alton Ry. & Ill. Co.

Akron, O.—W. D. Chapman, Gen. Man., and C. A. Chapman, Akron St. Ry. & Ill. Co.

Atlanta, Ga.—E. Woodruff, V. Pres. and Gen. Man., and Thomas Elliott, Con. Engr. Atlanta Consolidated St. Ry. Co.

Atchison, Kan.—J. A. Bendure, Gen. Supt., Atchison Ry., Light & Power Co.

Augusta, Ga.—D. B. Dyer, Pres., and R. J. McCarty Gen. Man. Augusta Ry. Co.

Baltimore, Md.—J. F. Haywood, Gen. Man., S. B. Thompson, Mast. Mech. City & Suburban Ry. Co.

Baltimore, Md.—F. E. Tobe, Mast. Mech. Baltimore City Pass. Ry. Co.

Bay City, Mich.—W. B. Morrison, Asst. Gen. Man., and A. S. Ashe, Supt. Bay Cities Consolidated Ry. Co.

Boston, Mass.—C. S. Sergeant, Gen. Man., and J. E. Rugg, Gen. Supt. West End St. Ry. Co.

Bridgeport, Conn.—Andrew Radel, Pres. Bridgeport Traction Co.

Brockton, Mass.—Charles S. Clark, Direct., and A. A. Glasier, Clerk Brockton St. Ry. Co.

Brooklyn, N. Y.—John L. Heins, Supt. Brooklyn City & Newtown R. R. Co.

Brooklyn, N. Y.—C. L. Rossiter, Pres., and I. A. McCormack, Gen. Supt. Brooklyn Heights R. R. Co.

Buffalo, N. Y.—H. H. Littell, V. Pres., Robt. L. Fryer, Direct., and Robt. Dunning, Elec. Engr. Buffalo Ry. Co.

Buffalo, N. Y.—H. H. Littell, V. Pres., Burt Van Horn, Jr., Gen. Man., Robt. L. Fryer, Direct. Buffalo & Niagara Falls Ry. Co.

Butte, Mont.—J. R. Wharton, Butte Consolidated Ry. Co.

Camden, N. J.—J. Willard Morgan, Pres., Thos. P. Curley, Sec., J. Naramore, Supt., and Henry J. West, Direct. Camden, Gloucester & Woodbury Ry. Co.

Camden, N. J.—Wm. S. Scull, Pres., and W. E. Harrington, Gen. Man. Camden Horse Ry. Co.

Champaign, Ill.—B. F. Harris, Pres., Champaign Elec. St. Ry. Co.

Chester, Pa.—Dr. John McFayden, Supt. Chester Traction Co.

Chicago, Ill.—H. M. Sloan, Gen. Man. Calumet Elec. St. Ry. Co.

Chicago, Ill, F. R. Greene, Sec., T. C. Penington, Treas., M. K. Bowen, Supt., G. W. Knox, Elec. Engr., J. E. Moore, Mast. Mech., G. W. Price, A. C. Keidelberg, Track Foreman, Robt, Stewart, R. L. Garth, Pass. Agt., and D. Hooton, Chicago City Ry. Co.

Chicago, Ill.—J. B. Wesley, Sec. and Treas. and J. R. Chapman, Elec. Engr., W. Chicago St. Ry. Co.

Chicago, Ill.—B. J. Jones, Supt. South Chicago City Railway Co.

Cincinnati, O.—H. P. Bradford, Gen. Man., and B. J. Arnold, Con. Engr. Cincinnati Inclined Plane Ry. Co.

Cincinnati, O.—John Harris, Supt., B. L. Kily, E. E. and Patrick Lew, M. M., Cincinnati St. Ry. Co.

Cleveland, O.—M. S. Robinson, Direct. Cleveland City Ry. Co.

Columbus. O.—W. F. Kelly, Gen. Man. Columbus St. Ry. Co.

Council Bluffs, Ia.—N. W. Wells, Pres., and W. S. Dimmick, Gen. Supt. Omaha & Council Bluffs Ry. & Bridge Co.

Dallas, Tex.—W. H. Sinclair, Dallas City St. Ry. Co.

Davenport, Ia.—James F. Lardner, Sec. and Treas. Tri-City Ry. Co.

Derby, Conn.—B. W. Potter, Engr. Derby St. Ry. Co.

Des Moines, Ia.—Geo. B. Hippee, Gen. Man., J. S. Goodrell, Supt. M. P., and W. G. Owings, Supt. Des Moines City Ry. Co.

Detroit, Mich.—Thos. Farmer, Mech. Engr., and Chas. Remelins, Detroit Citizens' St. Ry. Co.

Evansville, Ind.—W. L. Stockton, Elecn. Evansville St. Ry. Co.

Fall River, Mass.—Robert S. Goff, Pres. and Gen. Man. Globe St. Ry. Co.

Findlay, O.—C. D. Kinney, V. Pres., Jacob Strader, Treas., J. A. Bope, Sec., and Chas. Smith, Supt. Findlay St. Ry. Co.

Galveston, Tex.—C. P. Young, Gen. Man. Galveston City R. R. Co.

Girardville, Pa.—E. W. Ash, Gen. Man. Schuylkill Traction Co.

Hamilton, Ont.—J. B. Griffith, Man. Hamilton St. Ry. Co.

Harrisburg, Pa.—F. B. Musser; Supt. Harrisburg Traction Co.

Hartford, Conn.—E. S. Goodrich, Pres., and Wm. Grauten, Elecn. Hartford St. Ry. Co.

Hazelton, Pa.—A. Markle, Gen. Man., and G. W. Thompson, Supt. Lehigh Traction Co.

Houston, Tex.—A. H. Hayward, Man. Houston City Ry. Co.

Johnstown, Pa.—H. C. Evans, Johnstown Pass. Ry. Co.

Kansas City, Mo.—C. F. Holmes, Man., Martin H. Holmes, V. Pres.. A. E. Siebert, M. M. Metropolitan St. Ry. Co.

Kirkwood, Mo.—J. D. Houseman, Jr., Highlands Scenic Ry. Co.

Lawrence, Mass.—W. P. Clark, Lowell, Lawrence & Haverhill St. Ry. Co.

Lexington, Ky.—C. H. Stoll, Pres., and R. T. Gunn, Supt. Pass. & Belt Ry. Co.

Lock Haven, Pa.—John A. Seeley, Treas., and H. H. Harrison, Lock Haven Elec. Ry. Co.

London, Ont.—C. E. A. Carr, Gen. Man. and Treas. London St. Ry. Co.

Long Island City, N. Y.—Geo. Chambers, Gen. Man. Steinway Ry. Co.

Louisville, Ky.—J. O. Haddox, Supt., T. J. Minary, Gen. Man., and W. T. Cook, Con. Engr. Louisville Ry. Co.

Lynn, Mass.—Col. J. N. Cunningham, V. Pres. Lynn & Boston R. R. Co.

Memphis, Tenn.—F. G. Jones, V. Pres. and Gen. Man., and Frank Smith, Citizens' St. Ry. Co.

Meriden, Conn.—N. H. Heft, Pres., and Wm. J. Stark, Meriden Elec. R. R. Co.

Milwaukee, Wis.—C. D. Wyman, Gen. Man. Milwaukee St, Ry. Co.

Minneapolis, Minn.—C. G. Goodrich, V. Pres. Twin City Rapid Transit Co., Minneapolis Division.

Mobile, Ala.—J F. McAviney, Elecn. Mobile St. Ry. Co.

Nashville, Tenn.—E. G. Connette, Gen. Man., Geo. Swint and H. C. Burraugh, Nashville St. Ry. Co.

Newark, N. J.—Andrew Radel, Supt. Newark & South Orange Ry. Co.

New Bedford, Mass.—E. E. Potter, Gen. Man., and Chas. F. Shaw. Treas. Union St. Ry. Co.

New Brunswick, N. J.—Andrew Radel, Direct. Brunswick Traction Co.

Newburyport, Mass.—Chas. Odell, Pres., James F. Shaw, Direct., and H. Fisher Eldridge, Haverhill & Amesbury St. Ry. Co.

Newburyport, Mass.—Jas. F. Shaw, Direct. and H. Fisher Eldridge, Direct. Newburyport & Amesbury Horse R. R. Co.

New Haven, Conn.—G. A. W. Dodge, Gen. Man. New Haven St. Ry. Co.

New Orleans, La.—Frank R. Ford, Engr., and Ralph L. Crump, Asst. Engr. Canal & Claiborne, R. R. Co.

New York, N. Y.—E. T. Landon, Sec. Dry Dock, East Broadway & Battery R. R. Co.

New York, N. Y.—H. M. Littell, V. Pres., and Thos. Millen, Gen. Mast. Mech. Metropolitan St. Ry. Co.

Norwich, Conn.—Wm. S. Silver, Direct. Norwich St. Ry. Co.

Omaha, Neb.—W. A. Smith, Gen. Man., and F. A. Tucker, Supt. Omaha St. Ry. Co.

Philadelphia, Pa.—A. Langstaff Johnston, Con. Engr. Hestonville, Mantua & Fairmount Pass. R. R. Co.

Philadelphia, Pa.—J. A. Brill, Manayunk & Roxborough Inclined Plane & Ry. Co.

Pittsburgh, Pa.—T. M. Tate, Jr., Gen. Man. Federal St. & Pleasant Valley Pass. Ry. Co.

Pittsburgh, Pa.—Henry Hubbard, M. E., Gen. Supt., and E. L. Rodes, Con. Engr. Pittsburgh, Allegheny & Manchester Traction Co.

Pittsburgh, Pa.—John Murphy, Supt. Second Ave. Pass. Ry. Co.

Portland, Me.—W. R. Wood, Pres., W. A. Wheeler, Direct. E. A. Newman, Gen. Man., and Frank M. Blaisdell, Civil Engr. Portland Ry. Co.

Portland, Ore.—J. E. Thielsen, Portland Ry. Co.

Quincy, Ill.—E. H. Stone, Jr., Sec., and J. F. Mare, Night Foreman Quincy Horse Ry. & Carrying Co.

Racine, Wis.—T. E. Meyers, Rep. Gen. Man. Belle City St. Ry. Co.

Reading, Pa.—M. C. Autenbach, Treas., and J. E. Rigg, Supt. Reading Traction Co.

Richmond, Va.—R. L. Williams, Treas., and A. Langstaff Johnston, Consulting Engineer, Richmond Traction Co.

Rochester, N. Y.—F. O. Rusling, Gen. Man. and J. H. Stedman, Rochester Ry. Co.

Rockland, Me.—John F. Hill, Pres., O. O. Gray, V. Pres., and Thos. Hawkin, Supt. Rockland, Thomaston & Camden St. Ry. Co.

St. Joseph, Mich.—W. Worth Bean, Pres. St. Joseph & Benton Harbor Elec. Ry. & Light Co.

St. Louis, Mo.—D. G. Hamilton, Pres., Robt. McCulloch, V. Pres. and Gen. Man., C. N. Duffy, Sec. and Treas., and Richard McCulloch, E. E. & C. E., T. F. Bergin, E. T. Brown, M. Clooney, Cass Avenue & Fair Grounds Ry. Co.

St. Louis, Mo.—J. S. Walsh, D. G. Hamilton, Pres., Robt. McCulloch, V. Pres. and Gen. Man., C. N. Duffy, Sec. and Treas., Richard McCulloch, C. E. & E. E., F. N. Duffy, W. A. Jennings, F. S. Jones, M. E. Whalen, Citizens' Ry. Co.

St. Louis, Mo.—Edwards Whitaker, Pres., Geo. W. Baumhoff, Supt., James Adkins, Treas., S. M. Dodd, H. C. Haarstick, C. Hodgman, F. W. Lehman, C. D. McClure, H. S. Priest, D. S. H. Smith, B. E. Blow, Lindell Ry. Co.

St. Louis, Mo.—P. C. Maffitt, Pres., F. R. Henry, Sec. & Treas., J. D. Davidson, Supt. Missouri Ry. Co.

St. Louis, Mo.—Chas. Green, Pres., and John Mahoney, V. Pres., and Gen. Man., People's Ry. Co.

St. Louis, Mo.—C. Kilpatrick, Pres., Joe S. Minary, Man., and John C. Allen, Supt., R. E. Lovelady, G. W. Lubke, W. S. Minary, J. C. Richardson, H. Muench, Southern Elec. R. R. Co.

St. Louis, Mo.—C. H. Turner, Pres., S. M. Kennard, V. Pres., R. Lehmann, Sec. & Treas., T. F. Sneed, Supt., H. C. Rockwell, Elec. Engr., L. S. R. Blackmer, T. B. Case, James P. Dawson, James Green, James Jackson, Kent Jarvis, D. B. Lee, Charles C. Maffitt, J. E. McKeighan, L. B. Pierce, C. H. Sampson, Ellis Wainwright, R. J. Wood, St. Louis & Suburban R. R.

St. Louis, Mo.—D. G. Hamilton, Pres., Christian Peper, V. Pres., R. B. Jennings, Sec. and Treas., Robt. McCulloch, Gen. Man., Richard McCulloch, P. E. and E. E., W. M. Adams, John W. Dryden, S. M. Galt, W. McCarty, C. Peper, J. Woolam, St. Louis R. R. Co.

St. Louis, Mo.—John Scullin, Pres., Harry Scullin, V. Pres. and Gen. Man., Thos. W. Murphy, Gen. Supt., Chas. H. Pierson, M. M., Jno. P. Gilbert, M. C. B., James Campbell, W. Desmond, G. A. Madill, F. Scullin, Union Depot R. R. Co.

St. Paul, Minn.—C. G. Goodrich, V. Pres. Twin City Rapid Transit Co., St. Paul Division.

Salt Lake City, Utah.—W. P. Read, Supt. Salt Lake City R. R. Co.

Springfield, Ill.—C. K. Minary, Man. Springfield Consolidated Ry. Co.

Springfield, Mass.—Wm. S. Loomis, Pres. SpringfieldRy. Co.

Springfield, O.—S. L. Nelson, Gen. Man. Springfield Ry. Co.

Syracuse, N. Y.—Matthew Murphy, Auditor Syracuse St. R. R. Co.

Taunton, Mass.—Geo. F. Siebel, Supt. Taunton St. R. R. Co.

Toledo, O.—Albion E. Lang, Pres., E. J. Buchtel, Supt. Power Plant, and C. N. Hart, Supt. Construction Toledo Traction Co.

Trenton, N. J.—Chas. Y. Flanders and R. H. Beach, Trenton Pass. Ry. Co.

Troy, N. Y.—C. H. Smith, Supt., and J. H. Jones, Troy City Ry. Co.

Washington, D. C.—James B. Adams, Sec. and Treas. Columbia Ry. Co.

Wheeling, W. Va.—Michael Loftus, Supt. Wheeling Ry. Co.

Wilkes-Barre, Pa.—J. C. Friexill, Wilkes-Barre & Wyoming Valley Traction Co.

Williamsport, Pa.—Ernest H. Davis, Gen. Man., J. W. Cochran, Asst. Man. Williamsport, Pass. Ry. Co.

Youngstown, O.—A. A. Anderson, Gen. Man. Mahoning Valley Elec. Ry. Co.

Others in Attendance.

Abadie, E. H. H., Wagner Electric Manufacturing Co.
Ackerman, P. C., American Electric Works, Providence.
Adreon, E. L., Jr., Sargent Co., Chicago.
Allen, J. B., The Edward P. Allis Co., Milwaukee.
Allen, W. B., Brownell Car Co., St. Louis.
Allison, Giles S., St. Louis Register Co., St. Louis.
Alexander, E., American Car Co., St. Louis.
Alvord, B. C., Shultz Belting Co., St. Louis.
Alvord, Harry J., Shultz Belting Co., St. Louis.
Anthony, Willis M., New Haven Car Reg. Co., New Haven, Conn.
Ashburner, Thos., Babcock & Wilcox Co., New York.
Atkinson, J. M., J. M. Atkinson & Co., St. Louis.
Atkinson, F. W., J. M. Atkinson & Co., St. Louis.
Atterbury, Allen W., Detroit Steel & Spring Co., Detroit.
Aull, Robert, Sec. and Man. St. Louis Fair Association.

Baier, F. A., Brownell Car Co.
Bailey, Theo. T., General Electric Co., Chicago.
Bailey, Geo, C., John A. Roebling's Sons Co,, New York.
Baker, Walter H., National Lead Co., St. Louis.
Barr, B. M., Walker Co., Cleveland.
Barrett, C. E., Hale & Kilburn Manufacturing Co., Philadelphia.
Bartholomew, W. S., Adams & Westlake Co., Chicago.
Baue, H. L., Missouri Malleable Iron Co., St. Louis.
Beach, R. H., General Electric Co., New York.
Beadle, Edward, New York.
Bellamy, Robert J., Bellamy Vestlette Manufacturing Co.
Benjamin, John B., Crane Co., Chicago.
Benzel, Arthur, National Lead Co.. St. Louis.
Bernardin, F. M., Bowers Co., Kansas City.
Berry, J. B., Crane Co., Chicago.
Bigelow, H. T., Hale & Kilburn Manufacturing Co., Philadelphia.
Blatterman, J. B., Murphy Varnish Co., Chicago.
Blewitt, Scott H., Missouri Car & Foundry Co., St. Louis.
Bogle, E. S., Dusenbury & Bond.
Bolt, R. O., Mermod & Jaccard Jewelry Co., St. Louis, Mo.
Bonner, Wm. T., The Babcock & Wilcox Co., New York.
Booker, S. G., Phœnix Carbon Manufacturing Co., St. Louis.
Bouslog, A. H., Peru Electric Manufacturing Co., Peru, Ind.
Bowers, E. S., Bowers Bros., Chicago.
Boyd, F. C., vice-pres. New Haven Car Reg. Co., New Haven, Conn.
Boyer, F. N., General Electric Co., Chicago.
Boynt, F. L., Central Missouri Brass Co,, St. Louis.
Bradley, T. A., Security Bank Note Co., Philadelphia.
Bragg, C. A., Westinghouse Elec. & Mfg. Co., Philadelphia.
Brill, John, A., J. G. Brill Co., Philadelphia.
Brittan, L., Washburn & Moen Manufacturing Co., Waukegan, Ill.
Broderick, J. J., Broderick & Bascom, East St. Louis.
Brookmiere, James, Jr., Curtis & Co., St. Louis.
Brown, Harold P., New York.
Brown, W. R., Westinghouse Electric & Manufacturing Co., Boston.
Brownell, W. C., B. & N. Y. Railway Supply Co.
Brownell, F. B., Brownell Car Co., St. Louis.
Burr, L. G., National Lead Co., St. Louis.
Bush, J. E., Chicago Varnish Co., Chicago.
Buchanan, A. S., Devlin Street Car Brake Co., Memphis, Tenn.
Buchanan, E. S., Central Electric Co., Chicago.
Buehler, J. C., Columbia Machine Works, Brooklyn, N. Y.
Burow, Wm., Shickle, Harrison & Howard Iron Co., St. Louis.
Cabot, J., Cincinnati, O.
Cable, Paul D., Commercial Electric Supply Co., St. Louis.
Calhoun, W. S., Brussells Tapestry Co., New York.
Campbell, J. Vernon, Campbell & Zell Co. Baltimore.
Candee, Willard S., The Okonite Co., New York.
Carpenter, Edwin S., Westinghouse Electric & Mfg. Co., Pittsburgh.
Carlisle, James L., Postmaster City of St. Louis.
Carry, E. F., Jr., Wells & French Co., Chicago.
Case, Frank K., Hoopes & Townsend, Philadelphia.
Castle, Chas. C., Hildreth Varnish Co., New York.
Cavagua, Chas. A., R. A. Nuttall Co., Pittsburgh.
Christensen, W. A., Seamless Structural Co., Milwaukee.
Christy, Will, Cleveland Construction Co., Akron, O.
Chur, Walter, American Railway Supply Co., N. Y.
Churchill, Fred. J., Commercial Electric Supply Co., St. Louis.
Clark, Wm. J., General Electric Co., New York.
Clark, P. H., Member of City Council of St. Louis.
Cleary, J. W., National Electric Headlight Co.
Cleland, T. A., Westinghouse Elec. & Mfg. Co., Pittsburgh.
Cleland, F. A., Westinghouse Electric & Mfg. Co., Pittsburgh.
Cleveland, W. B., Forest City Electric Co., Cleveland.
Clifford, C. C. Chicago
Clisdell, P. A., General Electric Co., Chicago.
Cobb, C. W., Central Electric Co, Chicago.
Cochran, J. M., M. M. Buck Manufacturing Co., St. Louis.
Coe, W. H., W. H. Coe Manufacturing Co., Providence.
Colbert, Frank E., Terre Haute Car & Mfg. Co., Terre Haute, Ind.
Colcord, W. R., Bethlehem Iron Co., Philadelphia.
Collins, G. Fred., Valentine & Co., New York.
Collins, G. F., McGuire Manufacturing Co., Chicago.
Collins, L. B., Stever Rail Joint Co., Canton, O.
Condit, S. B., Jr., L. A. Chase Co., Boston.
Condict, G. Herbert, Gen. Man. Englewood & Chicago El. R. R. Co.
Conover, A. B., John A. Roebling's Sons Co., Trenton, N. J.
Connelly, James, Man. C. & F. Co.
Conners, C. G., Man. Col. Springs St. R. R. Co., Col. Springs, Col.
Cook, Abe, Laclede Car Co., St. Louis.
Cooke, W. E., Peckham Motor Truck & Wheel Co., New York.
Cooke, W. J., McGuire Manufacturing Co., Chicago.
Counger, Cliff R., Edison Illuminating Co., St. Louis.
Corby, Frank F., St. Louis Car Co., St. Louis.
Cosby, Frank Clark, Standard Underground Cable Co., Pittsburgh.
Cosper, W. P., Consolidated Car Heating Co., Albany.
Coster, Maurice, Westinghouse Elec. & Mfg. Co., Pittsburgh.
Crane, J. O., Holmes, Booth & Haydens, New York.
Critten, Lewis. Washburn & Moen Mfg. Co., Worcester, Mass.
Crowley, H. J., General Electric Co., Philadelphia.
Curtis, E. A., Chicago Truck Co., Chicago.
Curwen, S. A., J. G. Brill Co., Philadelphia.

Daggett, H. M., Lombard Hydraulic Brake Co., Boston.
Daggett, George E., Weber Railway Joint Mfg. Co., Boston.
Dana, Leslie, Charter Oak Stove & Range Co., St. Louis.
Daniel, A. T., Daniel Street Ry. Co.
Daniels, James, Shickle-Harrison & Howard, St. Louis.
Daniels, A. L., The H. B. Camp Co., Aultman, O.
Daniels, F. H., Washburn & Moen Mfg. Co., Worcester, Mass.
Davidson, W. J., Walker Co., Cleveland.
Davis, H. P., Westinghouse Electric & Mfg. Co., Pittsburgh.
Dean, D. B., Terre Haute Car Manufacturing Co., Terre Haute, Ind.
Denniston, J. M., St. Louis Car Co., St. Louis.
De Witt, E. F., E. F. de Witt & Co., Lansingburgh, N. Y.
Dickinson, Thomas H., New York Belting & Packing Co., Chicago.
Dilworth, Dewitt, Pittsburgh Car Wheel Co.
Disereus, F. L., Cedar Rapids & Marion Ry., Cedar Rapids, Ia.
Dodd, S. T., The Walker Co., Cleveland.
Dolph, John, Forest City Electric Co., New York.
Donohoe, Francis E., American Electric Mfg. Co., St. Louis.

Donovan, W. T., M. M. Buck Manufacturing Co., St. Louis.
Doty, W. W., W. W. Doty & Co., New York City.
Dowell, A. R., with Arthur S. Partridge, St. Louis.
Doyle, Wm. L., J. A. Roebling's Sons Co., New York.
Draffen, E. D., Safety Insulated Wire & Cable Co., New York.
DuBois, E. D., Muncie, Ind.

Ebert, H. C., Westinghouse Electric & Mfg. Co., Pittsburgh.
Einstein, R. E., Elliot Frog & Switch Co., East St. Louis.
Elbing, T. J., Kraushaar, Lamp & Reflector Co., St. Louis.
Elliot, H., Jr., Elliot Frog & Switch Co., East St. Louis.
Elliot, W. H., Elliot Frog & Switch Co., East St. Louis.
Elliot, H., Elliott Frog & Switch Co., East St. Louis.
Englund, A. H., Mayer & Englund, Philadelphia.
Estep, F. A., R. D. Nuttall Co., Pittsburgh.
Ettinger, Chas. D., Murphy Varnish Co., Newark, N. J.
Evans, O. C., The Johnson Co., Cincinnati, O.
Evans, H. C., The Johnson Company, New York.
Evans, E. J., Man. Beach Elec. Ry., Waukesha, Wis.

Fawcett, Wm., St. Louis Car Wheel Co., St. Louis.
Fay, William, The C. & C. Electric Co., New York.
Ferguson, W. L., General Electric Co., Chicago.
Ferguson, C. W., National Lead Co., St. Louis.
Ferguson, J. A., Shultz Belting Co., St. Louis.
Ferguson, W. A., Morrell Electric Works, St. Louis.
Field, Arthur W., Peckham Motor Truck & Wheel Co., Boston.
Flesh, Jno. M. V., Murphy Varnish Co., St. Louis.
Fletcher, Theo., Fletcher & Stone, St. Louis.
Flynn, C. C., Walker Co., Chicago, Ill.
Francis, A. G., New York Belting & Packing Co., Chicago.
Fraser, P. A., Wells & French Co., Chicago.
Frederick, E. P., Broderick & Bascom Rope Co., St. Louis.
Frederick, C. R., J. G. Brill Co., Philadelphia.
Fredericks, A. H., Pres. Board of Assessments of St. Louis.
Fitch, F. H., Southwest Missouri Elec. Ry. Co.
Flesh, F. M., Sec. & Treas. Miami Valley Ry. Co., Piqua, O.
Franklin, Jos., Jr., Commercial Electric Supply Co., St. Louis.
Fuller, W. A., The Plastic Rail Bond, New York.

Gallagher, Thomas M., Shickle, Harrison & Howard, St. Louis.
Garton, W. R., Central Electric Co., Chicago.
Garneau, Pierre A., National Conduit Mfg. Co., St. Louis.
Gates, J. Holt, Walker Co., Chicago.
Geddes, C. T., Toledo, Bowling Green & Fremont R. R. Co.
Gerleman, J. F., International Electric Co., New York.
Gold, Egbert H., Gold Street Car Heating Co., Chicago.
Goode, A. H., Lincoln Water, Lt. & Pr. Co., Lincoln, Neb.
Gordon, A. F., Westinghouse Electric & Mfg. Co., Pittsburgh.
Graham, F. F., Gen. Man. Washington St. Ry. Co.
Granger, John A., New York Car Wheel Works, New York.
Greensfelder, J. B., St. Louis County Street Ry. Co.
Green, R. W., St. Louis Car Wheel Co., St. Louis.
Gregory, Charles E., Chas. E. Gregory & Co., Chicago.
Grier, H. M., Clarence Whitman & Co., New York.
Glenn, O., Jr., Central Electric Co., Chicago.
Gray, L. A., Adams & Westlake Co., Chicago.
Greene, Oliver H., National Lead Co., New York.
Greenhalge, Geo. P., with Arthur S. Partridge, St. Louis.
Grier, Thos. G., Western Electric Co., Chicago.

Hale, Geo. H., Consolidated Car Fender Co., Providence, R. I.
Halbrook, Royal H., Cedar Rapids & M. C. R. R., Cedar Rapids, Ia.
Hall, Geo. S., with J. B. Bradley, Philadelphia.
Halliday, Edwin, Supt. Cairo Elec. Ry. Co., Cairo, Ill.
Ham, R. T., Trojan Button Fastener Co., Troy, N. Y.
Hamblan, E. W., M. M. Buck Manufacturing Co., St. Louis.
Hamblan, A. H., M. M. Buck & Co., St. Louis.
Hammond, S. F., Pennsylvania Railway Supply Co., Philadelphia.
Hanna, J. A., Peckham Motor Truck & Wheel Co., Chicago.
Hand, Wm., General Electric Co., St. Louis.
Hands, W. A., Supt. N. E. St. Ry. Co., Kansas City, Mo.
Hartwell, Arthur, Westinghouse Elec. & Mfg. Co., Pittsburgh.
Hartman, Harry A., Philadelphia.
Harrison, John M., Shickle, Harrison & Howard Co., St. Louis.
Haskell, G. M., J. G. Brill Co., New Haven.
Hassulay, E. W., Pres. Cairo Elec. Ry. Co., Cairo, Ill.
Hatch, E. B., H. W. Johns Manufacturing Co., New York.
Hayden, M. M., National Carbon Co., Cleveland.
Heinrichs, E. R., Westinghouse Elec. & Mfg. Co., Pittsburgh.
Helvey, Geo. H., Hooven, Owens & Rentschler Co., Hamilton, O.
Hendrick, W, T., Geo. P. Jones & Co., St. Louis.
Henry, Geo. W., Steel Motor Co., Johnstown, Pa.
Heulings, Wm. H., Jr., J. G. Brill Co., Philadelphia.
Hewlett, E. M., General Electric Co., Schenectedy, N. Y.
Higgins, Geo. A., George P. Jones & Co., St. Louis.
High, John M., Clarence Whitman & Co., New York.
Hobart, J. C., Triumph Electric Co., Cincinnati.
Hodgkins, Edw. W., Q. & C. Co., Chicago.
Holbrook, Percy, Weber Railway Joint Mfg. Co., New York.
Honig, Louis, Electric Insulating Paint Co., St. Louis.
Hooper, W. H., Safety Car Heating & Lighting Co., New York.
Hooven, J. C., Hooven, Owens & Rentschler Co., Hamilton, O.
Hoppin, Albert, Edw. P. Allis Co., Milwaukee.
Howe, F. B., Wm. Wharton, Jr.,& Co., Philadelphia, Pa.
Howard, George E., Scarritt Furniture Co., St. Louis.
Howard, Clarence H., Safety Car Heat'g & Light'g Co., St. Louis.
Hubbell, Harry M., Beckwith-Chandler Co., New York.
Hubbard, M. G., McGuire Manufacturing Co., Chicago.
Hubbard, O. M., Bradford Belting Co., Cincinnati.
Hudson, F. V. M., Hyatt Roller Bearing Co., New York.
Humphrey, H. H., Bryan & Humphrey, St Louis.
Hunt, H. E., Hunt Air Brake Co., Pittsburgh.
Hunter, L., Hunter Automatic Fender Co., Cincinnati.
Hurd, G. A., Crane Co., Chicago.
Hutchinson, A. H., Frick Co., Waynesboro, Pa.

Ittner, W. P., St. Louis.
Ives, Wm. M., Ives & McClernan, Baltimore, Md.
Isaacs, M. J., K. McLennan & Co., Chicago.

Jackson, Newton, Elec. Mutual Casualty Ass'n, Scranton, Pa.
James, C. D., Standard Paint Co., New York.
Janney, Jos. A., Jr., Janney & Steinmetz, Philadelphia.
Jenkins, W. H., with T. A. Bradley, Philadelphia.
Jens, W., Johnson Co., Johnstown, Pa.
Jones, Geo. P., Geo. P. Jones Co., St. Louis.
Jones, F. B., Adams & Westlake Co., Chicago.
Johnson, Harry, Charles Scott Spring Co., Philadelphia.
Joslin, C. N., Brownell Car Co., St. Louis.

Keeler, H. E., Adams & Westlake Co., New York.
Keister, E. F., The Commutator Co., Milwaukee, Wis.
Kennelly, J. J., Sterling Supply & Mfg. Co., New York.
Kessler, E., Supt. Richmond Traction Co., Richmond, Ind.
Kimball, Fred M., General Electric Company, Boston.
King, C. K., Ohio Brass Co., Mansfield, O.
Kingsland, Geo., Central Union Brass Co., St. Louis.
Kingston, Wm. W., The Johnson Co., Atlanta, Ga.
Kinn, Clarence, R. Bliss Manufacturing Co., Pawtucket, R. I.
Kippenberger, Geo. L., American Car Co., St. Louis.
Kissam, Geo., Geo. Kissam & Co., New York.
Kittle, E. B., Interior Conduit & Insulation Co., New York.
Knight, P. H., Westinghouse Electric & Mfg. Co., Pittsburgh.
Knapp, J. N., Graphite Rheostat Co., Chicago.
Kraushaar, C. F., Kraushaar Lamp & Reflector Co., St. Louis.
Kretsinger, Geo., St. Louis.
Kuhlman, G. C., G. C. Kuhlman Co., Cleveland.

Lawless, E. J., American Car Co., New York.
Lawrence, F. D., Standard Electric Works, Chicago.
Leidmyer, Jos., Dayton Manufacturing Co., Dayton, O.
Leidmyer, P., Dayton Manufacturing Co., Dayton, O.
Lewars, Geo. H., Westinghouse Electric & Mfg. Co.. Pittsburgh.
Lewis, Alex. H., Aultman & Taylor Machinery Co., Mansfield, O.
Lodwick, J. A., Mississippi Glass Co., St. Louis.
Lindley, Ezra H., St. Louis.
Littlefield, A. S., Johnson Co., Chicago.
Lloyd, Herbert, Electric Storage Battery Co., Philadelphia.
Logan, James F., Asst. Supt. Consolidated Ry. Co., Springfield, Ill.
Loper, A. N., New Haven Car Register Co., New Haven.
Lombard, S. W., Lombard Hydraulic Brake Co., Boston.
Lombard. N., Lombard Hydraulic Brake Co., Portsmouth.
Lucas, H. P., Graphite Rheostat Co., Chicago.
Luther, T. P., American Electric Heating Corporation, Boston.
Lyle, Robt. B., Illinois Steel Co., Chicago.

Macleman, J. H., H. W. Johns Manufacturing Co., New York.
Macomber, T. B., Leschen-Macomber-Whyte Co., Chicago.
Macy, E. T., Ready Rock Asphalt Roofing Co.
Major, Joseph, St. Louis Mica Co., St. Louis.
Many, F. B., The Mehling Manufacturing Co.
Mark, C. E., Mark Railway Equipment Co., Chicago.
Marshall, W. P., M. M. Buck & Co., St. Louis.
Mason, W. R., Mason Electric Equipment Co., Chicago.
Mattox, W. A., New York Belting & Packing Co., New York.
May, C. H., Washburn & Moen Manufacturing Co. Worcester, Mass.
Mays, W. B., Hooven, Owens & Rentschler, Hamilton, O.
McCardell, J. R., Limburg Sickel & Co., Trenton.
McClernan, R. H., Ives & McClernan, Baltimore.
McDuffie, R. L., Taunton Locomotive Mfg. Co., New York.
McEwen, R. L., Murphy Varnish Co., Newark, N. J.
McCoy, Frank, Railway Supplies, Brooklyn and New York.
McCrandall, J. R., Linburg, Sickle & Co., Trenton, N. J.
McGhie, J., General Electric Co., Chicago.
McGovern, Frank, Rossiter, McGovern & Co., New York.
McKay, W. J., Detroit Stove Works, Detroit.
McNeil, F. P., Supt. Springfield Con. Ry. Co., Springfield, Ill.
McNeill, M., Jr., Central Electric Co., Chicago.
McQuade, James P., National Underground Cable Co., New York.
McRoy, John T., Chicago,
Meaker, J. W., Meaker Manufacturing Co., Chicago.
Meaker, Guy L., Meaker Manufacturing Co., Chicago.
Meek, J. E., H. W. Johns Manufacturing Co., New York.
Mehling, John A., The Mehling Manufacturing Co.
Meinholtz, H. C., Heine Safety Boiler Co., St. Louis.
Meier, Adolphus, Heine Safety Boiler Co., St. Louis.
Meier, E. D., Heine Safety Boiler Co., St. Louis.
Meier, A. J., National Lead Co., St. Louis.
Merriam, Henry P., Standard Air Brake Co., New York.

Mercur Robt. J., New York Car Wheel Works, Buffalo.
Merton, S. D., Heine Safety Boiler Co., St. Louis.
Myers, L. E., Electric Installation Co., Chicago.
Meysenberg, O. W., Wells & French Co., Chicago.
Meysenberg, E. A., The Johnson Co., Chicago.
Miles, B. F., National Carbon Co., Cleveland.
Miller, S. F., Hildreth Varnish Co., New York.
Miller, J. G., Dilworth, Porter & Co., Pittsburgh.
Millen, T. C., Smith of New York.
Mine, Seiryo, Electric Engineer Japanese Government.
Moore, M. M., Safford & Moore Railway Jack Co., Chicago.
Morrell, F. A., Brooklyn & N. Y. Ry. Supply Co., Elizabeth, N. J.
Morrell, A. W., Morrell Electric Works, St. Louis.
Morris, Elmer P., Monarch Insulating Paint, New York.
Morrison, A., Dillworth, Porter & Co., Pittsburgh.
Morse, Geo. D. Rochester Car Wheel Works, Rochester.
Mown, L. C., Valentine & Co., New York.
Moyle, L., M. M. Buck Manufacturing Co., St. Louis.
Mueller, E. A., National Lead Co., St. Louis.
Munson, John H., Munson Electric Conduit Co., Chicago.
Myers, Garson, Standard Railway Supply Co., Chicago.
Myers, Jos. P.,Chillicothe El. R. R. Co. Lt. & Pr. Co.,Chillicothe, O.
Mynders, Al., Kraushaar Lamp & Reflector Co., St. Louis.

Neff, John, National Air Brake Co., New York.
Nethercut, E. S., Paige Iron Works, Chicago.
Newbert, A. F., Decatur Car Wheel & Mfg. Co., Decatur, Ill.
Newton, Charles E., Jewell Belting Co., Hartford, Conn.
Nichols, S. F., J. H. McEwen Manufacturing Co., Ridgeway, Pa.
Nute, John W., St. Louis Car Wheel Company, St. Louis.
O'Brien, J. B., Commercial Electric Supply Co., St. Louis.
O'Connor, Richard, National Carbon Co., Cleveland.
Olin, F. W., National Air Brake Co., St. Louis.
Olshausen, Geo. R., Wm. Wharton, Jr., & Co., Philadelphia.
Onick, Henry C., Mica Insulator Co., New York.
Orr., A. M., Gen. Man. Miami Valley Ry. Co., Piqua, O.
Oswald, Edwin H., Benedict & Burnham Mfg. Co., New York.

Padfield, Jno. B., St. Louis.
Page, H. L., Phœnix Carbon Manufactnring Co., St. Louis.
Paige, A. W., Paige Iron Works, Chicago.
Pantaleone, G., Westinghouse Elec. & Mfg. Co., Pittsburgh.
Parkam, Eug. C., Steel Motor Co., Johnstown, Pa.
Parker, Chas. M., Charles Scott Spring Co., Philadelphia.
Parker, Geo. T. , Scarritt Furniture Co.,
Parker, Lee H., General Electric Co., Schenectady, N. Y.
Parker, H. L., Emerson Electric Manufacturing Co., St. Louis.
Parsons, J. N., A. Mertes Manufacturing Co., Allegheny, Pa.
Parsons, C. F., Mark Railway Equipment Co., Cleveland.
Partridge, Arthur S., Arthur S. Partridge & Co., St. Louis.
Pearson, Geo. F., National Jack Co., Boston.
Peckham, E., Peckham Motor, Truck & Wheel Co. New York.
Peirce, Chas. C., General Electric Co., Boston.
Percival, Geo. J., Electric Storage Battery Co., Philadelphia.
Perry, Frank D., American Car Sprinkler Co., Worcester, Mass.
Platt, Chas. P., Western Telephone & Construction Co., Chicago.
Pond, Frank H., Pond Engineering Co., St. Louis.
Porter, H. F. J., Bethlehem Iron Co., S. Bethlehem, Pa.
Porter, J. F., Alton Ry. & Illuminating Co., Alton, Ill.
Potter, H. B., E. T. Burrowes Co., Portland, Me.
Post, W. B., Billings & Speucer Co., Hartford, Conn.
Prather, Henry L., Falk Manufacturing Co., Milwaukee.
Pratt, E. J., Southwest Mo. Elec Ry. Co., Joplin, Mo.
Pratt, G. E. Hunt Air Brake Co., Pittsburgh.
Pratt, Mason D., Pennsylvania Steel Co., Steelton, Pa.
Prouty, E., Devlin Street Car Brake Co., Memphis, Tenn.
Pugh, D. W., John Stephenson Co., Limited, New York.
Pugh, John, John Stephenson Co.,New York.
Pullman, Wm. C., Bushnell Manufacturing Co., Easton, Pa.
Pullman, O. S., American Steel Foundry Co.

Quincy, C. F., Q. & C. Co., Chicago.
Quinn, G. H., Detroit Steel & Spring Co., Detroit.

Randall, F. C., J. G. Brill Co., Philadelphia, Pa.
Ransom, H. N., Consolidated Car Heating Co., Albany.
Rawlings, E. W., St. Louis.
Redick, R. J., Standard Paint Co., New York.
Reinoehl, G. W., Pennsylvania Steel Co., Steelton, Pa.
Reynolds, A. T., Taylor Electric Truck Co., Troy, N. Y.
Rhotehamel, J. H., Columbia Lamp Co., St. Louis.
Rhodes, J. D., Pittsburgh Car Wheel Co., Pittsburgh.
Richey, Albert S., Citizens' St. Ry. Co., Muncie, Ind.
Roach, John M., North Chicago St. R. R. Co.
Roberts, Wm. F., Muneon Electric Conduit Co., Chicago.
Robidoux, C. E., M. M. Buck Manufacturing Co., St. Louis.
Robinson, E. I., Laclede Car Company, St. Louis.
Rodgers, J. K., Rodgers, Baldwin & Vickars, New York.
Rogers, A. H., Joplin, Mo.
Rosenthal, Geo. D., General Electric Company, New York.
Ross, E. L., Chapman Valve Co., Indian Orchard, Mass.
Russell, F. D., Rochester Car Wheel Works, Rochester.
Russell. H. H., E. T. Burrowes Co., Portland Mc.
Rutherford, J. A., Westinghouse Elect. & Mfg. Co., Pittsburgh.

Sachs, Gus., Western Electric Supply Co., St. Louis.
Scarritt, Chas. H., Scarritt Furniture Co., St. Louis.
Scarritt, Sanford, Scarritt Furniture Co., St. Louis.
Schlyel, Robt. A., Robt. A. Schlyel Bros., St. Louis.
Schmid, Albert, Westinghouse Elec. & Mfg., Pittsburgh.
Schmidt, Albert, Westinghouse Elec. & Mfg. Co., Pittsburgh.
Scovill, Frank E., Sec. and Supt. Austin St. Ry. Co., Austin, Tex.
Scrugham, G. R., Creaghead Engineering Co., Cincinnati, O.
Searing, Geo. S., Hart & Hegeman Mfg. Co., Hartford, Conn.
Sharp, Edw. P., R. D. Nuttall Co., Buffalo.
Shainwald, J. C.. The Standard Paint Co., New York.
Sharp, Chas. E., Southern Electric Supply Co., St. Louis.
Shearns, Melville H., Murphy Varnish Co., Newark, N. J.
Sherman, E. W., Broderick & Bascom Rope Co., St. Louis.
Shields, D. P., Shields Fender Co.
Shippey, H. L., John A. Roebling's Sons Co., New York.
Shultz. Ed. B., Shultz Belting Co., St. Louis.
Shultz, J. H. J., Shultz Belting Co., St. Louis.
Shultz, John R., Schultz Belting Co., St. Louis.
Siegrist, J. H., Jr., A. L. Ide & Son, St. Louis.
Silk, A. E., Jewell Belting Co., Hartford.
Silver, Wm. S., Wm. Silver & Co., New York.
Skinner, C. E., Westinghouse Electric Co., St. Louis.
Skinner, H. E., Chas. Munson Belting Co., Chicago.
Slee, A. W., Wm. Wharton Jr., & Co., St. Louis.
Sloat, F. J. J., Cleveland Construction Co., Akron, O.
Smith, Clement C., Falk Mfg. Co. Milwaukee.
Smith, C. H., Sec. Springfield Transfer Co., Springfield, Mo.
Smith, W. M., Chicago Insulated Wire Co., Chicago.
Snow, F. W., Valentine & Co., New York.
Speer, B. S., Partridge, Carbon Co., Sandusky, O.
Spencer, E. J., Safety Insulated Wire & Cable Co., St. Louis.
Steedman, Geo. T., Curtis Co. Manufacturing Co., St. Louis.
Stein, Sam. J., Electric Insulating Co., St. Louis.
Stephenson, J. A., St. Louis Register Co., St. Louis.
Stever, George, Stever Rail Joint Co., Cleveland.
Stieringer, Luther, New York.
St. John, Wm., Safety Car Heating & Lighting Co., New York.
Stinby, F. H., General Electric Co., New York.
Stone, Frederick W., Fletcher & Stone, St. Louis.
Storer, N. W., Westinghouse Electric & Mfg. Co., Pittsburgh.
Sullivan, M. A., Chas. A. Schieren & Co., New York.
Sunny, B. E., General Electric Co., Chicago.
Sutton, Wm., American Car Co., St. Louis.
Sutro, John M., St. Louis Car Wheel Co., St. Louis.
Swain, R. A., Chicago.
Sweet, D. C., Springfield, Mass.

Taylor, John, Taylor Electric Truck Co., New York.
Taylor, T. H., Washburn & Moen Manufacturing Co., Chicago.
TenBroeck, W. H., Diamond Truck & Car Gear Co., Kingston, N. Y.
Terry, Geo. N., Safety Car Heating & Lighting Co., Chicago.
Titus, J. V. E., Garton-Daniels Electric Co., Keokuk, Ia.
Trimble, James A., B. & N. Y. Ry. Supply Co., Elizabeth, N. J.
Tucker, A. L., Western Electric Co., Chicago.

Urling, Geo. A., The Duff Mfg. Co., Allegheny, Pa.
Utes, Frank, J. G. Brill Co., Philadelphia, Pa.

Vail, J. A., Hooven, Owens & Reutschler Co. Hamilton, O.
Van Cleave, J. M., Michigan Stove Co., Detroit.
Van Cleave, Giles B., Michigan Stove Co., Detroit.
Van Dorn, W. T., Fitzgerald-Van Dorn Co., Chicago.
Verstraete, E., St. Louis (electric brake).
Vosburgh, A. C., New Process Rawhide Co., Syracuse, N. Y.
Vossler, Edw. M., Leschen-McComber-Whyte Co., Co., Chicago.

Walker, Russell, Heine Safety Boiler Co., St. Louis.
Ward, D. O., Weber Ry. Joint Mfg. Co., New York.
Watson, C. W., Member House of Delegates City of St. Louis.
Wattles, James F. Rand-Avery Supply Co., Boston.
Weatherly, Robt. H., Scarritt Furniture Co., St. Louis.
Weber, George A., Weber Ry. Joint Mfg. Co., New York.
Weierbach, Kinzer & Jones Manufacturing Co., Pittsburgh.
Wendell, Jr., Jacob, Taunton Locomotive Mfg. Co., New York.
Wessels, Edw. J., Standard Air Brake Co., New York.
Westlake, C. T., American Steel & Foundry Co., St. Louis.
Wharton, Wm. W., Scranton Manufacturing Co., Scranton, Pa.
Wheeler, G. K., General Electric Co., New York.
White, C. B., Central Electric Co., Chicago.
White, T. C., Central Union Brass Co., St. Louis.
Whitmore, C. E., Con. Elec. Purifier Co., Chicago.
Whyte, Geo. S., Leschen-Macomber-Whyte Co., Chicago.
Wickham, E. F., St. Louis Register Co., St. Louis.
Wiley, J. R., Standard Underground Cable Co., Pittsburgh.
Wilkinson, A. L., Ohio Brass Co., Mansfield, O.
Wilkinson, T. A., Campbell & Zell Co., Baltimore.
Wilkinson, W. H., Diamond Truck & Car Gear Co. Kingston, N. Y.
Williams, N. W., Chicago, Ill.
Williams, John R., Electric Storage Battery Co., Philadelphia.
Williams, M. W., Safford & Moore Ry. Jack Co., Chicago.
Wirt, H. C., General Electric Co., New York.
Wise, Clift, Chicago.
Wister, E. A. W., Falk Mfg. Co., Milwaukee.
Woodward, A. H., International Register Co., Chicago.
Woodworth, A. C., Consolidated Car Fender Co., Providence, R. I.
Woodworth, Jr., A.C., Consolidated Car Fender Co.,Providence,R.I.
Wright, T. L., James A. Wright & Sons.
Wurts, A. J., Westinghouse Electric & Mfg. Co., Pittsburgh.

Yerkes, Chas. E., Siemens & Halske Electric Co., Chicago.

Zell, A. F., Campbell & Zell Boiler Co., Baltimore.
Zeigenheim, Henry, Collector of City of St. Louis.
Zimmerman, W. F., Westinghouse Elec. & Mfg. Co., New York.

LADIES.

Alexander, Louise, St. Louis.
Allen, Mrs. W. B., St. Louis.
Alvord, Miss Libbie S., St. Louis.
Anderson, Mrs. J. C., Youngstown, O.
Bailey, Mrs. T. P., Chicago.
Barr, Mrs. Belle, St. Louis.

Bascom, Mrs., St. Louis.
Beach, Mrs. R. H., Trenton, N. J.
Bemis, Mrs. J. L., Brooklyn, N. Y.
Blow, Mrs. J. W., St. Louis.
Brady, Mrs. M. J., St. Louis.
Broderick, Mrs., St. Louis.
Brownell, Mrs. F. B., St. Louis.
Buchanan, Mrs. A. S., Memphis, Tenn.
Buchanan, Mrs. E. S., Central Electric Company.

Carr, Mrs. C. E. A., London, Ont.
Cayee, Miss Susie, St. Louis.
Chambers, Mrs. George, Long Island City, N. Y.
Colcord, Mrs. W. R., Bethlehem, Pa.
Connolly, Mrs. James.
Cook, Mrs. A., St. Louis.
Cook, Miss C., St. Louis.
Cooke, Mrs. M. E., Chicago.

De Figueiredo, Mrs. A.
Diekman, Miss E., St. Louis.
Draffen, Mrs. E. D., St. Louis.
Duffy, Mrs. C. N., St. Louis.
Dumwick, Mrs. W. S., Council Bluffs, Ia.

Ebanues, Mrs. Q., St. Louis.
Elliot, Mrs. H., Jr., St. Louis.
Elliot, Mrs. W. H., St. Louis.
Endris, Mrs. Oscar, St. Louis.

Ferguson, Mrs. J. A., St. Louis.
Fleming, Mrs. A. W., St. Louis.
Flower, Mrs. Walter L., St. Louis.
Francis, Mrs. A. G., St. Louis.
Frederick, Mrs. E. P., St. Louis.

Geunner, Mrs. C. E., St. Louis.
Gilford, Mrs. H. H.
Goff, Mrs. Robert L., Fall River, Mass.
Green, Mrs. Charles, St. Louis.
Green, Miss Genevieve, St. Louis.
Green, Miss H. M., St. Louis.
Greene, Mrs. F. R., Chicago.
Greene, Miss Mabel E.

Haynes, Miss, Augusta, Ga.
Hand, Mrs. Wm., St. Louis.
Harris, Mrs. John, Cincinnati, O.
Harrison, Mrs., St. Louis.
Hawken, Mrs. Thomas, Rockland, Me.
Heft, Mrs. N. H., Meriden, Conn.
Henry, Mrs. F. R., St. Louis.
Hodgman, Mrs. M., Philadelphia, Pa.
Howard, Mrs. C. H., St. Louis.
Howard, Mrs. Geo. E., St. Louis.
Hudson, Miss Ella, St. Louis.

Jenkins, Mrs. W. W.,
Johnson, Mrs. A. L., Philadelphia, Pa.
Johnston, Mrs. W. J., New York.
Jones, Mrs. F. G., Memphis, Tenn.
Jones, Mrs. Geo. P., St. Louis.

Kelly, Mrs. W. F., Columbus, O.
Kenfield, Mrs. F. S., Chicago.
Kilpatrick, Mrs. Claude, St. Louis.
Kipperberger, Mrs. Geo. L., St. Louis.
Kirkwood, Miss S. L., St. Louis.
Kraushaar, Mrs. L., St. Louis.
Kuhlman, Miss Mamie A., Cleveland, O.

Leen, Mrs. Patrick, Cincinnati, O.
Lewis, Mrs. Henry C., St. Louis.
Littell, Mrs. H. M., New York City.
Littell, The Misses, New York City.
Loomis, Mrs. W. S., Springfield, Mass.

MacLeman, Mrs. J., New York City.
McCulloch, Mrs. Robt., St. Louis.
McNeil, Jr., Mrs. M., St. Louis.
McNull, Jr., Mrs. M., Chicago.
Macy, Mrs. E. F., St. Louis.
Markle, Mrs. A., Hazelton, Pa.
Mahoney, Mrs. John, St. Louis.
Major, Mrs. Emma, St. Louis.
Major, Miss Tempest, St. Louis.
Mattox, Mrs. W. A. New York.
Millen, Mrs. T., New York City.
Miller, Mrs. J., Chicago.
Minary, Mrs. Jos. S., St. Louis.
Mitchell, Mrs. A. B., St. Louis,
Musser, Mrs. F. B., Harrisburg, Pa.

Nelson, Mrs. S. L., Springfield, O.

Opel, Miss Amy, St. Louis.
Oswald, Mrs. Edwin H., New York City.

Padfield, Jr., Mrs. J. B., St. Louis.
Penington, Mrs. T. C., Chicago.
Perry, Mrs. F. D.
Prickham, Mrs. Ed. F., St. Louis.

Radel, Mrs. Andrew, Bridgeport, Conn.
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LEGAL NOTES AND COMMENTS.*

Edited by J. Aspinwall Hodge, Jr., and George L. Shearer,
of the New York Bar.

Insurance Against Liability of Common Carriers of Passengers.

In the February, 1896, number of the Street Railway Journal we discussed the legality of policies of insurance which sought to indemnify common carriers of passengers against liability arising out of their negligence for the loss of life and limb of passengers and others. At that time there was pending in the Court of Appeals of Maryland an action in which the question arose, and since then that court has handed down a decision which must be interesting to all common carriers of passengers, both in its direct effect and in the tendency which is indirectly shown in the reasoning of the court.

The court learnedly expounds the proposition that "public policy is a variable quantity; that it must vary "and does vary with the habits, capacities and opportun- "ities of the public"; and after reviewing the fire insurance cases in the Supreme Court of the United States, to which we referred in our former article, and after admitting that no contract can be made between the carrier of passengers and the passenger himself, which restricts or limits its obligation to the passenger and the public to the exercise of the highest degree of care and diligence, the court procceds to point out that, in its opinion, there is a distinction between such a contract made with the passenger and the policies in question, which "leave that "liability precisely where and as complete as it was before "they were written," and after suggesting that the contract of insurance merely furnishes the common carrier with a fund out of which it can pay its liability, it holds that such policies are valid contracts.

But there is a sentence in the opinion which seems to demand careful consideration, although it be only a *dictum*. The court says, "The compensation to an individual, "whether passenger, employee or stranger is, after all, a "money compenaation, and though the life or limb of a "person may be, and certainly is, of greater intrinsic value "than goods and chattels, still the law knows of no other "means of making compensation or approximate compen- "sation in either instance, than by the assessment of "damages in dollars and cents".

So far as this refers to the loss of or injury to a limb, perhaps no criticism can be made upon the statement; but so far as it refers to loss of life, it appears to assert a novel proposition and one dangerous not only to the interests of the passenger and the public, but dangerous to the common carrier. Let it once be supposed that, contrary to the ancient doctrine of the common law, there is such a thing as "compensation" for the loss of human life and a double result would obtain.

First, there would be a deadening of the responsibility felt by the common carrier, and, in the second place, there would be an increased tendency in courts and juries to give damages over and above those allowed by the stricter and more logical rules of law as heretofore laid down in our decisions. These decisions nowhere suggest that even the family of the deceased is "compensated." Only certain *pecuniary losses* sustained by a certain number of persons by the death are made good, and those but partially. This is incidentally, but clearly, shown in our discussion of six cent verdicts in negligence cases in the March number of the Journal. There is and can be no "compensation" paid to the dead man, who has suffered the greatest loss that can be inflicted, nor is there any "compensation" made to the state and community for the loss of its citizen, as is shown in the decisions cited in our former article.

It is not a question of degree, as the court would seem to imply. A human life "most certainly is of greater in- "trinsic value than goods and chattels;" but the very taking of the life robs the law of the ability of making any compensation whatever to the wronged person, who, without fault of his own, has lost his life through the fault of another, and the law should shrink at the idea that the state by a penalty or fine can be indemnified for the loss which it has sustained.

But, as already noted, the propositions we have been commenting upon, contained in the opinion, are but *dicta*, and the decision, based upon the reasoning of the court, does not seem to necessarily rest upon these propositions. The opinion reported in 82 Maryland, 535, is full of interest, and we feel some regret at not being able to quote it more fully, but owing to the necessary omission in the October number of the Journal of the current cases from the reports, and their publication in this number, our space is limited. H.

*Communications relating to this department may be addressed to the editors, No. 32 Nassau Street, New York.

STATUTES, ORDINANCES, CHARTERS, POWERS, ETC.

New Jersey.—Under P. L. 1895, p. 462, providing that, where the route of a railway crosses an established steam railway, applications shall be made to the chancellor to define the mode, who shall proceed to define it, and shall avoid a grade crossing if, in his judgment, it be reasonably practicable to do so, and the public safety so requires, he cannot change the location of the crossing to a point which he considers better for the public.

It is not "reasonably practicable," within such act, to avoid a grade crossing of an electric railway or a steam railroad where an overhead or undergrade crossing will cost $100,000, and will materially interfere with the approach on the highway to an important railroad depot, and it appears a grade crossing can be rendered safe by a signal tower and apparatus for stopping an electric car if the motorman disobey signals to stop.—(*In re* Atlantic Highlands v. Ry. Co., 35 At. Rep. 387.)

Pennsylvania.—Though the right of a street railway company, even to that part of the street occupied by its rails, is only in common with that of other travelers, its right to use an ordinary and usual appliance upon the track to repair the overhead wire is, for a reasonable time, paramount.

The consent of the borough, if necessary to enable a street railway company to change from horse power to an electric trolley system, will be presumed from the acquiescence of the borough in such change for five years, so far as to preclude an individual, in a suit against the company for personal injuries, from claiming that the maintenance of such system is negligence per se.—(Potter v Scranton Traction Co. (Pa. Sup.) 35, At. Rep. 188).

Pennsylvania.—Acts May 14, 1889 (P. L. 211), does not limit corporations chartered under it to the right to build passenger railways on "streets" properly so called, but authorizes the building of such railways through boroughs, and over township or country roads.—Pennsylvania R.

The charter of a street passenger railway company, granted under Acts May 14, 1889 (P. L. 211), covered the route on which the road was built, and it had the consent of the local authorities, of all the owners of property along the roads occupied, and of those through whose property its lines passed. *Held*, that a railroad company whose tracks were crossed by such street railway, and which owned no land abutting on the streets or roads occupied by such passenger railway, could not dispute the passenger railway company's rights to construct and operate its road over such streets and roads.

But where such passenger railway passed over an overhead bridge which was not built originally for a street passenger railway, and which passed over such railroad company's tracks, the railroad company was entitled to be protected from the danger to it and its passengers arising from the use of the bridge by the street railroad company.—(Pennsylvania R. Co. v. Greensburg, J. & P. St. Ry. Co. 35 At. Rep. 122.)

Construction and Maintenance of Electric Railway Tracks.

BY GEO. H. NEILSON.*

Foundation.—In preparing the foundation, or subgrade in the construction of track laid in city limits where girder rail is required, it is a great mistake to make any arbitrary specification as to the thickness of the concrete. It should depend on the solidity of the ground on which it is laid; in many places four inches is ample, and in others six or eight inches may be necessary. The engineer, or whoever has charge of the construction, should watch this up carefully as it is very important, and if the work is properly done it will be of lasting benefit. A few soft spots if not taken care of, will soon make themselves felt, and will spoil the effect of the balance of the work. The excavation for the foundation should not be any wider than necessary. Eight feet for a five foot three inch gauge is ample. The depth, of course, depends on the height of rail, thickness of concrete, etc.

Concrete.—The concrete should consist of one part of cement, two parts of sharp sand, and five parts of stone, not larger than will pass through a two inch ring. The sand and cement should be mixed dry and turned over at least four times before water is used. The stone must be wet before being added to the sand and cement, and the whole thoroughly mixed on a board platform with tight joints. After the concrete is spread it must be rammed hard, the ramming to continue until water comes to the top, care being taken to keep it uniform and smooth. About one inch of coarse sand or gravel should be spread over it to make a bed for the ties. The spaces between the ties should be filled with broken stone, sand or gravel.

Ties.—The ties should be at least six inches on face, seven feet six inches long, of white or rock oak and thoroughly seasoned. If practicable it would be well to treat them with creosote or wood preserver of some kind. They must be hewed and not sawed. They should be laid with twenty-six inch centers or fourteen to every thirty feet.

Rails.—The rails should be at least seventy pounds to the yard, and heavier if the traffic over the line will warrant it. They should be in sixty foot lengths. The usual thirty foot rail is harder to keep in shape on account of the numerous joints, and does not ride as well.

Splices.—Splices should be six-holed, for all rails under seven inches in height. If the rail is over seven inches there should be two rows of six bolts, one beneath the other, as one row will not hold the wide splices tight against the rail. The splices should rest firmly on the base of the rail, and fit snugly under the head. All bolts should be put on with nut-locks; if this is not done the constant jar will wear them, and the joint will get loose. In fastening the rail to the ties, if tie plates are not used, care should be taken to give the rail a good bearing across the entire face of the tie; as the average hewed tie will not allow this, they should be adzed off before the rail is laid. If this is not done the rail will work under the pressure of the cars. The most satisfactory way to fasten the rail to the ties, would be by means of tie plates. Plates with a raised lug to prevent the rails spreading and with claws to hold them to the tie, answer several purposes. They hold the track to gauge, which is very important and is more than spikes will do; they lengthen the life of the cross ties and hold the track in surface better. Rail chairs which bolt or spike to the tie, and upon which the rail rests, are practically useless where traffic is heavy, and they will work and break and are a constant source of annoyance. The preservation of the gauge is very important, and to my mind tie plates will do this better than any other method now in use. If put on every other tie they would hold the rail, although if used on every one would make a more solid and lasting piece of work.

Frogs, etc.—Frogs should be solid. Solid frogs last longer than those that are made up of several pieces bolted together, and do not get loose and rattle. The same is also true of the switches and mates. If the track is properly laid, the maintenance will be a small item for some time, but when repairs are necessary they should be made at once. It is far better to take hold of the work in time, than to wait until the whole line is in bad condition. It is very poor policy to construct a road on a cheap scale, as it takes but a short while for it to need repairs, and the result will be a constant strain on the company for maintenance, which will in the end be far more expensive than a well built road would have been.

SUBURBAN TRAFFIC.

Suburban traffic on trolley lines has grown to such an extent in the last few years that the proper location of roads has become of great importance. Not only must we take into consideration the localities to be touched, but we must get to them by the shortest and most economical way. By economical, I mean both from a construction and operative standpoint. Before a road is definitely located, many things must be taken into consideration, such as the future of the county through which the road is to be built, and how great a factor in the encouragement of suburban living the road will prove. Travel over the road must be attractive, and unless it is well located and laid, it cannot be made so; and people will not patronize it to the extent they otherwise would. Any points which will cause the public to use the road should not be lost sight of, and many trolley companies have built parks and places of amusement on their lines with this idea.

Sub-Grade.—When the road has been located, the alignment and grade should be staked out, and not laid out by the eye, as is sometimes done. The grade should be as nearly uniform as possible, all humps, short dips and sudden changes in grade being avoided. Hills must, of course, be climbed, but the short dips can be worked out, and should be, as they cause an uncomfortable lurching to a rapidly moving car, which cannot be remedied, except by raising the track. High places should be kept out when the grade is first made. When they are once in they can only be gotten rid of by digging down—a very expensive piece of work after the track is laid.

If the company constructing the road cannot afford a good grade at the outset of its career, it must never lose sight of the fact that its grade is faulty, and gradually work it into shape. If the road is adjacent to a wagon road, it should be at least a foot higher in order to avoid the drainage. The roadbed should be drained and protected from water as thoroughly as possible. The absence of the proper channels for the escapement of water has very often resulted in serious damage, and the eventual expenditure of more money than serviceable ditches would have cost. Before ditches are constructed the watersheds adjacent to the road should be studied, as it is a useless expense to provide larger ditches than are necessary, but it is worse not to have them large enough. Ditches along a single track road should be well outside the trolley poles, and if the line is a double track one, they should be at least seven feet from the ends of the ties. If they are too close, the roadbed will work out and become unsettled, and the result will be pumping ties if the ground is at all soft. Water should not be carried under the track, if possible to avoid it. If it must be, iron or terra cotta pipe or stone culverts should be put in. The ordinary wooden box decays and in the end is most expensive.

Bridges.—Where it is necessary to cross a creek or ravine, deck girders or I beams should be used. Timber rots out and is not serviceable when compared to iron. The girders should rest on stone supports, solidly built and on a good foundation. If this is done they will last for years. If the bridge is over a creek, it should be high enough to allow the water in time of freshet plenty of headroom. If this is not done, floating timber is liable to prove destructive.

Ties.—The cross-ties should be of white or rock oak, well seasoned and hewed Chestnut ties are too soft, and are more affected by the weather. They should be at least eight feet long, six inches on face and laid with twenty-six inch centers.

Rail.—The rail should be at least seventy pounds to the yard and thirty feet long laid with joints, staggered fifteen feet apart. Splices should be six-holed with full complement of bolts and nut-locks. In spiking the rail to the ties, the inside spokes should be opposite each other, and the outside spokes opposite, the reason being obvious.

Curves.—In laying out curves, the regular curvature should not be carried through the entire length of the curve. If it is done, the change from the straight line on to the curve is so abrupt that the wheels will strike the point of the curve instead of traveling easily on to it. To avoid this the ends of the curve should be flattened or "eased off," as trackmen say. This flattening should be short so as not to extend too far into the curve and destroy its regularity.

The proper elevation of curves is important and no set rule can be made for it. It depends principally on the rapidity of the car movement. If elevation can be avoided at all it should be, as it is hard to keep in shape if the roadbed is not solid and the track well ballasted.

Road Crossings.—Where the wagon traffic over the road crossing is heavy, it should be planked solid. If the traffic is light it can be made of wooden strips parallel to the rail and across ends and the center filled with stone.

Ballast.—The track should be well ballasted. Broken stone or screenings are much preferable to cinder, as they hold the track better and are not so hard on the ties.

Maintenance.—The gauge of the track should always be exact. Any inequality will affect the riding of the cars to a very appreciable extent. Line and surface should be kept in as good shape as possible. A rough road is not apt to attract passengers, besides being anything but a credit to the management. The roadbed should be kept as clean and neat as finances will permit, and the ditches lined up and free from dirt and weeds. The patrons of a road notice many things which some managements overlook, and a road which attracts attention on account of its smoothness and clean appearance has done much that will encourage travel. In the fall, the track should have a thorough lining and surfacing in preparation for winter, especially if it is laid in soft ground. If well ballasted, it will not be easily affected by the frost, but if it is not, the cold weather will heave it. The only resort then is to shim up the worst places, and wait until the frost is out of the ground. As soon as the weather opens in the spring, extra trackmen should be put on so as to go over the track in a short time; putting in ties where needed, and giving it a thorough fixing up. After this has been done, the regular force should be able to keep it in first class shape. Three good men can take care of eight miles of track if it is well laid and ballasted.

*Abstract of paper read before the Pennsylvania State Association, Sept. 2, 1896.

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IT is a wonderful thing that in a time of severe business and industrial depression and, in the opinion of many people, of great national peril, there should be brought together from all parts of the United States over one thousand representatives of a great industry to discuss purely business matters relating to their present and future prosperity, and to witness an exhibition of manufactured goods, the mere transportation of which to and from the place of meeting, together with the labor of putting in place and the attendance during the exposition, represents a sum of money larger than ever expended for a similar purpose in the brightest and most prosperous years of the past. The Fifteenth Annual Convention of the American Street Railway Association, held at St. Louis last month, was from every point of view the most successful one in its history, and marks in the Association's life a turning point toward better things than have ever yet been attained, rich though its record is in notable achievements. There have been times, we confess, when we have taken a somewhat gloomy view of the Association's future—when we have feared that the seeds of disintegration were being sown. It has never stood on firmer ground, however, than to-day, nor been more sure of a useful and prosperous career. This has been due to several causes. In the first place, the Association's debt was cleared off by a general subscription at the meeting at Montreal last year, and the President and Executive Committee of 1895–6 have managed its affairs with such skill and economy that it is now on a firm financial footing. In the second place, St. Louis and the St. Louis street railway companies have been most generous in their hospitality to the convention of 1896, and a convention more free from objectionable features and more enjoyable to those in attendance has never been held. In the third place, the manufacturers have come forward this year with an exhibition of great variety and instructive value. But more than all else, the papers presented have had remarkable engineering and practical value. The genuine business of an association of this character—the papers and the discussion of problems of practical importance to members—must always be the real foundation of the convention structure, and if this foundation is weak, there is danger that the whole will sooner or later fall to the ground.

* * * * *

The retiring officers and Executive Committee deserve the unqualified thanks of the Association for their untiring efforts in its behalf during the year. Four of them, Messrs. Littell, Kelly, Markle and Morgan have been present at every executive meeting during the year, and have borne the brunt of the work, while Secretary Penington has been a valuable executive officer, and one whose opinions have been sought by the committee on every subject. It is probable that to the personal popularity of President Littell and Secretary Penington is due, in a large measure, the magnificent exhibit made by the manufacturers, although the local committee at St. Louis deserves the utmost praise for the complete and thorough way in which all the details of the exhibit and of the convention itself were carried out.

* * * * *

The new Executive Committee will be a strong and vigorous force tending to carry the Association to still higher levels. No man stands higher among street railway managers than Captain McCulloch, the new president, who has proven himself, in his administration of the seven different properties in St. Louis owned by the National Railway Company, of Chicago, as progressive in his ideas as he is energetic and industrious in the management of his trust. C. S. Sergeant, the first vice-president, is general manager of the West End Street Railway Company, of Boston, one of the largest and most valuable properties in the world. D. B. Dyer, the second vice-president, is president of the Augusta (Ga.) Railway Company, and has other large financial interests in the South. The third vice-president, C. F. Holmes, has successfully conducted a general consolidation of the street railways of Kansas City, during the last two years, and is now manager of one of the most important properties in the West. In accordance with custom, H. M. Littell, the retiring president, has been placed on the Executive Committee, where his experience in the work of the Association last year will be of value to the new committee. Other members of the Executive Committee are Harry

Scullin, who is vice-president and general manager of the Union Depot Railway Company, of St. Louis, and who is, perhaps, the youngest manager of an important street railway property in the country; Geo. B. Hippee the general manager of the Des Moines City Railway Company; H. P. Bradford, general manager of the Cincinnati Inclined Plane Railway Company, and Chas. H. Smith, superintendent of the Troy City Railway Company. Mr. Pennington has well earned his re-election as the Association's secretary and treasurer, and it is understood that he is planning new work for the coming year, which will bring the secretary's office into close touch with every member.

IT is a privilege to listen to and to study so valuable a paper as that of Mr. Bowen's on the subject of "Track and Track Joints." Mr. Bowen treats the subject from a purely engineering standpoint and brings out, in his discussion of the influences bearing on the success of track, a number of novel and interesting points. In the very beginning of his paper, he shows in a clear and graphical way how important it is for the economical use of both rail and wheel, to match the one to the other so as to prevent the excessive wear on both which comes about in the effort to bring them to a bearing surface by use. The evils brought about by carelessness or indifference to this feature of track and wheels are seen on almost every street railway in this country and it is only when street railway managers understand that wheels must be coned for proper centering on the track and that the rail heads should therefore be beveled to approximately fit the coned surface of the wheel, that sharp flanges and excessive wear on the rail head will disappear. Mr. Bowen states that in his experience thirty-five per cent additional life has been given to both wheels and rails by this simple expedient. Mr. Bowen also takes up a branch of the subject, to which little attention has been given by street railway engineers in times past, and that is the composition of the rails. The great trouble with a rail weak in carbon is that it "squashes out" in service, i. e., it is hammered down by the cars to a broader and a lower surface. Examples of this action may be seen in a great many cities, and the heavy rail sections which have been put in so generally within the last two or three years are perhaps more likely to suffer from this action than from almost any other to which they are subjected. In our opinion a higher percentage of carbon, up to even .60 or .65 per cent, should be specified by street railway companies, instead of .40 to .50 per cent at present in common use. It is true that with these higher percentages of carbon the rails become more brittle and breakages are somewhat more likely to occur, but the danger of train accidents from rail breakage in street railway work is almost *nil*, while it has been one of the principal reasons for keeping the carbon percentage down in steam railroad work. In the matter of joints, Mr. Bowen has had perfect satisfaction with cast welding and certainly the record which he shows in a breakage of less than one per cent of the joints so far laid down is remarkably good. One thing seems to be demonstrated in cast welding joint work, and that is, that the rails should be most thoroughly cleaned and polished before the cast is made, as this greatly affects the strength of the joint. Mr. Bowen's "dynamometer" or "track observation" car is a valuable invention and he has shown the spirit of a true engineer in offering to furnish to his brother managers without charge full working drawings of such a car or to loan them the car itself. His method of determining with some approach to accuracy, the amount of money which can be profitably spent in repairing track is a very interesting one and is worthy of careful study and imitation.

MR. McCULLOCH'S paper on "The Modern Power House" is also one of high engineering value and in it will be found one of the most complete and lucid discussions of the different elements which go to make up a well designed power station that we have ever seen. There is evidently a strong element of "horse sense" in Mr. McCulloch's personal composition, for he does not fall into the error common to so many engineers of putting theoretical efficiency above practical results in dollars and cents, but, on the contrary, advises the placing of simplicity and reliability in a power station plant above considerations of minimum fuel consumption, pointing out the great loss of receipts caused by a shutdown of a station from any cause. In his discussion of steam generating apparatus he brings out several points regarding the use of economizers and other feedwater heaters which are based on a close observation of results found by him in visiting, during the past year, a large number of power stations in different parts of the country. In his discussion of steam consuming apparatus he strongly recommends direct connected units, and states that the main objection originally urged against them, namely, that the shocks resulting from quick changes in load are thrown directly on the engine and might prove a destructive influence, is met by the fact that in none of the installations of direct driven generators so far made can any trouble be traced to this source. He regards with some favor the use of storage batteries in railway plants to equalize the fluctuations of load and to make it possible to run the generator and engine plant at maximum efficiency throughout the day's run as well as to take care of the owl cars at night. He urges cleanliness in the power station as one of the most important points bearing on economical operation, and even goes so far as to say that "there is more loss through dirty and greasy electrical devices, badly set valves, leaky steam joints, poor firing and careless supervision than ever will be gained through the use of compound, condensing engines." Mr. McCulloch has obtained operating figures from a number of large modern power houses, East and West, and finds that results range from $.0075 per kilowatt hour to $.0125 per kilowatt hour, these figures including cost of coal, water, supplies, repairs, and labor, but not including taxes, insurance, interest, or depreciation. Converting these figures into annual costs, it will be seen that our large electric railway power houses are producing power, on the basis of twenty hour service per day, at from $54.75 to $91.25 per kilowatt per annum, or, from $41 to $68 per electrical horse power, per annum. It is interesting in this connection to compare these figures with the estimates given by Dr. Charles E. Emery in a discussion of the cost of producing power in 500 h. p. units, made in 1893. Dr. Emery's figures showed that 500 net mechanical horse power could be delivered on, for example, the dynamo shaft of a direct connected engine, for $30.39 per horse power per annum with $2 coal, $38.45 with $3 coal, and $46.51 with $4 coal. If we assume a dynamo efficiency of ninety-three per cent, these figures

would become $32.70 per electrical horse power with $2 coal, $41.30 with $3 coal, and $50 with $4 coal, these figures being all based on a twenty hour day for 365 days and covering fuel, supplies, labor, and repairs on engines alone. It would seem, therefore, that there is an opportunity for electric railway plants to increase their economy, particularly in view of the fact that units larger than 500 h. p. are usually found in most modern electric railway power stations, and several of them at that, so that the labor account, at least, ought to be less than in the assumed examples of Dr. Emery. It is nevertheless true that electric railway stations in our principal cities often have to work under disadvantages from one cause or another, sometimes because of inability to obtain condensing water, sometimes because of heavy cost of fuel delivered at the power stations, and always because of heavy fluctuations in load which prevent maximum engine economy from being reached.

MR. WYMAN, in his paper "How Can the Revenue of Street Railways be Increased?" offered a number of important suggestions upon this topic, which is of live interest to street railway managers. Like the wholesale house which "wanted orders," the best methods of developing traffic should be constantly in the thoughts of the manager of a street railway company. It is to secure revenue that a street railway company is organized, that is its *raison d'être*, and efforts to keep and add to the traffic of a road should not be relaxed under the idea that people will ride anyway. That the traffic of a railway can be increased by making the cars attractive, by politeness on the part of the attendants, and by the thousand and one ways which the good manager knows by instinct, but which the poor manager never thinks of, is now undisputed, we think. Such attention to the needs or whims of passengers does not require in many cases any additional expense. A thorough study of the local conditions, a readiness to grasp and improve opportunities which may be presented as they come along, publicity of the desirable kind and the ability to impress the mind of the public with the constant idea that the seeker after their business is doing his best to care for them and to anticipate their wants—these are the essential features of successful business men, whether in the street railway industry or in any other trade. That the essential principles of ordinary business affairs apply to the traffic side of street railway operation is becoming more and more true. As Mr. Wyman clearly pointed out, the traffic manager stands in his relation to the public somewhat like a retail merchant seeking customers. And as the trend in business is constantly toward a greater effort on the part of the seller to attract and please the customer, street railway companies are finding that they can no longer wait for passengers to come to them, but if they wish to secure all the traffic possible in a city, must use business methods to accomplish that end. Handsome and comfortable cars, short headway and uniformed attendants are ways to gain customers. Mr. Wyman states that his company in addition has published a folder giving the routes of his lines and ways of reaching the most desirable pleasure resorts, and time tables of the different lines have been profitable. Other roads, we know, have had a similar experience, and one, the Brooklyn Heights Railroad Company, even publishes a monthly in the interest of its traffic department.

But on every road subordinates must be depended upon to carry out any line of policy, and the successful outcome of even the most wisely conceived plans and policies may be prevented by improper or inadequate support. Every motorman and conductor should be made to feel a personal interest in the success of his company, as well as a pride in its service and equipment. This can be helped by discussing with him the necessities and objects of the company, explaining the reasons for the enactment of any new rules which may appear arbitrary, and by showing him that the interests of an employer and employe are identical, and that he gains when his company is prosperous and suffers when it is subject to loss. The opposite doctrine, that capital and labor are opposed and that their interests lie in opposite directions, has been preached so long by demagogues who have had ulterior objects to serve that it has come to be regarded by many as an admitted fact. This idea should be combated by showing to employes a desire on the part of the railway company to help them better their condition, to instruct them in their duties and to care for their comfort as much as possible, confident that all efforts in this line will have a direct effect on the efficiency of a road by producing a more intelligent and better class of employes. Mr. Wyman's monthly bulletin, in which the official notices of the company and suggestions to aid the motormen and conductors in their work are published, is a most excellent idea and has been found, we understand, to serve its purpose well on that road. Other railways might find this an important method of bringing about closer relations between the officials and employes. It would seem desirable, however, to distribute this bulletin by mail directly to the residence of each employe. In this way the officials of the company would be more certain that each employe received his copy than if they depended upon his taking a copy from the car house. Moreover, in case of strike the side of the railway company could be presented in the bulletin and read by the employe and his family, whereas he might not call at the car house or office of the company for his copy. The other suggestions by Mr. Wyman are all valuable, and his paper as a whole is one of the most imteresting on the subject of traffic ever presented to the Association.

THE paper on "Modern Overhead Construction" by Mr. Benjamin Willard was a valuable discussion on this subject and was especially interesting as showing the great progress which has been made in this branch of railway equipment since the first electric road was installed. A valuable comparison was made by Mr. Willard of the relative cost of maintenance of overhead construction using iron and wooden poles for a period of thirty years, the total cost, including two renewals of wooden poles, being very nearly the same for the two, with a difference slightly in favor of the wooden construction. It would be instructive to have a comparison also with these figures of those of poles treated with creosote or some other preservative material. We understand that poles used for outside work and so treated have given a life in Germany considerably greater than that assigned by Mr. Willard for iron poles.

ON account of limitation of space we shall reserve until another month more extended mention of the valuable papers by Mr. Kelly and Mr. Akarman on "The Selection and Management of Employes" and "Street Railway Trucks" respectively.

PAPERS READ AT THE ST. LOUIS CONVENTION.

Track and Track Joints: Construction, Maintenance and Bonding.

By M. K. BOWEN.

After signing a contract to tell my associates in business how to construct and maintain a street railway track, I began to cast around for data bearing upon the subject, and found that the life of a rail was measured by the wearing out of the head, and less than twelve per cent was worn away before we sold the old rail for scrap; hence the deduction that the point of contact between the wheel and the

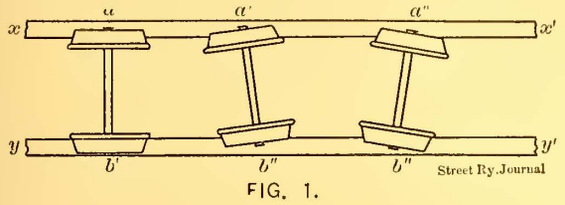


FIG. 1.

rail, in other words, the bearing and wearing part of the track, was the most important consideration. I asked a wheel manufacturer why wheels of street railroad cars were made conical or beveled shape instead of flat. His answer was "To draw out of the mould, of course." Not being satisfied, I asked a steam railroad man the same question; he said it was for the purpose of compensating on curves for the farther travel of the outside wheel.

If I had asked a street railroad man the same question he would have promptly and correctly answered (even if he did not know and had to guess) that the bevel on a car wheel was for the purpose of centering the car on the track, providing a means for a lagging wheel to catch up again, maintaining the axles of the car at right angles with the rail of track. The foundry man was wrong, because we all know that flat wheels can be made. The steam railroad man, when he answered, had in mind his 10 deg. maximum curve, but in applying his answer to our conditions he was wrong, because on a quarter circle curve of 50 ft. radius, 30 in. wheels, the outside wheel is compelled to travel 7 ft. 4¾ ins. farther than the inside wheel, and

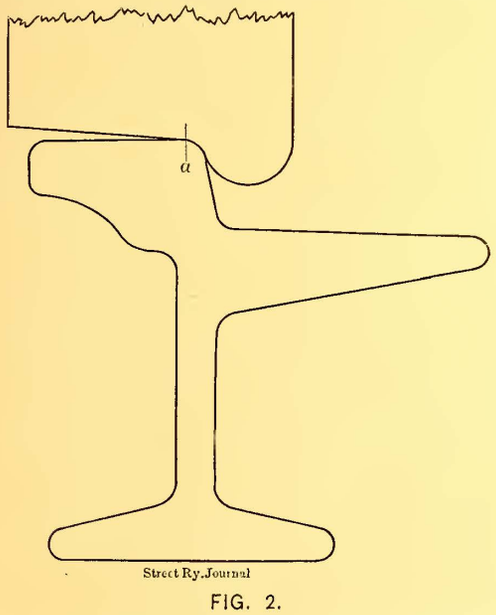


FIG. 2.

the absurdity of the bevel of ¼ in. on a 2 in. tread compensating for this travel, and preventing slipping is readily apparent, as it would require a bevel of 1 1/16 ins. in a 2 in. tread to compensate for the difference in travel of the wheels. The effect of the slipping of wheels on curves is clearly shown by the brightness of the rails, showing abnormal wear.

The street railroad man was right, because if he stands behind any of his receding cars he notices the movement of the car from side to side with a rhythmic motion which tells of an action taking place. The analysis of the action develops a coal saving, wear saving movement, always at work; a sort of a silent partner producing part of your dividend, for if this motion did not exist the wheel which once got behind, an axle which once assumed a position not at right angles with the truck, would be apt to remain in its faulty position during the entire trip, requiring excess of power to haul the car, and abnormal wear of wheel and rail, resulting in sharp flange wheels and short life of rail.

The action taking place is this: suppose the car has shifted toward the rail, $y\ y'$, Fig. 1. This action causes the wheel (a) to bear upon its smallest diameter and the wheel (b) to bear upon its greatest diameter, with the result that (b) runs ahead of (a). This brings the axle at an angle with the rails, as shown by (a') (b'). The wheels will now tend to shift to the opposite side— $x\ x'$—the wheel (a) will rest upon its largest diameter, while the wheel (b) will rest upon its smallest diameter, when (a') will start and run ahead of (b'), bringing the axle into position shown by (a'') (b''), and so this action keeps up continually, tending always to keep the truck in the center of the track.

If the wheels had no bevel the result would be that unless the rails were exactly on the same level the car would shift to one side —the result you all know.

Take first a conical wheel running on a rail, the surface of which is level. Referring to Fig. 2, we note that the rail and

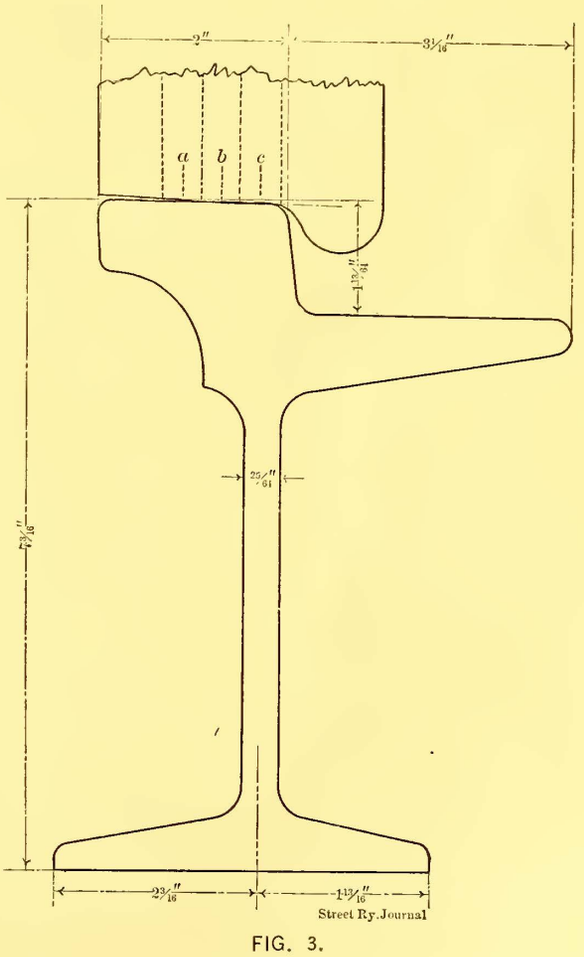


FIG. 3.

wheel make contact only at the point shown at (a). This is the state of affairs when the rail and wheel are new.

In a few months, if we again examine our wheel and rail, we will not find them the same as when we first looked at them. We now observe that the wheel is badly worn next to the flange, while the inner edge of the head of the rail has flattened to a considerable extent and worn down. Both the wheel and the rail are doing their best to come to a common bearing surface, but it is at the expense of scrap wheels, of which only half of the tread has been worn

through the chill. It is quite plain that the rate of wear must be enormous at first, for the whole weight of the car is brought to bear upon a very small surface (*a*, Fig. 2), almost a point, I might say. This rate of wear steadily decreases as the surfaces of the rails and wheels wear themselves away, until the contact between the two is a line the whole width of the rail, and not merely a point. But long before the surface of the rail has conformed to the surface of the wheel tread, where the best form is attained, the head of the rail has lost a large per cent of the metal allowed for wear, and as wheels wear faster than rails it has taken, in some cases, thousands of quickly worn out wheels to bring the rail to its final and best form.

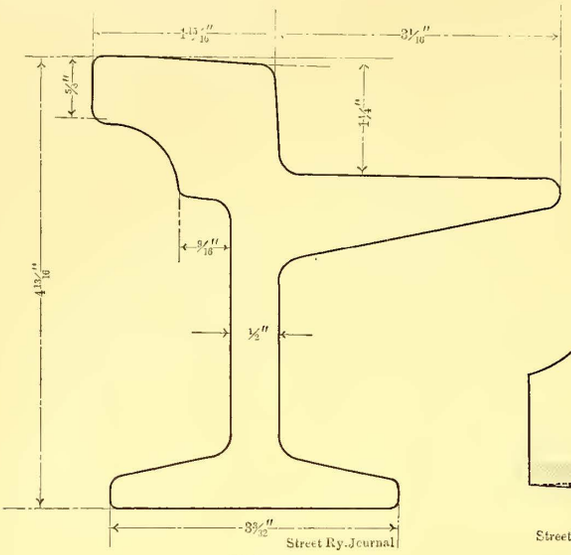


FIG. 4.

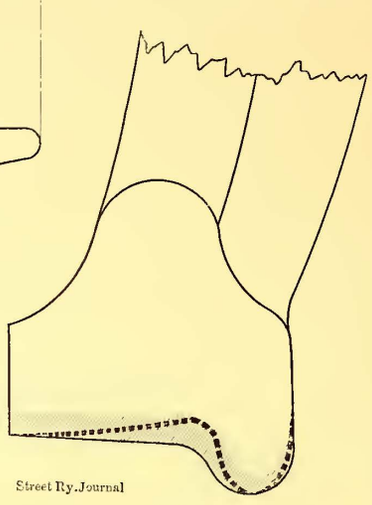


FIG. 5.

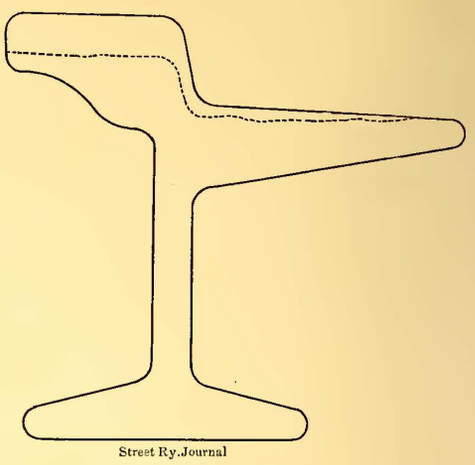


FIG. 6.

Figs. 3 and 4 show sections of the rail now in use on the State Street cable line, the height of the head being $1\frac{3}{16}$ ins. high. The first rail put in State Street, Chicago, had a head $\frac{3}{4}$ in. high; this was increased to 1 in., and later to $1\frac{3}{16}$ ins.; it is beveled to conform with the bevel of the car wheel for two-thirds of its section from the gauge line across the head.

Many will ask, no doubt, if there is not a slipping of the wheels on the rails, due to the unequal diameter of the wheel at all points. There is, imagining the wheel divided into three parts at right angles to its axis (Fig. 3), and each piece free to move by itself, and whose diameters are situated at *a*, *b* and *c*, respectively, it is quite evident that as the portion (*a*) makes one revolution it will travel over a less distance than the portion (*b*) would, and similarly the portion (*c*) will travel farther than the portion (*b*) in one revolution, but on account of it being all one the portion (*a*) travels farther than it otherwise would, thereby causing it to slip; the portion (*c*) would travel a less distance than it otherwise would, thereby causing it also to slip.

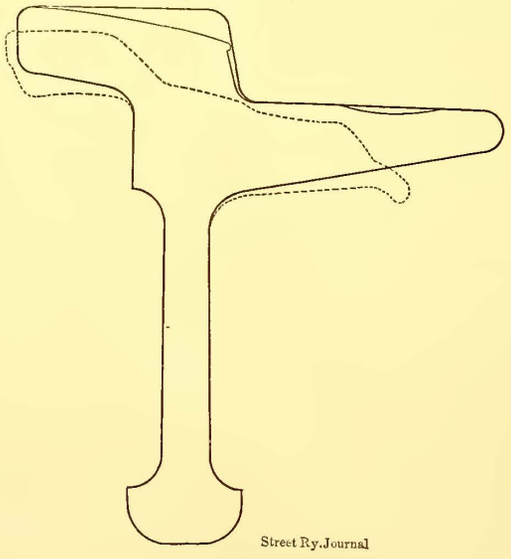


FIG. 7

The above is based on the supposition that the car would move a distance equal to the circumference of the wheel at the point (*b*) in one revolution of the wheel. But this waste of power due to slipping is very slight, for, considering the co-efficient of friction as .15, we find that for a ton mile the energy lost by this slipping is .0104 h. p.; so small, in fact, that on account of other advantages it may be ignored.

The experience of the Chicago City Railway Company, which first tried this form of head, has been that it saved wear of both rails and wheels, increasing their life by about thirty-five per cent. Why not, in building a track, put in rails which are beveled to conform to that of the car wheel at first, and not spend time and money wearing the wheel and rail down to fit each other?

Fig. 5 shows a section of a new and an old car wheel, which shows clearly the manner in which the tread of the wheel will wear if used on a rail with no bevel. The record of car miles of this wheel is not known, but no doubt a great amount of energy was lost before it had worn down to its most economical state.

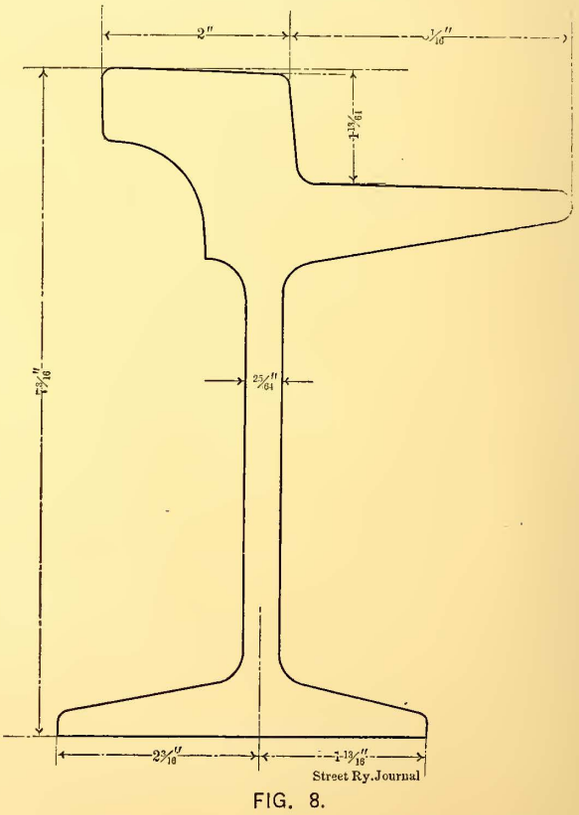


FIG. 8.

Fig. 6 shows a rail taken from State Street track after eight years' wear, during which time 8,000,000 car wheels passed over it.

Fig. 7 shows a rail when taken out after eleven years' wear. The rail should have been taken out three years previous, but owing to impossibility of getting rails at the time and the World's Fair coming at that time the track was not rebuilt. The true rate of wear cannot be found, as the flange of the wheel had begun to run on the flange of the rail long before it was taken out. The dotted

lines show an interesting state of affairs. This section shows the wear due almost entirely to wagon traffic.

Fig. 8 shows the rail used at the present time in our seven inch construction with chairs or tie plates. The rail weighs 83 lbs. and has a head $1\frac{3}{16}$ ins. high, beveled as described.

Fig. 9 shows the rail used at the present time in our nine inch electric construction without chairs or tie plates. The rail weighs 90 lbs. and also has a head $1\frac{3}{16}$ ins. high, beveled as described.

The question concerning the composition of the rails is one to be considered here also. How does the composition affect the life of the rail? The number of starts and stops made by cars on electric railways are enormous as compared with those on a steam road. The result is the wheels slide, sometimes spin, and this together with the sand and dirt on the track is a cause of great wear on both the wheels and rails. This wear, together with that due to other causes, might be greatly reduced by proper composition of metal.

I give below a table gathered from different sources showing the composition of metal advocated by experts to-day:

	A	B	C	D
Carbon	.45-.55	.55-.60	.50	.40
Manganese	.80-1.00	.80-1.00	.75-.95	.01
Phosphorus	.06 not over	.06 not over	.09	.11
Silicon	.15-.20	.15-.20	.10	
Sulphur	.07 not over	.05 not over	.07	.06

Rail.	Carbon.	Phosphorus.	Silicon.
No. 70 T	.43-.51	.085	.10
" 75 "	.45-.53	"	"
" 80 "	.48-.56	"	"
" 90 "	.55-.63	"	"
" 100 "	.62-.70	"	"

It would seem that the harder a rail becomes through its composition and the process of rolling the longer it would wear. As regards this, Mr. Moxham of the Johnson Company says: "There are two schools—first those who advocate a low hardened and ductile material as being of the greater wear. Second, those who advocate the greatest possible hardness, regardless of brittleness. For many years, without taking positive grounds, I have leaned to the former class, but the experiments so far have demonstrated to me that neither class is correct—that the correct solution lies between the two."

I come now to what has been heretofore the weakest part of track construction, namely, joints. Once weakened they rapidly grow worse, and not only are the rails worn at such joints, but the rate of wear of the car equipment is greatly increased. Were it only possible to get rails in continuous lengths just as one gets trolley wire, the railway manager would be happy, but as it is we must do our best to overcome the difficulty found in making rail joints solid and rigid to withstand the severe strains which come upon them. What we want is some method of keeping the rails from pulling apart at the joints, due to contraction and spreading outward at joints, and the shape, due to the outward pressure of the car wheels, and from bending down at the joints, due to the pounding and weight of the cars. The joint I have used for the past year is a cast welded joint. This has been found to give perfect satisfaction as a joint; it is strong and substantial, as has been proven by its holding under the extreme changes in temperature for which Chicago is noted. Seventeen thousand joints were put in in 1895, and of these only 154 joints were lost. The joint in comparative tests has been shown to be far stronger than the rail itself, and such breakages as have occurred were due to a flaw in the metal. The metal cast around the joint has eight times the cross section area that the rail has. Hence, considering steel as four times as strong as cast iron, the joint is twice as strong as the rail. It has been found in some cases where this joint was used at crossings with other tracks, the tracks were apt to be pulled out of shape through the changes of temperature. To overcome this the joint nearest the crossing should be anchored in a substantial manner. The method of making the joint is as follows: the rails at the joint are scraped and brightened, a cast iron mould is placed around the joint, making a tight fit, into this the molten iron, twenty-five per cent scrap, twenty-five per cent soft and fifty per cent hard silicon pig is poured. The metal in contact with the mould begins to cool and forms a crust, while the interior remains molten. This crust continues to cool and at the same time contracts, forcing the molten metal strongly towards the center, which makes a solid and rigid joint. The top, or bearing part of the ball of the rail is afterwards filed off perfectly level so that it is very difficult to detect a joint by riding over it or looking for it. Upon breaking a joint which has been well cast three spots will usually be found where amalgamation has taken place between the rail and cast portion, one on each side of the web and the other on the bottom. These spots are from 1½ ins. to 2 ins. in diameter. There has been some discussion as to its being a bond for carrying electric current. I cannot recommend it with certainty as there are occasional joints which I have taken off where no amalgamation has taken place whatsoever, thus destroying the effect as a bond of all joints in that line of track. To overcome this difficulty I have adopted the plan of bonding all joints. However, future experiments and care in the casting of joints may develop their efficiency as a bond.

I give below an outline of specifications for track construction, used by the Chicago City Railway Company, knowing that it will not fill all conditions, but will serve as a suggestion for all cases; Fig. 10 shows a section of same, except as regards joints.

Excavation.—Excavate to a depth of nine inches below the established grade of the street, taking out all dirt for a width of eight-

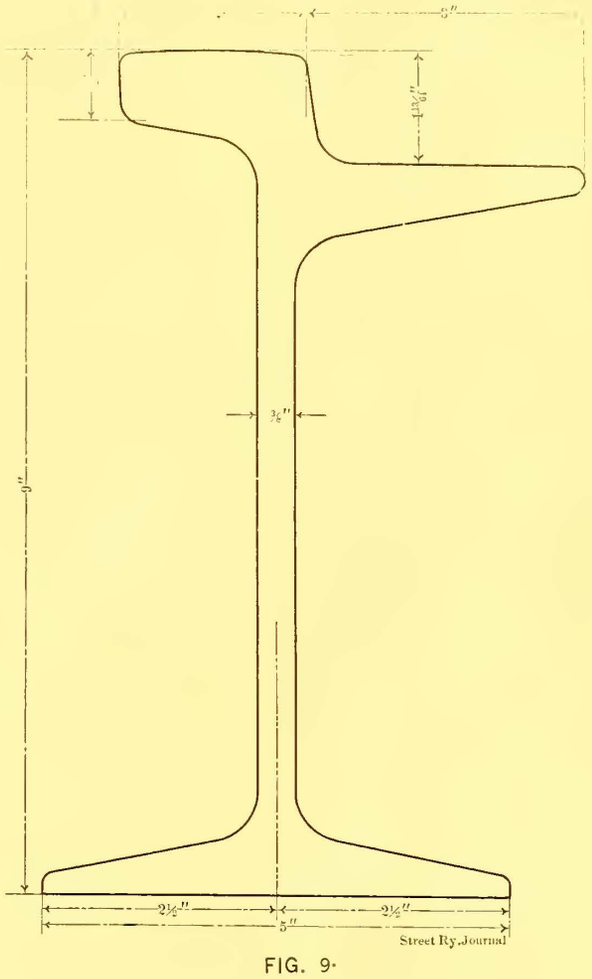


FIG. 9.

een feet; then excavate for each tie to a depth of five feet, leaving the earth between the ties in places.

Ties.—The ties, which should be of good sawed white oak 5 ins. × 8 ins. × 7 ft., free from sap, are laid in their proper places, 30 ins. centers, directly upon the ground, and thoroughly tamped with medium broken stone.

Rails.—The rails to be used are 9 in. girder rails, 5 ins. base, 60 ft. long; the head to be beveled for two-thirds its width to conform to the bevel of the car wheel (see Fig. 8). These are laid on the ties and fastened with ½ in. × ½ in. × 4½ in. H. H. spikes—eight spikes to a tie. Double nut tie rods, 1¼ ins. × ⅜ in., are to be used 6 ft. apart, the first and last to be 3 ft. from the ends of the rail; the rails on both sides to be filled with wooden or vitrified brick filling between the paving blocks and the web.

Paving.—The roadbed is now filled to within 8 ins. of the top of the rails with medium fine limestone, thoroughly tamped. Upon this place hemlock boards 1½ ins. thick, running lengthwise of the track. Upon this layer of boards a layer of clean sharp sand 1 in. deep is to be laid; upon this are to be laid the paving blocks, which should be No. 1 white cedar, 6 ins. high. After being laid the joints are to be filled with good gravel or a limestone screening,

tamped in place, the top of paving blocks to be even with top of rail both inside and outside.

Gauge.— The gauge must be 4 ft. 8½ ins., or ¼ in. wider than the gauge kept in the shop for gauging car wheels. This is important and should be closely watched.

Level.—There must be not over ⅛ in. difference in the height of two opposite rails. Any amount above this will be considered sufficient cause for rejecting such part of track and rebuilding or resurfacing the same. The foundation should be as solid as possible to make it. The ties should be of such material that their life will be about equal to that of the rail, if anything a trifle more. The expense of taking up and replacing pavement and repairing defective ties is very great. The wood most generally used, and the one which gives the best satisfaction is good sound white oak free from sap. Its life is about eight to ten years under ordinary circumstances. The nature of the soil has considerable to do with the life of the tie. It is not good judgment to get the tie which will last the longest, thereby possibly paying a much higher price, for after the rails are worn out the tie will still be in a fairly sound condition and the new rails may be laid on these old ties, which are fit to last only a portion of the length of time the rails will.

Brace chairs in place of tie rods cannot be recommended for use with high rails, as they are very apt to bend over in time, but with shorter rails this will not happen.

The paving of a street upon the right-of-way is generally regulated by municipal authorities. Wooden blocks are extensively used in the smaller cities, but in the larger ones they soon wear unevenly and require replacing. Granite block paving is by far the most durable, lasting under ordinary wear in cities thirty years, and should be used where the street traffic is at all heavy. The blocks should be hard, but not liable to become slippery by use, the average size being 4 ins. × 8 ins. × 12 ins. I advocate small blocks, even as low as 3 ins. × 6 ins. × 10 ins.

The cost of one mile of double track with paving for eighteen feet in width of right-of-way, as above specified, based on Chicago prices, would be as follows:

283 L. tons, 9 in., 90 lbs., at $33	$9339
4224 white oak ties, 5 ins. × 8 ins. × 7 ft., at 38 cts	1605
352 cast welded joints at $3.50	1232
1760 tie rods at 15 cts	264
33,792 spikes, ½ in. × ½ in. × 4½ ins., at 1 ct	338
42,240 ft. of wood filler at ½ ct	2112
Labor at $1 per 1 ft. of D. B. T	5280
10,560 sq. yds. cedar block 30 cts.	3168
146 sq. yds. sand at $1.25	183
445 cu. yds. crushed stone at $1.50	668
10,560 sq. yds. gravel and dressing at 8 cts	845
15,560 sq. yds. Hemlock boards, 2 ins. thick, at 8 cts. sq. yd.	845
	$25,879

If granite had been used instead of wood block, the cost would have been $12,708.

Upon organization depends the successful maintenance of the track, and one which I find gives the greatest efficiency is that the system is divided up into sections consisting of twelve miles of double track each. Each section is put in charge of a working foreman who is to keep and maintain and repair as cheap as possible, and who is held directly responsible for the condition of the track at all times. He has under him as many laborers as are required to keep his division in repair. This foreman is held completely responsible for all tools, and is required to maintain at some convenient point on his section a small place for keeping his tools. All tools which need repairing are sent to the main storeroom where they are exchanged for others in good condition. All new tools and material required are obtained from the main storeroom. The method employed previous to the above was to send out a gang of men here and there at different points of the system; thus one portion of the system might be sadly in need of repairs long before the gang sent out reached that portion.

The question as to the right time to reconstruct a track is one of the greatest importance, as it often involves the expenditure of thousands of dollars. The question to be solved is, Am I losing money by not rebuilding my tracks? Should I have rebuilt them two or three years ago, or should I have waited a year or two longer? No doubt many of you have been confronted with just such a question as this and worried over it for days and nights, knowing that the decision meant the expenditure of many dollars for better or worse.

The task of solving this question was brought before me not long ago concerning the State Street cable track, which had reached a deplorable condition. Taking the trackmaster with me, we rode over the line and, as street railway men often do, guessed that it was time to rebuild the track. This involved a very large expenditure, and it would be an expensive guess unless correct, so to ease my conscience and make sure of my guess I had run over the line a car weighing 8665 lbs., attached behind a grip car by means of a recording spring balance called a dynamometer. This test car was then run over a track newly made at the same speed as over the old line; the dynamometer showed that it took 13.75 lbs. more pull per ton to haul cars over the old line than over the new. The average speed of cars on this street is twelve miles per hour. The excess horse power required to haul one ton was .44, and the excess cost of hauling one ton one hour was $.0088. The number of tons hauled one mile per year on this track was 45,147,537, and the time required to haul one ton one mile was five minutes, and 45,147,537 tons hauled at a given speed for five minutes is equal in work done to 3,762,295 tons hauled at the same speed for one hour. 3,762,295 × $.0088 = $33,108, which is the excess cost per year for hauling cars on account of bad track. It is estimated that the new track with cast joints will last twelve years, and as there will be no low joints the drawbar pull will not increase much until the rail is worn down sufficiently to allow the wheel to run on the flange, so the annual saving will be nearly $33,108, during the life of the rail, and the total saving will be $397,276, which in twelve years will pay principal and interest on $293,444, which is the amount we could profitably expend in repairs. The actual cost of rebuilding this track was $61,670.

This caused me to think up some scheme by means of which dynamometer or power ratings could be taken and automatically traced on paper, showing the condition of the track at all points, showing faults of gauge, level, or joints; showing faults and excess power in consequence of faults, side by side, thus placing a value on faults, and then instead of representing faults and excess power in inches or foot pounds, make the instrument show them in dollars and cents per ton of load when capitalized, which would show, multiplied by the ton miles on any road tested the amount that could,

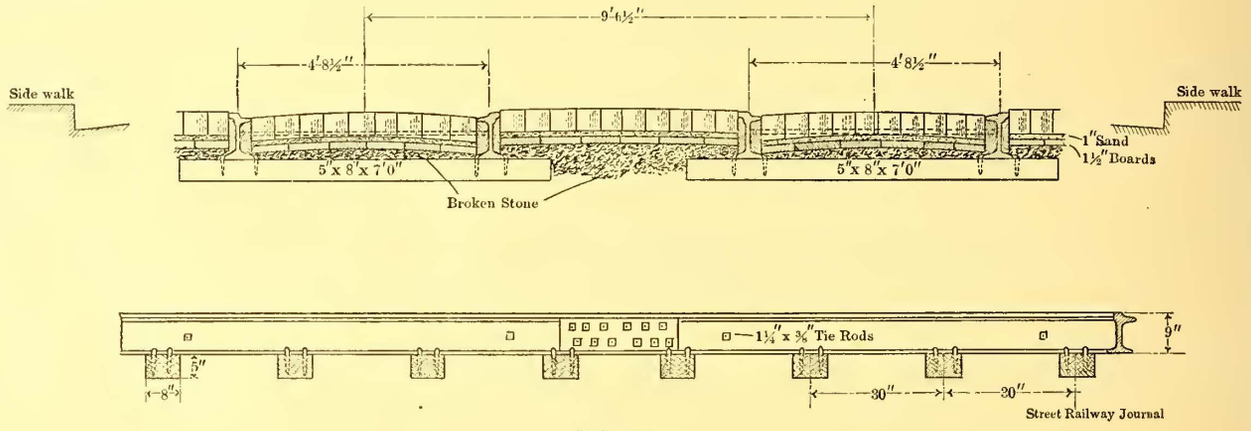


FIG. 10.

with good management, be expended on track reconstruction, or rebuilding. The apparatus devised for this purpose is what we call an indicator car. A description of the construction and method of working might be of interest to not a few, for I do not know of another in use by a street railway company, and found only one other, although very dissimilar, in existence on a steam road after I had the plans of mine finished.

The results shown by it are high and low rails, low joints, gauge, drawbar pull and the variation of the track level. Each one of these results is automatically platted on paper eighteen inches wide. The car consists of a platform 8 ft. × 10 ft., mounted on a single truck, no springs being used. Midway between the two end axles is one which is fitted with wheels which record defects of joints or gauge. After use and calibration of instrument it will be more valuable and the dynamometer will not be required, as any man using this car constantly will become so accustomed to the value of defects that a glance at the profile will tell him the money he may, with judgment, spend for rebuilding a track or repairing it.

The dynamometer consists of two drawbars, one at each end of the car, and extending beneath the platform to within a distance of about one foot of each other. Between the two adjacent ends of the drawbars a spring is placed, and the amount of pull required to draw the car along the track in either direction is recorded by a recording arm, which is connected to the spring with a wire. The apparatus for showing the variation in the level of the tracks is mounted on the platform and consists of two cups of mercury (having a connection between them by means of a pipe) and into which dip two plungers connected to a recording arm. The paper on which

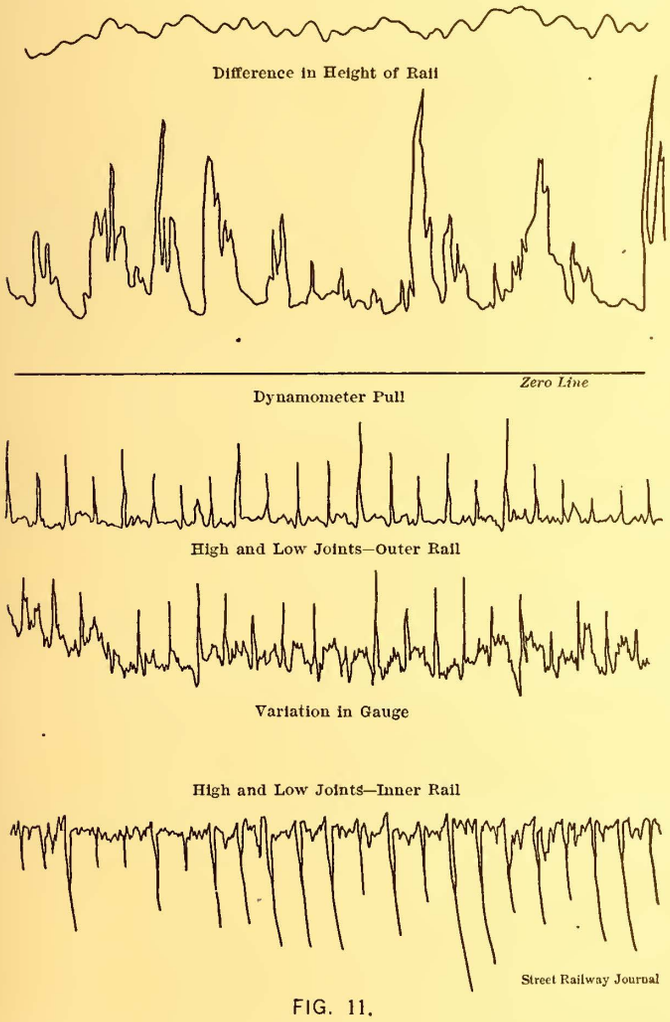


FIG. 11.

the record is taken unwinds at a uniform speed of 1 ft. per 1000 ft. of track. The car weighs 3865 lbs. The car is fastened to an ordinary car, which is drawn over the tracks by horses (or any motor car) made to go at as even a speed as possible. The results shown by a recent test trip are very interesting to compare.

Fig. 11 is from an old track; the joints are uncast, spread far apart, and the rails are low at each joint; this is distinctly brought out by the record. The gauge is also uneven. It would appear from the record that the rails spread at each joint. The dynamometer pull is very unsteady, showing the effect of low joints and uneven gauge.

Fig 12 is a record from a new track; here we can observe hardly any joints or variation on gauge, and the dynamometer pull is more steady. Occasionally high points are observed, but they are due more to unsteadiness of speed. A person riding on this track will not be able to detect any joints. This track has the cast welded joint. We find from the data obtained by use of this car that we

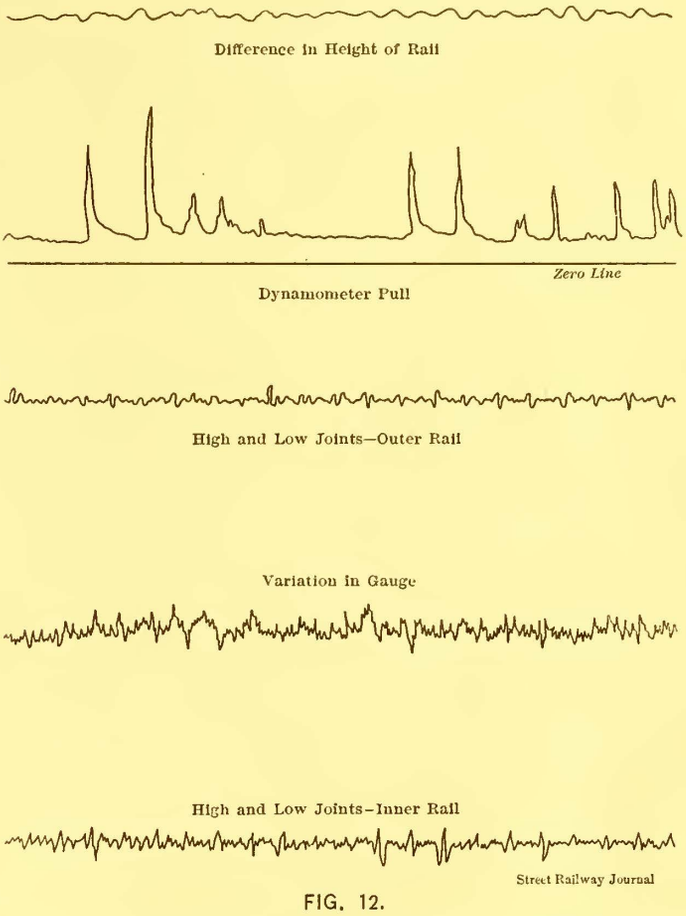


FIG. 12.

could afford to expend $7383 per mile to repair the old track. The estimated cost of repairing this track, leveling and casting new joints, is $1740 per mile.

The track maintenance during the year 1895 for 184 miles of track cost $158,217 and represented 17.75 per cent of the total operating expenses. This excessive cost is largely due to a partial or complete rebuilding of many miles of track.

In conclusion I wish to acknowledge receipt of facts and data bearing upon the subject of this paper from Mr. Moxham, Mr. Augustine W. Wright and Mr. Mead; also to thank Mr. W. G. Price for valuable aid rendered me in designing and perfecting the details of the indicator car, which can be inspected in the exhibition room during this convention.

The Modern Power House.

By RICHARD MCCULLOCH.

In beginning a paper of this kind, it is usually considered proper to start with a sort of historical review, but in this case we are immediately struck with the fact that, unlike most modern institutions, the eventful history of the street railway power house has been condensed into the last few years. The conditions, the general design and the greater part of the machinery itself, have been evolved during the last ten years. All of these have changed rapidly and the manager who now deplores as antiquated a power house built six years ago, with the best existing machinery and in the light of the most approved practice, can say with Cicero, that it was not his fault, but the fault of the times.

It may be readily seen that there are two standpoints from which the design of the power house may be viewed. That of the one who strives that the general plan, that each machine and that every arrangement shall tend solely towards the cheapest possible

production of power; and that of the other who while appreciating the position of the former, desires also that nothing shall enter into the design which will materially affect either the simplicity or the reliability of the plant. The cost of power on a large road is about ten per cent of the total operating expenses and it is almost a self-evident fact that the use of any apparatus which might produce unreliable service and thus impair the receipts and ruin the prestige of the road in order to save a small percentage of this cost of power would be very bad business policy. The first criterion of any machine installed in a power house should be absolute reliability, and the second, economy.

LOCATION.

A great deal has lately been written concerning the proper location of power houses, and formulæ and graphical methods for determining this point have been devised, but we doubt very much whether any street railway power house has ever been located either by graphics or by the differential calculus. Unfortunately it usually happens, especially in cities, that the electrical center of the distribution system falls in very valuable ground entirely unsuited for a power house location and the final location is very often influenced by the extremely unscientific fact that the railroad company owns that particular piece of ground and cannot find a purchaser for it. In selecting a location, it is very important that a large power house should be placed on a railroad track so that coal may be readily and cheaply delivered, and it is very desirable that the location should be on some water supply in order that condensing engines may be used, unless the conditions will warrant the use of self-cooling condensers. If a location fulfilling these conditions can be found somewhere near the electrical center of distribution it is an ideal spot for a power house, but if in order to secure coal and water it must be moved from this point it should if possible be moved in the direction of future extensions of the street railroads. There are cases where power houses cannot be located on the steam railroad tracks, but the only excuse for such a location is where the interest on the cost of copper feeders running from the steam railroad tracks to the center of distribution would greatly exceed the cost of hauling of coal in wagons.

BUILDING.

The main points which should be borne in mind in the design of the building are that it should be light, airy, compact and fireproof. The shape and size of the building will be largely governed by local conditions, but there is one general arrangement which has been adopted in a number of the most recent power houses. This will be discussed later. There is no reason why anything combustible should enter into the construction of a power house. The walls may be of brick, the roof of slate, tile or iron, and the floors of concrete or iron. This method of construction not only increases security against fire, but it obviates the necessity of carrying insurance, the saving of which will in a few years pay the extra first cost. The building should be substantially constructed, but unless the location is on an important street there is no necessity of going to great expense to render the building ornamental, especially as all money which can be spared for this purpose may be far better invested in machinery to put inside the building. In erecting a building for use as a power house it is advisable to decide first on the style, size and arrangement of the machinery, so that no part of the building will interfere with the proper repairs, renewals and inspection of the apparatus. This may seem unnecessary advice, but it is a very common oversight for railroad companies first to decide on the style of building they wish, then let the contract for the erection of the power building, and then find themselves hampered in the use of some particularly desirable form of apparatus by the shape or contracted area of their buildings.

As by far the greater number of the modern railway power stations are operated by steam power, steam alone will be considered in this article. For convenience in discussion the apparatus in a power station may be divided in three classes. (1) The steam generating part consisting of the boilers, pipes and all their accessories, such as coal and ash conveyors, mechanical stokers, stacks, economizers, feedwater heaters, pumps, etc. (2) The steam consuming part consisting of the engines, steam separators, oiling devices, condensers, etc. (3) The electric part consisting of the dynamo, cables, switchboard, electrical instruments, etc. The division between the first and second parts is more easy and more marked, as it is usually accentuated in the power house itself by means of a brick wall.

STEAM GENERATING APPARATUS.

Beginning with what we have called the first part, we start with the choice of fuel. This is largely a matter of location. In a general way the proper fuel to use is that which will evaporate the greatest quantity of water per dollar's worth of fuel. It does not pay to burn too poor a quality of fuel, however, because slack containing a great quantity of ash and sulphur will cake and clinker on the grate bars, make a great deal of work for the firemen, refuse to be forced when necessary and make much ash to be removed. On the other hand it will not do to make all arrangements for using a very expensive fuel, as a very little wasted in times when the furnaces must be rushed will make a great difference in the cost of operation. As an expensive fuel usually means one which is brought from a great distance, any furnace prepared for burning this would operate under unfavorable conditions if the supply is cut short by strikes or railroad blockades. Where the conditions are favorable for the use of oil, it makes an ideal fuel, requiring no handling, making no smoke or ashes, and allowing the fire to be regulated with the utmost nicety. Buckwheat anthracite coal is used largely by power houses in the Eastern cities. It is of high calorific value, clean, making no smoke and little ash, and capable of being readily handled in coal conveyors and mechanical stokers. In the Western cities soft, bituminous coal is used by force of necessity. This brings with it the troubles of ash, clinker and dirt, and in the city renders necessary some form of smoke consumer. As has been stated, it usually happens that the choice of fuel is a matter of location, but in cities where several competing grades of coal come to market, it would probably pay to have expert tests made to determine what grade of coal or what mixture is most economical for the work.

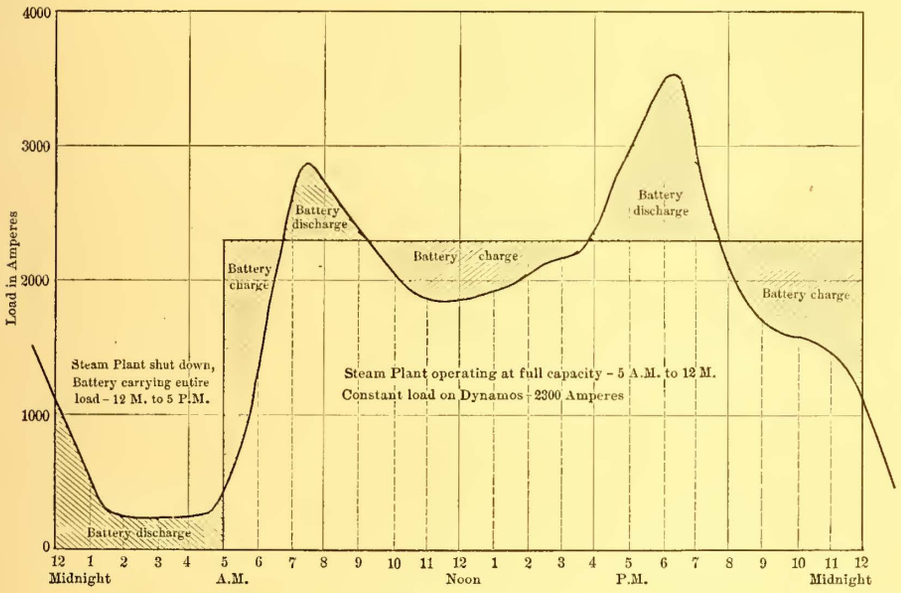
It is hardly within the limited scope of this article to discuss the numerous forms of coal and ash conveyors which have been put in use. Several large companies make a specialty of this form of machinery and special designs are developed for each power house. We may say in a general way, that in power houses handling large quantities of coal, where the coal is all delivered at the same place, as by rail or boat, the installation of coal and ash handling machinery will pay. Where coal is delivered in small quantities and where it is delivered in wagons and may be dumped at any part of the boiler room, the reverse may be said. The advantage of this form of apparatus is its saving in labor, and its disadvantages are its great first cost, its expensive maintenance and the fact that it is desirable for the best service that the coal should be fairly uniform in size, which is a requirement not always easily fulfilled.

In the East the use of mechanical stokers has grown to such an extent that no large power house is considered complete without them. In most of the Western cities, however, and especially here in St. Louis, the mechanical stoker has not been a success. This difference in results may be attributed to the difference in the fuels used. The buckwheat coal of Brooklyn and Philadelphia feeds evenly on the stoker and causes no trouble by cementing the grate bars together by clinkers. With the soft, fragile, bituminous coal, however, clinkers soon form on the grate bars, and very often the fire must be almost completely destroyed to remove them. No mechanical stoker will bear crowding to any great extent and any power house using them must be supplied with a greater capacity of boilers than one where hand firing is the practice. By reason of the fact that the coal is introduced gradually into the hotter part of the fire and the volatile matter slowly driven off, the mechanical stoker is a partial smoke consumer. With the exception of this, there is no advantage in the use of mechanical stokers, except the labor saved, as the great efficiency which was formerly claimed for them has never been proved in actual practice.

Notwithstanding the great number of types of boilers on the market, they may be divided into two general classes—fire tube and water tube. In most of the more recent power houses, some form of water tube boiler has been adopted, as this type possesses some marked advantages over the fire tube. They are non-explosive, they can be operated at a higher pressure and consequently are more suitable for use with compound engines, they have a large heating surface and are quick to respond to calls for power, they occupy less floor space and are usually more intelligently designed than the other class. On the other hand, their first cost is greater, there is a greater number of joints to be looked after and the cleaning is more difficult, especially in those forms which use a curved tube. It has usually been considered that the efficiency of water tube

boilers was much higher than the fire tube, but there is now a form of fire tube boiler being made consisting of a shell of large diameter and extra length, containing a large number of flues, which approaches the water tube very closely in efficiency. The high efficiencies obtained in boiler tests are seldom reached in actual practice as they usually result not so much from excellence of design in the boiler itself as from careful and intelligent firing during the test.

It is hardly necessary in presenting a paper before this intelligent body to discuss the reasons why water should be fed into the boilers as hot as possible. Besides preventing the straining of the boiler shell from the sudden changes in temperature, there is a large quantity of fuel saved, and the percentage of this saving will be found tabulated in nearly every work on thermodynamics. The usual methods employed in heating the feedwater are, first by the heat of the exhaust steam, and second by the heat of the escaping flue gases. There are numerous patented devices for utilizing the heat of exhaust steam, either by passing the exhaust through a number of pipes surrounded by the feedwater, or by spraying the feedwater across an opening through which the exhaust steam is admitted. Most of these devices are very simple in their construction and their efficiency depends very largely on the length of time the feedwater and the exhaust steam are in contact, and in case they are in separate chambers upon the conductivity of the separating medium. Care should be taken that the opening for the exhaust steam is never contracted, so that any possible back pressure on the engine is avoided.



STORAGE BATTERY OPERATING IN PARALLEL WITH STREET RAILWAY PLANT.

Battery capacity—700 H.P. at two hour discharge rate.

Street Railway Journal

FIG 1.—LOAD CURVE.

The method of heating feedwater by the heat of the escaping flue gases has been applied in apparatus under the general name of economizers. The arrangement usually employed is a coil of pipe containing the feedwater placed in the flue. In order to keep the soot from settling on the pipes, most forms of economizers are supplied with a mechanism for scraping off the pipes whenever necessary. Sometimes the economizer consists of one large bank of pipes placed in the main flue, and sometimes the apparatus is divided into a number of banks placed in a flue leading to one furnace. The choice of arrangements depends largely upon the size of the plant and the general location of the boilers. By means of a properly designed economizer, feedwater may be heated to a very high temperature, even above the atmospheric boiling point of water. In the use of any device in which feedwater is heated by the flue gases, care should be taken that the escaping gases will still retain sufficient heat for the maintenance of the necessary draft after part of their heat is taken from them by the feedwater. In the case of power houses using natural draft, economizers should not be used, where the draft is not already sufficiently strong, or is just barely strong enough for the work to be done. There are in operation, however, many plants using natural draft, discharging flue gases at a very high temperature, much higher than is necessary to maintain the required draft. Economizers used in such cases would result in a marked gain in economy.

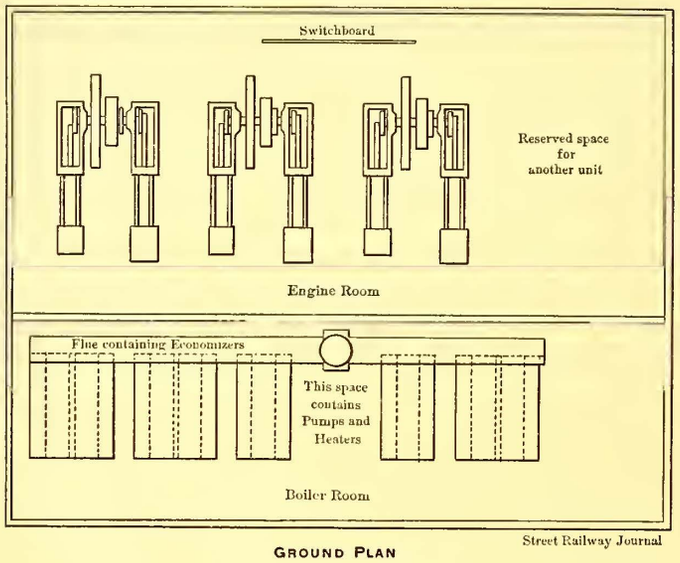
Whatever system of heating feedwater is used, the apparatus should be made abundantly large for the work to be done; first, that the water should pass through slowly and receive the full benefit of its contact with the heated gas or steam; second, that a large store of water may be kept on hand which is of great service in case of a sudden demand on the boilers; and third, that the feedwater heating apparatus may act as a water purifier. It has been found that water kept for some time at a high temperature will deposit a great portion of the carbonates and sulphates of lime and magnesia which it has in solution. This is probably due to the expulsion by the heat of the carbonic acid gas contained in the water, thus freeing from solution the lime and magnesia which it is well known are slightly soluble in water containing carbonic acid gas.

With condensing plants the waste from the condensers is never at a greater temperature than 100 degs. F. and if hot feedwater is desired the use of an economizer becomes almost a matter of necessity, as the water from the pumps and the other non-condensing machinery would not have sufficient effect in heating the feedwater of a large plant.

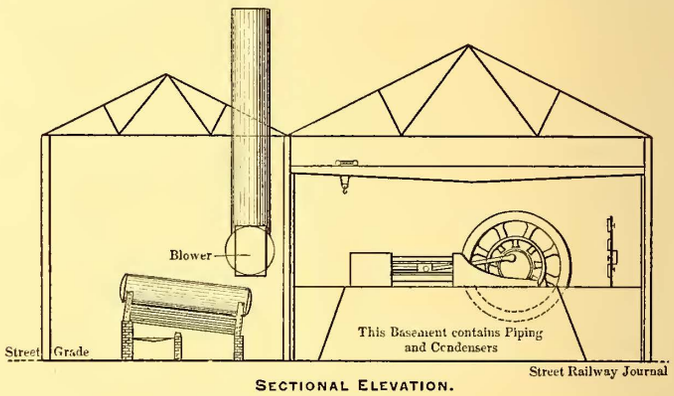
Several of the large power houses built during the last few years have abandoned the use of stacks for producing draught, and are operating by means of an induced draft produced by fans placed in the flue or short stack. In this case the stack is just high enough to clear the roof. This system has many advantages. First, there are no stacks to blow down or fall down, and this point is of special importance in a region subject to tornadoes. The second and most important advantage, however, is the absolute control which it affords in governing the fires, and this point will appeal especially to those power houses subject to sudden and rapidly changing loads. As an illustration of this may be cited the power house recently erected to operate the Belt Line tunnel road, in Baltimore, Md. A great part of the time there is no load on the power house as it is only operated when there is a freight train to be hauled through the tunnel. The manner in which the load is handled is as follows: the boiler room is supplied with blowers in place of stacks, and a slow fire is kept constantly under each boiler. When a telegram is received that a freight train is approaching, the blower is started and on the arrival of the train steam has been raised in sufficient quantity to supply the great demand put upon the boilers. This illustrates the extreme flexibility of the system and it would be difficult to handle this load in any other manner. Economizers are operated with great efficiency in connection with an induced draft as this system permits the flue gases to be robbed almost entirely of their heat, since it is not necessary to have a large quantity of heat in the flues gases in order to create a proper draft.

Passing from the steam generating system to the engines, we find as a connecting link, the system of piping. In regard to the general plan of the piping, opinion is very much divided. Some favor a single header with leaders to the engines. Others claim that a complete duplicate system is necessary, so that a failure in any part of the system need not cause a serious stoppage. The objection to a duplicate system is the greatly increased cost. In the installation of a duplicate system, it is only human that the material and workmanship employed will be cheaper than if a single system were employed, because it is reasoned that if one side breaks down, there is always the other to be depended upon. The other side, however, is often never used until a case of necessity arises, and on account of this very lack of use, the valves and joints are apt to be found leaky and in bad condition when suddenly put in operation. A compromise system has been used in some cases in which all pipes are duplicated, each side, however, having one-half the capacity required, necessitating the use of both sides at all times. In case of accident to one side, the other half of the system may be used, at a disadvantage, of course, by increasing the steam pressure. The best plan, however, seems to be to use a single header divided at convenient intervals by valves according to the size of the plant

and the number of units employed, and in laying out the system to use only the best valves, material and workmanship. The power houses having the least amount of trouble with their piping are those having a simple system, probably because it is natural to erect better, and take better care of something which is in constant use, than something which may easily be dispensed with. All steam and hot water pipes should be covered so as to prevent as much as possible loss of heat by radiation and consequent condensation of the steam. And in this connection it should be noted that there is a great difference in efficiency in the different kinds of pipe covering. Tests have shown that the Magnesia plastic and sectional coverings and the Asbestos fire felt covering give the best results.* A water separator should be placed in the leader to each engine. It should be large in size and placed as close as possible to the engine. A number of patented separators are on the market, but very good results may be obtained by the use of a simple, large tank with the steam entering at the side and leaving at the top and supplied at the bottom with a connection to a steam trap to catch any water collecting in the separator.



GROUND PLAN



SECTIONAL ELEVATION.

FIG. 2.—GROUND PLAN AND SECTIONAL ELEVATION OF A MODERN POWER HOUSE.

working parts of the engine and generator close together, it reduces danger, it is almost noiseless in operation, and it may be installed in a larger unit than the belt driven generator, which is limited in size by the width of the belt and pulley which may be employed. The main objection which was urged against the direct connected generator was the fact that the shocks resulting from overloads were thrown directly on the engine, and that there was none of the cushioning effect that a belt connection might supply. While this is undoubtedly true, the best argument which may be submitted against it is that none of the installations of direct driven generators can trace any trouble to this source. The large, slow speed, multipolar, direct driven generator has become, perhaps, the most prominent feature of the modern power house, and while there may be special services which would necessitate a belted arrangement, it is difficult to imagine a power house thoroughly up to date without direct driven generators.

By varying the number of poles and the number of armature conductors in the construction of a dynamo, the machine may be designed to run at almost any reasonable speed, the slower the speed, however, the greater being the cost of the dynamo. In the matter of speed it is necessary for the dynamo maker and the engine builder to effect some sort of a compromise because it is not good practice to run such large engines at too high a speed. The speeds which are most common are 75 r. p. m. for the 1500 k. w. dynamo, 80 to 120 r. p. m. for the 800 k. w. dynamo and speeds running from this to 150 r. p. m. for the smaller sizes. These speeds are what would have been considered, four years ago, quite out of the range of the Corliss valve gear, but the makers of this type of engine have risen to the occasion and now there are numbers of large Corliss engines driving generators at speeds up to 100 r. p. m. and some have even higher speeds than this. Several other types of engines have been adapted to this work and are running quite successfully. Outside of the question of valve gear, most engines made for this work possess the same characteristics; the heavy bedplate, the solidly constructed flywheel, now being made of steel plate, the wide cross head, the large connecting rod and the mammoth main bearings.

The choice between horizontal and upright engines is chiefly one of space. The horizontal engine is the cheaper, the simpler, the easier to inspect and the easier to repair. Outside of the advantage of requiring less space, the upright engine has the advantage of less wear on the cylinder, and a more direct strain upon the foundations.

The usual practice in the most modern power houses is to install compound engines. Most of these plants are so favorably situated that condensers may be operated in connection with the engines. This is undoubtedly good practice, but in case condensers are not used the cost of fuel must be very high for the gain in compounding to pay for the extra investment. Where power houses are favorably situated on bodies of water, condensing becomes a very simple problem, but in case the power house cannot be built on a body of water, as in this city, for instance, in order to use condensing engines, some sort of arrangement must be designed to cool a quantity of water so that it may be used over and over again for the purpose of condensing the exhaust steam. Devices of this kind have long been in use in the city of San Francisco and in Cuba, and lately several of the large manufacturing companies have put on the market complete apparatus for the purpose of cooling water after it has condensed the exhaust steam so that it may be used again for the same purpose. Besides the gain in power by using condensing en-

STEAM CONSUMING APPARATUS.

The question of the selection of the proper engine to operate the plant is so dependent upon what dynamo is to be used that it will be best to abandon our arbitrary classification temporarily and take up first the question of the dynamo. During the past four years the street railway generator has undergone a radical change. In the spring of 1893, there were installed in this city, in the power house of the Cass Avenue & Fair Grounds Railway Company, then being built, the first large direct driven generators of this type, which has since become so common. Soon after this the Intramural power house at the World's Fair was put in operation, containing one generator of the same size as those in St. Louis and another of twice the capacity. Since that time there have been few large power houses built in which direct driven generators have not been installed, and some of the large railway systems have found that economy of operation required a change from the belt, countershaft and unit of small size to the large direct driven generator. At the present time, the West End Railway Company, of Boston, which may be considered the pioneer in this country in electric traction, is changing its central power station, which had originally been equipped with a very complete and elaborate system of belting and countershafting, to a direct coupled plan.

The first cost of the direct coupled generator is about thirty-five per cent more than the belted generator in the 500 k. w. size, which is the largest standard size in which the belted generator is made, but when the expense of the belt, belt tightening device and the floor space is taken into account, the direct connected generator will be found the cheaper. Besides obviating the necessity of the costly and cumbersome belt, the direct connected generator offers the following advantages: in large sizes and in connection with large engines it has a much higher efficiency than the belted unit, it requires a small floor space, it aids supervision by bringing the

*Journal of the Association of Engineering Societies, January, 1895.

gines, it is claimed that by the use of this apparatus, actually less water is used than if the steam is exhausted directly into the atmosphere without condensing.

In the use of large direct connected units a great deal of the economy to be gained depends upon the selecting of the proper sizes of units. The efficiency of a generator will be good when it is operated at more than seventy-five per cent of its capacity, but the efficiency of an engine drops off very rapidly when it is running below its rated load. In order to achieve the best economy from the use of large direct connected units, the sizes of the different generators should be so proportioned that it is always possible to operate one or more units at their rated capacity. The railway generator as at present built will stand an overload of fifty per cent for several hours without trouble and at a maximum efficiency. This should be taken into account in the estimate of the dynamos required, but it should always be the aim to have at least one idle machine to throw on the line in case of failure of any of the others. The actual size of the units depends upon the character of travel which the road possesses and the number of cars, and this must be determined for each road independently. In choosing machines, however, standard sizes should always be adopted as this obviates any trouble in obtaining supplies and repair parts.

The railway generator switchboard has become standardized to the extent that it consists of a panel for each generator, each panel containing the usual automatic circuit breaker, ammeter, field rheostat, field switch and main switch. It is hardly necessary to mention that there should be nothing combustible about the board, and it is not an absolute necessity for the board to contain a marble tablet inscribed with the illustrious names of the president, vice-president and secretary. It would confer equal fame and perhaps be more economical of valuable space for their names to be handed down to posterity in some manner less electric. Switchboards as now erected usually contain a recording wattmeter and an ammeter which shows the total output of the power house. The recording wattmeter especially is a valuable instrument, as by means of its readings exact records of the power house may be kept.

The modern method of line construction is to divide the trolley into sections and connect each section separately to the main bus bars through feeder panels, each of which contains an automatic circuit breaker, an ammeter and a switch. This method confers the advantages that trouble on the line is always indicated on the proper section, and that in case of short circuits on the line, the main circuit breakers are protected by the section circuit breakers and the load is not suddenly thrown off the engines by the opening of the main circuit breakers. Most of the generator and feeder boards are supplied with devices for preventing damage to the station machinery by lightning, but a very simple and effective arrangement is to connect a large water rheostat between the positive bus bar and a good ground. This is either left in circuit continuously with a small current running through it, or is cut into circuit on the approach of a storm.

Besides those machines which are absolute necessities in a power house, there are various devices which may be added to secure convenience and regulation. An overhead crane is installed in the engine room of most of the large modern power houses and adds greatly to the speed with which heavy repairs may be executed. An oiling system of some sort by which the oil is either pumped or flows by gravity to the different bearings obviates the necessity of manual labor in oiling and insures a steady feed at each bearing. A recording steam gauge is found very useful in checking up the firemen. An air pressure system is beginning to be used in many of the power houses by means of which the carbon dust may be blown out of the armature windings. With this apparatus an armature may be kept thoroughly clean, and the danger lessened of short circuits occurring on account of the collection of carbon dust between its conductors.

If readings be taken of the total output of the power house at stated intervals and then plotted, a load curve will be obtained similar to that shown in Fig. 1. A study of this will show a very small load through the night from 1:30 A. M. to 5:30 A. M., a sudden rise at this point to a maximum about 7:00 A. M., a lower load through the middle of the day, followed by another peak between 6:00 P. M. and 7:00 P. M., after which the load again suddenly drops. In order to accommodate the machinery to the varying load, the number of dynamos in circuit must constantly be changed, and even then it is almost impossible to suit the power at all times to the load, the dynamos running much of the time either overloaded or underloaded, which, of course, means a sacrifice of economy. In addition to the variation of load shown by the curve, there is a momentary fluctuation, due to the starting and stopping of cars, the violence of which decreases with the number of cars in service. It is proposed to remedy this variation and operate the dynamos under a steady load by means of a storage battery plant connected in parallel with the line, charged from the dynamos during the period of light load, and discharged into the line on the heavy call for power. The operation of the plant under these conditions is indicated in Fig. 1. Installations of this sort have been placed in several of the large electric light plants where they are operating with marked success, and there is no reason why they should not meet with the same degree of success in electric railway plants. By means of this auxiliary plant, the proper number of dynamos are run throughout the entire day at their full capacity and hence at their highest efficiency, the battery taking care of all eccentricities in the load, charging when the load is less than the capacity of the dynamos, and discharging when the load exceeds this. The steam plant may be shut down entirely during part of the night, leaving the battery to operate the road, and in case of a breakdown, the battery may be used to take care of the entire load for a short time. The battery is discharged through a booster dynamo, which is so designed that the compounding of the dynamos and the battery are the same. This arrangement is entirely automatic, so that no hand regulation is required. The efficiency of a battery operating under conditions of this kind will be guaranteed by the manufacturers to be greater than seventy-five per cent and a maintenance of sixty per cent on the first cost of the battery will be guaranteed. The great drawback to this system of operation is the large first cost of the battery which is about $100 per horse power capacity figured on a two-hour discharge rate. A storage battery plant may also be used to increase the capacity of an existing power house and thus save the necessity of adding more machinery. There is another use to which a storage battery plant may be put which will, perhaps, appeal more strongly to the street railroad man. This is to install it as a substation to maintain the voltage at the end of long feeders, which are subject to fluctuating loads. In this case the batteries are charged from the distant power house and discharged into the trolley wire. The feeders from the power house to the storage batteries are figured only for the average load instead of the maximum load as would be necessary in case the line is fed directly from the power house. The economy in this installation depends very largely upon the difference in cost between the feeders in the two cases. Besides the question of economy, however, the substation will give the better service as the voltage will not fall and rise with the fluctuations of the load.

A number of power houses operating long lines are now equipped either with boosters or high voltage dynamos. Long lines usually have a booster constantly in circuit. This machine is automatic in its action and raises the voltage with every increase in the load. Some power houses operate a high voltage dynamo for use on sections which are subject to excessive loads The feeder boards in this case are equipped with an extra bus bar, so that any section may be thrown on the high voltage machine.

While each individual engineer has his own ideas concerning power house construction, and while each road building a power house may purchase different apparatus, there is one general design which has been followed in many of the plants usually installed. It has been adopted by so many different engineers and in so many different places that it might almost be called the Modern Power House. The general features of this design are shown in Fig. 2. The engine room and boiler room are divided by a brick wall and under different roofs; both are brick buildings, covered with an iron truss roof; the boiler room is set on the grade of the street and the engine room ten or twelve feet above this grade, the space below the engine room being utilized for the piping and condensers; the engine and boilers are set at right angles to the wall between them, with the engines next to the boiler room, so that the piping is made as short as possible and the condensation lessened; the switchboard and feeder board are set on the opposite side of the room from the boiler room, so that the length of the dynamo cables is equalized as much as possible. The general features of this design may be summed up as follows: it is compact to save real estate and buildings and to minimize the number of employes and the superintendence. Large units are used for the sake of economy and to save the number of working parts. The building is as far as possible fireproof.

The electric part of the preblem has been solved, temporarily at

least, by the adoption of the multipolar, direct coupled dynamo. The large, slow speed engine has followed as a necessary consequence and the general direction of improvement in power house construction seems to be toward the use of devices to prevent the waste of heat and to minimize the labor required.

There can be no more appropriate place to quote the proverb that cleanliness is next to godliness. An engine and dynamo room should be kept scrupulously clean. This is especially true in regard to the electrical devices, as a very small amount of grease and dirt in the wrong place will cause serious damage. Beyond the mere æsthetic consideration that cleanliness improves the looks of things, there is also the fact that a thorough cleaning amounts to a rigid inspection, and small leaks and defects are often discovered in this way which might otherwise pass unnoticed until they had become serious matters. It is to be regretted that this advice is not more generally followed, as there is more lost through dirty and greasy electrical devices, badly set valves, leaky steam joints, poor firing and careless supervision than ever will be gained through the use of compound, condensing engines.

As a means of comparing different kinds of machinery, figures as to cost of operation have been collected from some of the large modern power houses, and their comparison reinforces what has just been stated, that less depends upon the refinements of the machinery, than upon the condition in which the apparatus is kept and upon the supervision to which it is subjected. Among those having the lowest cost of operation was a power house, equipped with direct coupled generators, but operating single cylinder, non-condensing engines, burning soft coal and using hand firing, while among those having the highest cost of operation are several power houses supplied with compound condensing engines, and burning anthracite coal. The lowest results are about three-quarters of a cent per kilowatt hour, some records running slightly below this, while the results from some of the large stations are as high as 1¼ cent per kilowatt hour. These figures include the cost of coal, water, supplies, repairs and all labor, but do not include anything for taxes, insurance, interest or depreciation. The cost of operation depends largely upon the cost of coal and upon the relation of the average load to the total capacity of the power house, the higher this ratio, the less being the cost of operation.

The modern electric railway power house, although it has been developed entirely within the past ten years represents the thought and the experience of many men. It has been developed carefully, detail by detail, until it is now a work both of reliability and efficiency. No one man and no one company can claim the credit for this achievement, but no class of men hold a stronger claim to recognition than the managers and owners of street railroad properties, who have ever been ready to encourage with their patronage each improvement, who have freely distributed the information gained by their experience, and who even in the most radical departures have ever acted with the courage of their convictions.

How Can the Revenue of Street Railways Be Increased.

By C. Densmore Wyman.

I have often found that it gave me singular pleasure to read something I had long known and felt to be true, but which perhaps, I had never seen in print or in written form. I have thoroughly enjoyed listening to statements of a speaker, who perhaps but restated facts with which I was familiar, but which I had never attempted to place in form for public utterance.

I am consoled by these reflections in the presentation of this paper, for concerning the subject or subjects of which it treats I can hope to suggest little or nothing new, since the problem, "How can the receipts of my company be increased" has been the one question over which managers and directors have grown gray from the beginning of their company's operations.

The text that is handed to every general manager, superintendent and directing official of a street railroad company when selected for his position, reads "Increase your receipts; decrease your expenses," and I suspect that there are few if any untried paths leading towards the consummation to which such a text points.

Almost every company, by virtue of its location, the character of the people it serves, the specific requirements of its charter, and the general conditions surrounding its operation, is obliged in adopting any special method for increasing its revenues, or in introducing changes in the conduct of its business to take into consideration these local conditions, and these are as various as are localities of operation.

In the general discussion of the topics assigned for this paper these local conditions may be necessarily disregarded and cannot be taken into account, thus leaving to be mentioned only such general features as we may be able to suggest touching the operation of street roads, which we believe will be found to make for the growth of receipts. At the same time since the net revenue is produced as well by lessened outgo as by an increased income, it will be pertinent to point out if possible some methods by which possibly the coveted fares of passengers may be made the more certain of finding their way to the company's strong box without loss from light or careless fingers.

In many respects rules for the conduct of business that have been found by shrewd and successful merchants as worthy of observance in the securing and retaining of trade, and thus the upbuilding of their business, will apply to our dealings as railroad managers with the public, for, like the merchants, our companies have something to sell, and while a portion of our trade is derived from those who must purchase from us, much of our custom comes from those who deal at our counters from pleasure, and whose purchases are entirely voluntary.

Our regular line of customers we have always with us, and while their pleasure and comfort are to be cared for, what may be termed the transients, the occasional purchasers of our wares, are to be sought after, catered to, gathered in to increase the regular revenue. In the line of merchandizing, we have rides for sale, and all companies, I doubt not, feel at times that they are overstocked; for the disposal of this stock to attract to our counters not only those who must needs purchase, but as well the wandering, uncertain shopper is desirable.

Imitating the wise merchant, we must seek to place our wares before possible customers in the best condition. We should see to it that what we offer is not shopworn, but is made to appear alluring and enticing. Every car should be a fine looking show window, inviting not only to the regular business traveler, but to the tourist and sightseer as well, who does not know whether to buy a ride or not, and who needs an invitation. Our salesmen are to be as dapper and obsequious as the well drilled and groomed counter-jumper of the merchant's emporium, and all the surroundings of our business should be based upon the principle that to please is the way to get custom and retain it.

Judicious advertising is, I believe, usually regarded as the coin medium of a merchant's business. What ought a railroad company do in this direction? Some of us have doubtless felt that the presence of the cars in the streets was sufficient advertisement of the company's readiness to do business, but it seems to me in this matter we may continue our imitation of the merchant in the conduct of his business. I venture to point out two or three methods of advertising which I think may be successfully employed. First of all, what may be termed "Personal" advertisements through officials and employes.

Every person connected with the road should have it thoroughly impressed upon him when he takes a position that his first and primal business is to "talk up" his company at all times, under all circumstances and to every one with whom he comes in contact. It too often happens that a passenger riding upon a car expresses some criticism to the conductor, motorman or to an official, and instead of receiving an assurance that he must be mistaken, that it is quite impossible that an error such as that of which he complains could happen, or at best that it is surely not the fault of the company, his complaint is readily admitted as just, nay, he is almost congratulated upon his cleverness in finding weak spots in the company's armor.

How often some such conversation as the following is to be heard upon the cars: Passenger: "Conductor, what's the matter this morning? The old motor rattles like a box of nails on a rocky road." Conductor: "Oh, I guess the truckman at the barn was asleep last night, and forgot to grease up the machine; those fellows up there don't pay the attention they ought to to their business." The passenger alights with the feeling that there is carelessness in the service, and proud of his critical shrewdness is inclined to gossip of what he has noticed; and thus the conductor has done injury to the company, not only in the case of the individual, but also through him with his friends. Had the conductor said: "Why, I don't notice any special trouble; everything was all right when we went

out; I think it may have been some stones on the track from passing vehicles, or at any rate it is no fault of the company, for they are very particular in these matters," the passenger would have left the car feeling he was wrong and possibly that on the whole the company was doing the best it could.

Often, even in the office and among the heads of departments, criticism is met in a cringing and apologetic form that serves to make it more positive in the critic's mind that his fault-finding is well founded. However ready we may be to confess to ourselves that all is not just what we may desire, that our company is lame in some respects and halting in others, it is certainly the poorest of policy to make such an admission a matter of public notoriety.

Within the circle of our own counsels, the severest criticism of failure to reach the standard we have set for the men or apparatus may be indulged in, but to the public no intimation of our self-condemnation should ever be permitted to go. Of course, there are times when it may be proper and necessary for the manager to admit that an employe has made a mistake, or that some portion of the system is defective in operation, but the general trend of sentiment to be exhibited to the public on the part of the entire force, from the manager down, should be one of pride in the company, and a habit of talking up, praising, glorying in the institution with which they are connected, should be made a matter of cultivation on the part of the heads of departments, and insisted upon by them from all in the service.

A merchant going about with a sort of sheepish apology for the business in which he is engaged, the goods which he offers for sale, or the character of the methods which he employs in the conduct of his trade, certainly could not expect that the public would look with greater favor upon his wares and his character as a merchant than he appears to entertain regarding himself.

An individual or a company fixes its own rating often by the amount of self respect it exhibits; there is no reason why a street railroad company, conducted on modern principles, and doing its business in an honorable, progressive and straightforward manner, should not be a subject of pride and commendation on the part of those engaged in its service, and if we are all animated by such sentiments, those whom we serve will to a great extent take their cue from us, and will believe that the road of their city or the particular line upon which they are accustomed to spend their nickels, is one of which they may be proud. Each company, in dealing with its patrons, ought constantly to impress them with the feeling that they are getting, and the company proposes to give them, the best and finest service that can be offered, and that every effort of the company and its management is enlisted to make the street railway company an ideal one, and an honor to the city it serves.

Advertising by the use of printed matter may also be employed with advantage to place before the public. The street railway company's inducements, and publications of this sort are of especial service to strangers and tourists visiting the city in which the company is located. I have found a little folder, upon one side of which is a little map showing the various routes and points of interest in and about the city is printed, with other pages descriptive of the pleasure grounds, parks, cemeteries and other places of resort, together with the time tables of the different lines of our own system, to be of great advantage. These folders, placed at the different hotels, railroad depots and steamer docks, were eagerly sought for by visitors, and distributed upon the cars by the conductors, were very largely used by the patrons of the lines for reference. Our own company issued as an experiment about 50,000 of such folders at the beginning of the past summer season, and the call was so great for them that another issue was found to be justified in a very short time.

If a company's lines have some central point of intersection, from which different routes radiate, signs giving directions and places to which cars leaving these principal points go, may be of value and serve oftentimes to gather into the company's treasury nickels that, without the information so conveyed, would remain in the pocket of the undecided sightseer. These signs are not expensive and painted upon glass and illuminated they present a handsome appearance. They can be readily attached to trolley poles and lighted from the trolley current. They suggest progressiveness, and an up-to-date policy on the part of the company.

In the endeavor to increase business many street railroads have of late become purveyors of public amusement and as proprietors of parks and outing resorts located upon their lines have gone into the show business with more or less success. In studying this new departure on the part of street railway managers, we recall the Latin adage "*Ne sutor ultra crepidam*," and quote it as applicable to the inclination of railroad companies to embark in amusement enterprises in connection with the duties directly growing out of the operation of their respective roads.

From such statistics as we can gather, the net revenue gained by companies who have gone extensively into the show business has been in many instances inconsiderable, in some cases a loss has resulted, and but few report substantial profit. Whether to invest in matters of this sort is, however, so much a matter conditioned by the local surroundings, the improvement of unfrequented lines and the ever changing taste of the public, that no general rules for universal guidance can be formulated.

We are inclined to say to the general proposition, "Don't go into the amusement business if you can help it; subsidize those who have made that line of life their study, and give over to them the profit of the enterprise other than that gained by the transportation of visitors to their spectacle or resort; 'stick to your last, shoemaker' for you have quite enough to do to attend to your own business."

The specially illuminated trolley car for evening excursions is a species of advertising which pays in every way. It can be made a vehicle of pleasure not only to those who pay for its use, but as well to those who delightedly watch its artistic light effects from along the line over which it passes. We believe it tends to popularize the service.

In the smaller cities, the use of the newspaper columns for items of proposed change in car house, equipment, trackage, etc., extensions and improvements ought not to be disregarded. After the wise method of an advance manager for a show, frequently the newspapers should be given news of the proposed improvement about to be entered upon by the railroad company, some new addition to its service, something that will make for comfort or convenience of passengers, or of the proposed opening of some territory hitherto unoccupied.

All this tends to the maintenance of interest in the company and the stimulation of a local pride in its doings. Daily newspapers mould public opinion and are especially influential in the smaller towns; they should, therefore, be made vehicles as often as possible of announcements concerning the growth of the railroad and they should be used to make plain the company's anxiety to please the citizens, and to promote the reputation and the growth of the city in which it is located.

We now pass to the consideration of other methods for the increasing of our revenue with the final advice: advertise the goods of the company as the best and cheapest to be had anywhere, on all occasions and always.

In the line of making more attractive the service of a street railway company and therefore tending to increase its patronage, the establishment of a liberal transfer system is worthy of consideration. I am aware that the subject of transfers is one regarding which street railroad men differ widely, and for and against which arguments of the strongest kind are at hand. The difficulties inherent in the wide distribution of transfers, especially upon a large system of railroad lines, are many, among which the liability of the conductor to make of the transfers an opportunity for peculation and a cover for fraud is most prominent. While in many cities a transfer system has been made a subject of municipal enactment especially in the case of recent charters, and thus would seem to have come to stay, in some form or to some extent at least, it is for us to determine if possible whether or not the transfer system is a profitable measure for a street railroad company, and thus where it does not involve other considerations whether or not it ought to be readily adopted.

Inquiries made of various railways touching this point lead me to the belief that this question is to be answered in the affirmative. This is especially true of roads making quick time by means of cable or electric power. When a passenger to go a few miles required two or three hours, the transfer system was not specially beneficial or attractive to him, if a business man, who could not spend the time to avail himself of the privilege it gave of long distance riding. But now that six mile an hour rate has been increased to twelve, even in the crowded portions of many cities, and to a much higher rate upon suburban lines, longer distances can be traveled by passengers, visits are made possible within a reasonable length of time to widely separated portions of a city and the only

impediment to greater through business between such points is often the necessity of paying two or three fares for such a visit or journey.

This impediment once removed, an increase of travel is invited, and a ride upon two or more lines of cars is provided within the same period of time that a single ride was formerly given under the system of horse car traction.

It is, of course, a fact that the hazard of accident to a passenger is increased in proportion to the number of lines which he traverses on a single journey, and this with the labor attendaut upon the collection and registry of his fare, and his care while on the cars would perhaps be only fairly paid for by a fare upon each line he may use, but the larger number of persons induced to ride by a very free system of transfers upon a system extending to different quarters of the city of its operation, we believe will compensate for such extra hazard and labor even if it is assumed for a single fare.

This is especially true upon holidays and excursion lines. Almost every street railroad which controls a number of lines in a city has located somewhere upon one of them, and perhaps upon several, points for pleasuring, and to gather from all parts of the city the mass of the people and take them to these places of interest is important. The laboring man who desires to take his wife and children of a Sunday to some outing place, if he can reach that point from his distant home by transferring for a single fare each, is likely to take the journey. If, however, he must needs pay two or more fares of five cents each to get to the point of his pleasure, he remains at home or reduces the number of persons included in his party.

Another favorable argument for the transfer system is the fact that it leads to the settlement in the suburbs of many persons who would not venture so far from their places of business were they not assured of being able to reach them by the payment of a single fare, and this getting of people from the congested parts of a city to its environs, thus assuring the railroad company of their continuous patronage, is most desirable from a railroad standpoint. For these and other reasons which might be mentioned, we believe that it may be broadly stated that a liberal transfer system increases both the popularity and revenue of the street railway company by which it is adopted.

It is quite impossible, within the limit prescribed for this paper, to discuss the question, as fully as its importance deserves, whether it will be found generally profitable for an urban street railroad company to sell tickets good for a fare at a reduced rate by purchasing in quantities, or whether the best interests and profits of a company are secured by adhering to a fixed cash fare of five cents at all hours and times. When the almost universal motor for street railroad use was the horse and the mule, it was a generally accepted fact of experience, derived from the results of street railroad operation in this country, that five cents for an average ride was as cheap as a company could charge and do business at a profit, and was at the same time a most reasonable one for the users of the cars. Thus the charters of nearly all street railroads granted during the horse car period provided that the nickel should be the limit of their charge for a fare.

Is it true, as some of our would-be reformers in municipal councils and legislative halls loudly announce when seeking political preferment and a reputation for being what they are pleased to call "friends of the masses," that with the change of motive power from horse to electricity or to cable, the street railroads can now afford to reduce, by the sale of commutation tickets, their fares from five to four cents, or even three cents, and still have left a fair margin of profit upon their investment? The cost of transportation of a passenger upon any individual road can be made a matter of almost exact figures, and we believe that when the items properly to be included in such a computation are carefully set down the relative cost of transporting a passenger by horse car, as compared with that of electricity or cable, will be found to be such that any reduction in the fare cannot be made without positive loss to those who have put their money at risk in the enterprise. It is true that with the advent of quicker transit the gross receipts of almost all companies that have changed from horse to electricity or cable cars have greatly increased. This is undoubtedly due to the fact that a longer distance can be traveled in the same length of time, and the other fact that congested portions of the city have been relieved and the dwellers therein sent to the outskirts, thus creating new centers of population and business, and, further, that with this change of motive power have come more convenient and pleasanter facilities for transit, inviting not only more of the usual business travel, but an increase in transient, pleasure and excursion riding as well. But to an equal extent with the increase in gross receipts has the expense of installation and operation kept pace, and so preserved in net the former figures. The cost of the reconstruction of a system necessitated by the change of cars and stations, tracks and extensive machine shops, tools and new equipment are the first large items of this expense, and to these are to be added the expense necessitated by costly repairs in maintenance. Further must be added the increase in wages of employes, engineers, mechanics, electricians and skilled machinists whose employment is necessitated by the new regime, either because they receive more money for their labor or work less hours for the same wages.

A fact that must not be overlooked in this connection is that of the growing demand on the part of the public the company serves, for greater luxury and elegance in the matter of appointments of travel. Our cars must be handsomely and more expensively furnished than were those our patrons were satisfied to use a few years ago. Not only must they move faster, but they must be better lighted, better heated and generally better fitted up for the safety and convenience of passengers than were those accepted formerly. The supplying of these demands has been attended by an increasing operating and maintenance expense. Thus while an increase in the patronage of the road has been in most cases evoked by the change of motive power, we believe it can be safely asserted that little decrease in the expense per passenger carried has been made. This conclusion is brought out by the results attained on the operation of electric and cable roads in the majority of the cities of the country in the past few years as shown by their reports.

A careful study of the published reports will make it apparent even with the depreciation accounts eliminated that the cost per passenger upon electric or cable roads is not less than that on the horse car which they succeeded. As yet as far as urban roads are concerned we cannot discover that on the whole there is any more profit in a well managed electric or cable street railway than there was in a well managed horse car road; and we venture the assertion that to-day less of profit in the form of dividends derived from receipts of operation, is being distributed to shareholders in the modern electric and cable roads, proportional to the business transacted than was given them by the old fashioned horse car companies. From the books and statistics of the majority of companies no favorable arguments are to be drawn for the reduction of fare.

It must also be borne in mind in the consideration of this question that while it is an easy thing to reduce the fare of a road, it is by no means as easy to return to the old rate in case such a reduction results in a loss and proves a failure. Unlike the merchant who may raise or lower the price of his wares and for a day may attract a crowd to a bargain counter in the hope that there may be a profitable sale effected to-morrow, the loss occasioned by a reduction in street railroad fares cannot afterwards be regained by a corresponding increase above the rate originally receded from. Higher than the five cent point we may not go, and if once lowered, even with the plainest statements of the loss it entails before the public, an attempted return to the old rate is provocative of dislikes on the part of the patrons and is almost sure to set in motion legislative action designed to compel the continuance of the lower fare. Such a reduction, therefore, since it is likely to be permanent and continuous, whatever may be its effect on the company, is made at the risk and in the fact of the various contingencies, which surround the business of a road which must maintain an uninterrupted service through fat years and lean years, through times of depression and dullness, when competition and an uncertain labor market may make inroads on its income, and therefore is, to say the least, decidedly hazardous.

By the advocates of reduced fares it is ordinarily assumed that the cheaper rate will invite a sufficiently greater number of new riders to make good the difference in income by the lessened price to each. But we believe that a computation based on the earnings of almost all companies at the five cent rate to ascertain how many more passengers, say, at a four cent fare, would have to be carried to make good the difference between the two rates together with the increased cost for the more carried, including the risk assumed of accidents, will demonstrate the fallacy of such an argument.

The old adage "quick sales and small profits" will not apply in this matter. A less reduction than one cent per fare will hardly

be acceptable or sufficiently attractive to induce a more liberal patronage of the cars. But the reduction of one cent in five entails the loss of a high percentage of the original price and which is much greater than the ratio of original profit.

The fallacy of such a reduction is well stated in the editorial columns of a recent issue of the STREET RAILWAY JOURNAL. It is there remarked, "A loss of twenty per cent of their gross receipts following a reduction of fares from five cents to four would send half of our best paying roads into bankruptcy and would so cripple the others as to make improvements in service practically impossible. A further reduction of twenty per cent would make them all shut down."

For want of time we have not made mention of the serious danger to a company of loss through peculation by the conductors where the cash fares upon the road are fixed at one rate and commutation tickets are sold and received at a less rate. If the value of an article consists in the cost of its production and its exchange, we think in the light of present street railroad operation that the standard five cent fare is a just and reasonable equivalent for an average ride upon a street car, and that no reduction therefrom is advisable or expedient.

Whatever clever and ingenious scheme may be devised and adopted by the street railway manager for making more attractive the service offered by the company and thus increasing its patronage, it will fail of its ultimate purpose unless with the growth of business so stimulated he shall exercise a like amount of skill and sagacity in the selection and training of employes upon whose honesty, faithfulness, intelligence and carefulness he can depend. Attractive resorts upon the route of a road may be opened and fostered; a general system of transfers offering great benefits to the patrons of the line may be introduced; new territory may be occupied; in many ways more travelers may be allured to the cars; still, if the fares so brought to the hands of the company's collectors are not honestly handled; if its motive power and the devices for its application are unintelligently and uneconomically managed; and if that measure of discipline which secures the safety of its patrons is not enforced, the increased gain will not be found to result in an increase of the coveted net results.

To state in full the various rules and methods adopted for the securing of the desired characteristics just mentioned on the part of the employes would take too much of our space, already so nearly exhausted. We have not room to speak of the many and various excellent schemes of rewards and prizes offered to their men by not a few companies for excellence in the matter of freedom from accidents, careful handling of the company's property and perfect reports, schemes which have proven most useful and with which it would be well for us all to become familiar.

We cannot, however, refrain in this connection from congratulating the street railroad companies upon the fact that a superior claas of men have of late years sought employment at their hands. The motorman or gripman of to-day is the superior of his predecessor, the horse car driver. The conductor of the modern fast moving car with trolley to care for, transfers to issue and a more critical public to serve, must needs be brighter and more capable than his brother of the old style car. The chief engineer, the electricians, the master mechanics and the superintendent are necessarily men possessed of a better education and a far wider range of thought aud information than were those whose duties were limited to the care of horses and stables, mule cars and flat rail tracks in former days. As our business has grown in its technical and scientific requirements it is attracting a class of men for whom before there was neither call nor inducement to enter its service.

These facts are to be considered in the selection of our employes. A regular mental and physical examination should precede the appointment of all trainmen, and in the mechanical departments only skilled men, exclusive perhaps of apprentices, ought to be engaged. Every effort should be made by the manager and his assistants to enlist the interest and promote the education of the employe as regards his duties and the general characteristics of the business.

While it is true that sometimes "A little knowledge is a dangerous thing," we cannot sympathise with that policy which would make of the workman merely an automaton. The rule which some roads have of requiring their motormen to spend a certain time in the repair shops before they take their places on the cars is one worthy of imitation, and various other methods adopted along a similar line of education are to be commended. But with the desire on the part of the manager to educate the faithful men in the ranks must be a determination to prevent the retention or engagement of the dishonest, the intemperate or worthless.

We venture to make a suggestion which may aid in the line of this perhaps. Let it be a general rule of street railroad companies that all conductors, motormen or gripmen must, before entering the service, procure a bond from a reputable guaranty company. For motormen, this bond would be in the nature of protection against damage to property, in the case of the conductor, damage to property and dishonesty. The company selected for the giving of such bonds should be one having agencies in all of the principal cities and towns of the country.

The *modus operandi* of the bonding would be as follows: the man seeking either of the positions named, would make application in written form with a statement of names of former employers and their location, and would then be informed that such application would be sent to the guaranty company, and if accepted by them as a good risk, other conditions having been complied with, his appointment would be made. The guaranty company would then in accordance with their usual business methods make inquiry of the reference given, as to the applicant's record, and aside from this, examine all records in their several offices in the various cities to ascertain whether the said applicant had ever been the cause of a loss to them upon any former railroad or other position. With this system in whatever other city the wrongdoer might apply, his second attempt would be likely to be frustrated. The peripatetic fraud would be caught, while the knowledge on the part of those once accepted that if through carelessness or dishonesty their bonds would be forfeited and the record of such a fact placed on the books of the guaranty company would ever prevent another bonding and thus disbar them from the obtaining of another position of trust, would certainly prove a valuable deterrent to initial wrong.

If the street railway companies could but unite in this matter a responsible guaranty company would no doubt be found who would undertake the work as outlined above, and the cost to employes for such bonds could by arrangement be made inconsiderable. The assurance that the records of applicants would be carefully searched and their subsequent actions carefully noted and recorded would certainly serve to discourage bad men from applying, and restrain others holding such position of trust as that of trainmen from yielding to temptation and going wrong.

The methods of an army-like discipline to effect the discovery of offenses and the prompt discharge of the offender, the setting about the camp of guards and pickets beyond which no one may pass, is necessary and effective, but after the practice of many successful military commanders, who when the battle was set were accustomed to ride in front of the rank and file of the army and with words of encouragement and cheer stimulate to deeds of daring and devotion, so may we not with success adopt some method of coming into personal contact with our men, not as stern judges, presiding simply at their trial and prepared to deliver sentence, but leaders, educators and fellow workmen in the business in which we are engaged. In the case of a smaller company this might be accomplished with comparatively little trouble by the manager or superintendent, making it a point to frequently meet his employes, either in a group, say, at the stations where there are several connected with the system or en masse at some meeting held for the purpose. Thus instead of always presenting himself as a taskmaster, he will be able freely to discuss with them the necessities of the business and the purposes of the company with especial reference to their individual welfare, and he will have the opportunity to bring before them items of general information touching latest developments in the technique of street railroad work. In this way he and his men will be en rapport and more cordial relations will be established between them.

Where a company consists of a large number of lines, requiring the employment of many men and the division of official work among a number of officers, it becomes a question as to the best method to be adopted by the officers for making themselves known to the individual employe other than by the usual style of written orders, promulgated from time to time, and posted in the stations and shops. Having felt the desirability of some other and pleasauter medium of communication with his employes, the writer of this paper about a year ago began the monthly publication of a little sheet entitled "Milwaukee Street Railway Bulletin," and its objects were set forth in a short editorial in the first issue to the effect that

the publication was issued in the hope that by it might be effected a closer relationship between the management and the employes, based on a more definite understanding on the part of the latter, of the wishes and intentions of the former. It was also announced that as from time to time changes in the method of running the cars, the use of material and the general operations on the road, in the shops and power plant, might be deemed best by the management, either to test or permanently adopt as the company desire, in order to avail itself of the experience of other companies in their work, when after due investigation such experience seemed to offer something desirable for adoption; and as the usual form of such changes, as far as the employes were concerned, came to them in the shape of some new rule or regulation to be obeyed in most cases without a clear and definite idea of the cause of such ruling; it was proposed by means of the Bulletin to set forth from time to time the reasons for changes made, so that the desires of the company might be thoroughly understood and unity of purpose on the part of both official and employe thus promoted.

It was further set forth that it was the intention of the management to publish from time to time facts and news concerning the business that would be interesting and educating to readers, the results of improvements made on their own and other roads, of the construction and operation of electrical roads, details of which would be usually published in a trade journal, and, perhaps, would not always be accessible to those to whom the paper in question was to be sent.

Following the line marked out for such publication, the little paper was issued each month for more than a year, and in each number suggestions, requirements, rules, time tables, etc., were set forth for the benefit of the employes. Articles on the best means of handling transfers, the care of street railway motors, the treatment of passengers, and particularly the troublesome ones, statistics of the operation of the road and electrical information in general were put in print and placed in the hands of every employe. A personal column was also introduced, in which mention was made of any act showing skill in the avoidance of accidents, in the handling of the motor, etc., and attention was called from time to time to deeds worthy of commendation. To the columns of the Bulletin contributions were invited from the heads of the different departments, and in a column called Reminders, short articles were introduced, calling attention to any laxity on the part of the men in reference to any particular rule, together with suggestions how to act under any especial combination of circumstances. To its columns were welcomed contributions from the men, and queries addressed to the management by employes were answered in its monthly issues.

The publication of the little sheet was in the nature of an experiment, but the fact was speedily developed that the paper was of great utility. Its monthly issues were looked for by the employes, and its suggestions were made matters of discussion at the different stations and gathering places of the men. Hardly a conductor or motorman on the road did not carry his copy with him and often refer to it. The four page sheet soon changed to one of eight pages, 8 ins. × 12 ins. in size, and a few advertisements judiciously selected paid the expense of printing and distribution.

While the preparation and publication of such a paper will necessarily add to the burden of duty, already sufficiently great in the case of most managers, its value in keeping the men of the line in close touch with their officers by disseminating information of local value in the daily operation of the road, and in stimulating to better efforts by a judicious admixture in its columns of praise and blame and suggestions to those to whom it is addressed, will make it worth, many times over, the labor involved in its production. We would recommend a trial by all street railway companies of some such printed sheet for distribution among their employes.

Some companies have fostered what might be termed a benevolent protective society among their men, the officers of the company being included in the scope of such an organization with a voice in its affairs. We regard such societies as valuable along the lines of which we are speaking, and if tact and skill are used in the official relationship of the company to such a club or association, it can be made the medium of the cultivation of pleasant relations between the employer and the employed.

Reading rooms at the different stations and shops provided with technical journals, as well as the daily papers, for the use of trainmen and others can be made most serviceable; and all these methods tend we believe, to the retention of good men, the cultivation of good principles on the part of the employes, and naturally the elimination of the bad, the worthless and the iguorant. Given a large proportion of honest and intelligent employes upon a road, and by a natural process of the pressure which good always exercises upon evil, the bad will find themselves out of place and will be forced to leave. The work of the detective bureau, important as it is, ought, we believe, at all times to be supplemented by the most liberal efforts on the part of the managers to impress upon their employes, either orally or in printed form the advantages of doing right, the benefits of an intelligent conception of the scientific facts with which in their daily work they are constantly dealing, and the cultivation of an enlightened public sentiment among them, to the end that the dissipated, the ignorant, the careless and the dishonest may be made ashamed, and of their own accord seek other positions more congenial to their tastes. Light dissipates darkness.

Street Railway Trucks.

By John N. Akarman.

After a long and expensive experience, it has at last been generally conceded that trucks are necessary for carrying a modern street car. The term truck in this case means the separate framework for holding the running gear of an electric car; namely, the wheels, springs, brakes, motors, etc. This being the case, the question arises as to what form or type of truck is best adapted to the purpose, and the object of this paper is to endeavor to give some hints to street railroad men which will enable them to solve this question themselves. In doing this, it will be necessary to explain the principles involved, the requirements of the service, and show where single and where double trucks are most desirable.

When motors were first placed upon street cars, it was believed that there was no necessity for special construction, or any marked departure from the prevailing horse car practice. The idea of a separate truck had not even been conceived. We found Van Depoele placing his motors upon the front platform, and using chains and sprocket wheels to carry the power to the axle. The car carried the whole weight of the motor and load, and in addition to its usual work, took all the strains of the propelling power. Sprague made a short step in advance and in the right direction by carrying his motor on links from the car body and resting one end through sleeves, on the axle. This improvement preserved the distance always the same between the motor and the axle, but the rising and falling of the body imparted a racking motion to the motors, which was destructive to the cars. Both of those systems were radically wrong, and might have been known to be so, from a study of the steam coaches of fifty years ago, and from the steam wagons of fifteen or twenty years previous. As a result, the cars became hard riding and soon wore out. It was also found that a car body was put out of service whenever there was a necessity for any repairs to the motor or machinery.

It was at this point that the idea of a separate truck was thought of. It was not, however, considered with any favor, and months were spent without success in an attempt to get an electric manufacturing company to try the new system and put a separate truck under the body of a four wheeled car. The idea of a separate truck was first conceived about the year 1885, but it was not until the latter part of 1887 that it was put into operation in concrete form.

The first truck consisted of a continuous upper chord made of bar iron in the form of a rectangle. Its purpose was to support the car body, the sills of which rested on its frame. The sides of this upper chord were reinforced by heavy oak sub-sills to which the chord and the pedestals were both firmly bolted. This form of frame kept the body square and took many of the strains on itself; but it has been abandoned, and in abandoning and using separate bars, I think we have been drifting away from the best practice, for it had a very important advantage in preserving the squareness of the body and truck. In addition to this upper chord, there was a bar extending around the truck to which the bottoms of the boxes were fastened.

In all the early trucks the frame rested directly on the journal boxes. The jar and concussion which resulted crystallized the metal, injured the motors, made it impossible to keep bolts and nuts tight and was the cause of a rapid destruction of the whole truck. A remedy became an imperative necessity. So elasticity or cushioning of some sort was resorted to, and the first effort in this direction was made by placing a thick piece of rubber upon the top of the journal box between it and the axle box frame. While the principle was right, the means employed was of little value. The

rubber at best had only a trifling elasticity, was not durable and did not prevent the box from jolting.

Then a spiral spring was tried upon the top of the box. This was an improvement as it had a certain amount of motion, but the space available over the box was so small that a very stiff spring had to be used. So stiff in fact was it necessary to make the springs that they were but little better than the rubber. In many cases the springs used were so rigid that they were no better than the old uncushioned construction. It was found that springs in this position had the additional disadvantage of aggravating the rocking of the box from side to side; but by widening the box at the bottom, or adding ears so as to form spring seats, it was found possible to give each box two springs, one on each side, and of ample diameter and length, so that they would carry the load with ease and have sufficient motion. Thus placed they had the advantage of carrying the box perfectly steady, preventing entirely the rocking and unsteady motion. It should be noted here that the motors were carried on the truck and were in no way attached to the car body or connected with its motion.

So far as I can learn, the first car body carried on a separate four wheeled truck was run on the Scranton & Suburban Railway Company, in Scranton, Pa. About the same time, the Boston & Revere Beach Railway Company, in Massachusetts, had a car, the body of which was mounted upon a truck; from the frame of the latter, the motor was carried in the modern fashion. This car was operated under the eyes of the officials of an electric railway company, who watched its operation from day to day with the most careful attention, and it required but a few weeks of service to demonstrate that the principle was a great one, and that a very important advance had been made that was to mark an era of success in the operation of electric cars.

These first trucks, although involving nearly all the essential features of the modern trucks, were by no means perfect, and the conditions of the service soon suggested modifications. The first of these was to make the removal of the wheels and axles as easy and practicable as they had been with jaws and oil boxes used on the old horse cars. The form which the improvement took was the making of the jaws a part of the motor truck frame so that upon jacking up the truck, the wheels could be rolled out. This was an essential feature recognized by all truck builders, and has been embodied in every successful truck which has been constructed.

Up to this time brakes have been invariably hung from the body of the car. But it was soon found that brakes upon electrics were a very much more important feature than they had been upon horse cars. The high rates of speed and the greater weight of cars, not only made stopping more difficult, but the shortness of stops to avoid accidents was found to be important. The brakes were first suspended from the sills of the car, and the sinking of a body under a load left the shoe so far from the wheels that in applying the brakes the slack of the chains was increased and could not be taken up without considerable delay. The remedy was simple and consisted in suspending the brake rigging from the axle box frame in such a way that it was not subject to the action of the body springs.

The change in the brake rigging from the car body to the truck frame brought another evil which had been of slight importance heretofore. This was the longitudinal rocking or pitching of the car body, technically known as galloping, which was greatly increased under higher speed, and is also further increased by lengthening the car bodies. This motion is not only excessively unpleasant to passengers but very destructive to the trucks, motors and track. When the brakes were hung from the car body, it was possible to check this oscillation by a slight application of the brake, but the change in the hanging of the brake made this impossible, and remedies became imperative. The first thing that was done as a remedy was to increase the wheel base; but this did not prove to be of much advantage. The first success as a remedy appears to have been made by extending the sides of the truck, and on the extension pieces mounting an elliptic or half elliptic spring. The latter method with the half elliptic spring has been the most successful preventative tried. The necessity for overcoming the oscillation was considered so important, and the success of this device so great, that a series of inventions were, and are being, brought out for the purpose of accomplishing the same result. Numberless combinations of elliptics and spirals, and springs of various kinds were made, and also a large number of inventions involving the use of levers, cross-equalizing bars, and other similar mechanical devices have been made, some of which appeared to succeed, but in most cases failed to produce a satisfactory result. Some of these devices in overcoming longitudinal oscillation very frequently caused the car to ride very stiffly and produced an undesirable effect upon the track. Others gave the car too much lateral motion, apparently, by the conversion of the longitudinal oscillation into a side or lateral movement. The so called extended spring base which is combined with the half elliptic springs has, in my judgment, been the best solution of the problem up to the present time. It is conceded that the equalization of the wheels to carry the load according to the practice on steam roads is out of the question with a car which has only four wheels.

As time went on and experience was gained, one point was gradually made more and more evident. This was that a motor truck is a locomotive in every sense of the word, and for success must be governed in its construction by the same general principles that are involved in the construction of a locomotive. The greatest difference between the functions of a motor truck and a locomotive seems to be the fact that the motor truck carries the load instead of drawing it. It also has to preserve its propelling machinery in perfect alignment while it is moved forward by the revolutions of its axles, and is subject to combined vertical, horizontal and twisting strains of the most severe kind, and at the same time it must ride as easily as a carriage. It has been demonstrated that a composite truck frame is a failure because of its inability to stand all the strains imposed upon it. The braces which were amply sufficient to carry the weight give it no strength to resist twisting strains; then again, malleable iron parts break, bolts and nuts become loose and rattle, and it is next to impossible to prevent rivets from shearing and bars from twisting out of their place. The composite frame demonstrated its imperfections with the locomotive years ago, and has been found even less successful as a form of construction for a motor truck. This is due in a measure to the fact that on account of cost, first class workmanship is out of the question in building a low-priced truck. The truck frame consisting of a solid forged bar, of course, gives greater strength to resist strains thrown upon it from all directions than any form of a built-up truss.

Now as a result of the best information and from large experience, I believe the ideal four wheeled truck for electric cars at the present time is one having the fewest number of parts in its construction, in which the side pieces of the main frame are single forged bars connected across the ends by bars either bolted or welded on so as to make the frame one continuous piece. This frame is carried by springs from the journal boxes, and itself carries an upper chord, likewise a continuous rectangular piece which has suitable seats for the springs. This upper chord is recessed to take the bolts and spring seats, and leaving its upper surface flush. The ends are carried by the half elliptic springs, while the spirals are placed at the journal boxes. The brake should be hung by links.

Diagonal bracing, on account of the motors, is out of the question in the construction of a truck, but the diagonal strength is usually increased by the introduction of transoms. Such a frame carries its machinery with a certainty of its always being in alignment with the driving axle, and as it is spring-carried, it is as light on the rails as any form of single truck, while the longitudinal oscillation is prevented by the peculiar effect of the half elliptic springs which do not respond readily to rhythmic motion. So much for the form of construction of a good type of four wheeled trucks but what of the disadvantages of four wheeled trucks in general. Taken at its best, the four wheeled truck is an uncomfortable carriage and a veritable track destroyer, and should only be used, according to the best judgment of many of our wide awake railroad men, where cars are run at comparatively slow speed, and with moderate length of car bodies. Where it is desirable to run at higher rates of speed in suburban service, the damage to the track becomes so great that it should preclude its use. The increased length of wheel base made necessary, makes it hard on curves.

The only alternative is to use a double truck car with swivel or pivotal trucks. The advantage of this form of truck is very great, and while nearly everyone is familiar with its good qualities in a general way, I hope I may be pardoned for going into details which are not so well known. They are easy on curves to a degree that would hardly be credited by those who have only been familiar with four wheeled cars. The greater number of wheels not only reduces the weight on each wheel, but correspondingly reduces the blow when the wheels strike a joint or a low place in the track. This is still further diminished by what is known as "equalization," which

practically places the car body at the central point of the truck, so that each wheel in rising or falling in passing over any imperfection in the track elevates the load a distance but half as great as its own rise.

Oscillation, whether longitudinal or transverse, can be completely done away with by the use of double trucks. While the trucks conform closely to all the irregularities of the line, the body can move forward with but very little influence from them. The conditions, however, are not altogether in favor of the pivotal truck. As for instance, if all the weight is used for adhesion it is twice as expensive in use as a four wheeled truck. If two motors are used, it has only fifty per cent of the propelling power. In its ordinary form, it makes a wide body necessary, and, hence, is out of place in narrow streets or places where traffic is very heavy. It also has the disadvantage of putting the body at a greater height than is necessary with four wheels.

But it meets a great many of the requirements for fast suburban service, and has been endorsed with great satisfaction; but the objections I have just mentioned preclude its use in many cases where it would have otherwise been desirable. Now the remedy for nearly all these objections has been found in what is known as the maximum traction truck.

The maximum traction truck may be defined as a pivotal truck in which the load is eccentrically placed in relation to the four wheels, two of them receive only a sufficient amount of weight to keep them upon the track, while the others take the remainder of the load. In practice it is found that eighty per cent of the weight may be placed on the driving wheels, while twenty per cent is used for guiding. Upon applying these trucks it was found that it was not necessary to have the wheels of equal size; that a large pair of driving wheels and a small pair of idle wheels can be used. The large pair used as driving wheels being very near the pivotal point have a comparatively small amount of swing and can be allowed to rise within the floor timbers, while the small wheels moving through a much greater arc easily clear the sills. By this form of construction, the body can not only be brought down, but the frame can be made as narrow as in the ordinary street car body. This form of truck enables the car to be utilized for both street and surburban service. It is also found in its latest form utilized under long open cars. It carries the motor in a satisfactory manner, guides readily and answers nearly all the requirements of the service. But the question of what form of truck answers interurban service is one which every railway manager must study for himself. This becomes necessary because the conditions on different roads vary so much that there are scarcely two in the whole country upon which they are identical. The question of the amount of traffic and the headway which is desired to run cars involves a careful study. With heavy traffic and frequent stops it is necessary to have low cars from which ingress and egress are easy. An extra step will increase the danger to passengers very much. On the other hand, where passengers are carried a considerable distance without stops, long cars with more than one step are permissible.

As interurban service is almost equivalent to that of the steam roads, for this service, pivotal trucks having regular swing beams, equalizers, elliptic springs, and all the parts of the steam road truck are entirely satisfactory. They take curves easily at a high rate of speed. But for trucks which must run not only on trams, but on T rails, some form of the maximum traction truck will give, all things considered, the best service.

In conclusion, let me call attention again to this very important question to be considered in connection with the adoption of single and double trucks, which is whether the punishment to the track by single trucks is not so great as to more than make up for the cost of putting in and running double trucks under cars of all lengths of bodies, whether short or long.

Modern Overhead Construction.

By Benjamin Willard.

In the equipment of electrical street railways the item of overhead construction is a very important one, and one susceptible of many ideas. There are many different methods and kinds of materials used on overhead work all of which would go to make up practical and modern construction, but as a matter of fact there are hardly any two installations which are near alike. The reason for such a variety of construction is naturally the results of engineers' ideas, conditions and opinions relative to the merits of different manufactured parts. It is hardly possible to standardize all methods and appliances in such a way as to meet the general approval of different engineers, as the requirements vary with local conditions, and what may be found practical in one locality may be found faulty in another.

Difference in local conditions is not alone responsible for our inability to standardize construction and make it alike; it is because we are trying to arrive at a point of perfection and have a few miles to travel before we are there. The most practical method to pursue is to profit by the successful experience of others, and when we arrive at a point which we consider will admit of improvement, then put our individual ideas into effect. There is room for the manufacturer to investigate more carefully the outside requirements and to make many materials which would find a ready market, whereas the engineer is now dependent on his ability to devise and utilize such materials at an exorbitant cost.

My ideas relative to what is necessary for practical modern construction will undoubtedly differ in many respects from the opinions of others, and in some instances may be found not practical, but experience has proven to me many important features to be observed in modern construction, and I can only submit what in my opinion and during my experience I have found to be substantially practical.

Trolley line construction can be erected in various ways and still conform to good practice, one difference being in the kind and cost of poles to be erected. There are various requirements governing the selection and kind of poles to be used which determine an important factor in the first cost. Municipal requirements may compel you to erect steel or wood poles, or you may be allowed to make your own selection. In the first instance the price is fixed and you have only one thing to do, in the second instance you have opportunities which are left for your own discretion. The steel pole presents a neat and attractive appearance, also takes up a small amount of space, which are the chief points in its favor. The insulating qualities are not as good as with the wood pole, and although I am not prepared to say positively as to its lasting qualities, I have made some observations of deterioration on wrought iron columns that have been in the ground for several years and estimating that this deterioration would take effect in the same proportion on steel poles, I am convinced that in a moist climate a limit on the practical life of such poles would not be over thirty years. While I am not strictly an advocate of wood poles, I am of the belief that from a practical and financial standpoint, wood poles should be used in many instances.

Through the business sections of cities steel poles are in some respects better, as they are not affected by being wilfully or accidentally mutilated. In suburban or residence districts the wood poles when properly dimensioned answer every purpose, and appear fully as well as the steel poles. A heart pine or cedar pole will, if properly selected and kept painted, last in some climates twenty years. This is a known fact from observation of poles that are now in sound condition after having been erected for that length of time.

Suppose we select New Orleans as a suitable location to build a road and base our estimates on cost of material there. The cost of steel poles would be greater than in Northern cities, owing to freight rates and distance from the manufacturers of such poles. Wood poles can be furnished for less in New Orleans, owing to their near production, so that I think an estimate covering cost at that point would be a fitting proposition elsewhere.

Steel poles for one mile of span wire construction, 104 poles at $15 each would cost $1560, and assuming their life to be thirty years, the interest on your investment for thirty years at five per cent per annum would be $2340 or a total first cost and interest of $3900. The setting of steel poles necessitates the use of concrete which is an expense to be figured over the cost of wood pole setting, so we must figure at least the cost of such material and labor which would be $4.50 per pole, or $468 per mile, figured with interest for thirty years at five per cent per annum, would be $1170, or a total for interest and first cost of material and labor of $5070, which is to be considered against the cost of one mile of wood pole construction covering the same period.

Assuming the life of wood heart pine poles to be twelve years (instead of twenty years) I will base a comparative proposition on that basis, taking the interest on each investment and carry through to the expiration of thirty years. Wood heart pine poles for one mile of span wire construction, 104 poles to the mile at $4.50 each, would cost $468, also suitable labor and material for erecting at $2.50

per pole, $260, or a total first cost of $728; to this must be added interest for thirty years at five per cent per annum, $1098, making the first investment at the end of thirty years $1820. At the expiration of twelve years the construction must be renewed at a cost of $723, and to this must be added interest for eighteen years at five per cent per annum, $655.20, making the second investment at the end of thirty years cost $1383.20.

At the expiration of twenty-four years the construction will be renewed for a third time at a cost of $728, and to this will be added the interest for six years at five per cent per annum, $218.40, making the third investment at the end of thirty years cost $946.40, a grand total for wood pole construction of $4149.60.

The difference between total costs of steel and wood pole construction for a period of thirty years would be $920.40 per mile, which would be more than a liberal allowance for changing span wires and other work, but assuming it would take this amount we would stand even at the end of thirty years and still have six years more paid for on wood pole construction. If steel span poles are used, I would recommend for the average span of forty feet a pole weighing about 700 lbs. made in two parts, the lower section to be constructed of six inch extra heavy and the upper section of five inch standard steel pipe swaged at the joint for a distance of eighteen inches; such a pole to be twenty-eight feet long, eighteen feet for the lower and ten feet for the upper section, and provided with a cast iron and wood pole top for the attachment of the span wires. Such poles should be provided with a wood filling to fit the bottom of the lower half to prevent it from sinking, and should be set six feet in the ground with a rake of ten inches from the perpendicular to allow for being straightened when under strain. The average size of hole to be dug should be twenty inches in diameter with a depth of a little over six feet, requiring (after the pole is inserted) a mixture of about ½ cu. yd. of concrete composed of one part of Portland cement, two parts of sharp sand, and four parts of broken rock. The cement should be given at least three days in order to set firmly before attaching the span wires. Whenever it is practical to allow poles to bear against the curbing this should be taken advantage of as it affords an efficient stay to assist the pole in resisting the strain. Should it not be possible to secure use of the curb (or paving) a good-sized rock having a bearing surface of about one square foot would assist very much, and keep the pressure from cracking the cement.

If wood poles are used where it is necessary to make neat appearing and substantial construction, I would recommend for the average span of forty feet a long leaf yellow pine pole dressed and chamfered, thirty feet long, sawed square, 11 ins. × 11 ins. at the base, and 7 ins. × 7 ins. at the point, free from sap, rot or knots, and corners evenly chanifered 1½ ins., beginning at a point fourteen feet from the base, and terminating in an octagonal form and roofed evenly for a space of three inches.

In setting wood poles where concrete is not used (and I do not consider it necessary) a great deal depends upon the soil encountered. Whereas it is necessary to use very little prepared material for filling in some localities, it will take a quantity in others, so I will mention what would be required in a soil of medium clay and character which would probably meet the average condition. Poles should be set six feet in the ground with a rake of twelve inches from the perpendicular to allow for being straightened when under strain, and the hole should be dug to a vertical depth of six feet (or more if necessary to allow the pole to stand a given height above the track) in the ground and should be about two feet square at the top and not less than eighteen inches at the bottom. Where it is practical to allow poles to bear against the curbing (or paving) this should be taken advantage of, and it will not be necessary to use other material near the surface as in iron pole construction, but it will be necessary to place a substantial bearing at the heel to prevent the pole from pressing through the earth; for this purpose a small quantity of coarse broken stone or brickbats will answer every purpose, and where this is not easily obtainable, and the earth is soft, a piece of plank twelve inches wide by three inches thick, four feet long, sharpened and driven in the earth to a depth of about two feet at the back and base of the pole will give good results.

Whenever it is necessary to erect poles in the absence of substantial material at the surface such as paving or curbing, I would recommend that the base of the pole be well rammed with broken rock for a distance of eighteen inches, taking pains that the greater quantity is placed at the back where the pressure is greatest and leaving a small quantity in front where no pressure takes place. The space to within twenty inches of the top may be filled with earth taken from the hole and well rammed. To prevent the pole from yielding at the surface a breast plank of oak (or cypress) timber 3 ins. × 12 ins. × 6 ft. should be placed and spiked in front and at right angles to the pole about eight feet under the surface of the ground, which would make a suitable bearing surface, and resist the span wire strain. About twenty inches from the top of the hole and in front of the breast plank should be filled and well rammed with the same material as is used at the base of the pole. The necessary quantity of broken rock required would be about two-tenths of a cubic yard to the pole.

Poles of wood or steel which may be used for holding strains at curves should necessarily be heavier than those used for straight line construction and should also be set at greater depth in the ground. Steel poles of proper dimensions for curve construction should be made in two joints and constructed on the same principle as the straight line pole, except with heavier dimensions of pipe. A steel pole for curve construction should be twenty-nine feet long, made of six inch and seven inch extra heavy pipe, the larger section to be nineteen feet long, and the smaller section to be ten feet long and made to weigh 1050 lbs. Such poles should be set seven feet in the ground, and raked ten inches from the perpendicular in a direction radiating from central point of curve to where strain is required. The filling necessary would be the same as specified for straight line iron pole construction.

Wood poles for curve construction should be made similar to those specified heretofore for straight line construction, excepting dimensions of such poles should be 31 ft. long × 14 ins. × 14 ins. at the butt, 9 ins. × 9 ins. at the top, chamfered from a point fourteen feet from the base to the point, terminating in an octagonal form and roofed evenly for a space of three inches. Such poles should be set seven feet in the ground and raked twelve inches from the perpendicular in a direction radiating from the center of curvature where strain is required. The hole should then be entirely filled with about seven-tenths of a cubic yard of broken rock and well rammed.

The holes for eyebolts should be bored in wood poles before their erection and should be bored so that the bolt will incline slightly downward towards the eye to prevent the water from following in and rotting the top of the pole. The correct location for eyebolt holes would be determined by the height at which the trolley wire is to be placed; twenty-two feet from the base of the pole would be correct, assuming that we allow two feet for drop in the ear body and ear and also dip in the span which would make the height of trolley wire about twenty feet. To facilitate the setting of poles to a uniform height it is a good plan to place grade stakes near the location selected for poles indicating a given height relative to the grade of the track.

Center pole construction is required in many locations and may be more adaptable than other methods, but I consider span construction better, owing to its flexibility and for being less unsightly. There are now on the market appliances for making bracket suspensions flexible, which are an improvement over the old style of rigid construction. One of the most practical which I am familiar with is an attachment to receive a short span of flexible wire and the ordinary straight line hangers.

Poles used for center and bracket construction should be made accordir g to the same specifications as those used for span construction, excepting that an ornamental pole top would be required for the steel pole instead of an insulated one. Much can be spent on ornamentations on center and bracket construction, but it always occurred to me that the most practical is ornamental enough and places the cost where it will do the most good. For the bracket arm a 1½ in. pipe of the required length attached to a malleable iron collar made in halves and encircling the pole and supported by truss rods leading from the end and center of the arm to near the top makes excellent and neat appearing construction.

Wherever guard wires are required it will be necessary to leave about two feet additional space on the top of the pole above where the trolley span wires are attached for the attachment of the guard wire span. It would hardly be practical to provide an insulated pole top to provide for both span wires, so the trolley span would be supported by means of a wrought iron clamp collar encircling the pole at the proper point and provided with suitable insulating fastenings. I do not especially approve of this method of construction (as I do not favor guard wires) but I would recommend it where it is compulsory to erect guard wires.

All poles should be painted with one coat before their erection as it affords better opportunities to carefully apply the priming coat and at less expense than after the poles are set. A paint of dark green composed of graphite mixture I find to wear well, and although it costs more than some other paints, it has better lasting qualities (especially in iron work). A second coat of this paint after the poles are erected will cover marred places made necessary in setting, and will look well and last for at least two years.

Span Wires.—Span wires necessary for trolley suspension should be flexible steel $\frac{5}{16}$ in. in diameter, composed of seven strands of No. 12 galvanized wire, and when under strain with conditions of pole setting as I have stated would have a tension of about 750 lbs. when erected. Whereas I have allowed eighteen inches for sag in the span, it probably would not be over twelve inches at the time the wire is first suspended, but will gradually sag more as the wire stretches and the poles spring or yield in the ground, so if a forty foot span is attached twenty-two feet above the rail surface the trolley wire within the course of a year would measure approximately twenty feet above the rail.

Where wood poles are used (or wood pole tops for steel poles), the ordinary $\frac{5}{8}$ in. × 12 in. eyed bolt threaded about four inches answers every purpose for the attachment of the span wires, and other devices more expensive used for the same purpose are not necessary. Poles when properly set will bear a given strain on the span wires for many years without much yielding, consequently an adjustable device is rarely if ever used. Hard drawn copper trolley wire of No. 0 B. & S. gauge has been found to be the most practical dimension of wire and is generally considered a standard for most trolley construction; therefore, overhead appliances are made of various manufacture to meet such requirements. There has been a trolley wire recently manufactured in the form of a figure 8 which is now in use on some roads and has given very good results. Where this wire is used it leaves a perfectly unobstructed surface for the trolley wheel and gives greater current carrying capacity, but in modern construction the hanging appliances have reached such a degree of perfection that the round wire can be used with equally good results, and as the trolley wires on large systems are relied upon but little as a conductor for current capacity, I can hardly recommend anything that would be more practical than the round wire.

Span wire hangers and insulators are of various forms and compositions, and many possess equal merit, and I would recommend for straight line work those most indestructible and possessing the best insulating qualities. The best forms of such hangers are those where the insulation is concealed from the weather as much as possible, and having a metallic covering to prevent them from being broken by accidental contact of the trolley pole. Brass hangers are more expensive than iron, but resist the moisture and are maintained at much less expense. Iron hangers if kept in good condition should be painted at least once a year, as the oxidization if allowed to accumulate will form a conductive contact between the conductors and span wires, and in course of time will cause the escape of current by leakage. Hard rubber insulation for hangers is more expensive than many other compositions, but from my experience I must say it has fine insulating qualities, and stands different conditions of climate with little or no deterioration.

Suspension ears are of as many varieties as hangers, and I have experienced the use of many such appliances, and have concluded that a little modification of the old brass solder ear is the most practical and lasting of all, if properly attached. A solder ear should be fifteen inches in length, tapped for a $\frac{5}{8}$ in. cap bolt and provided with thin lips at either end, so dimensioned as to encircle but little more than half the trolley wire, and one point which should be observed very particularly is to have the ends of the ears ground to a thin tapering end, so that they will become flexible with the vibrations of the wire. If the ends are made heavy or unyielding the vibrations will have a tendency to detach the ear at the points, and when this takes place it is a question of a short time before the ear is wholly detached.

Insulators and hangers for curve construction, like straight line material, are of many designs and permit of wide selection. However primitive may seem my ideas of this particular part of construction, I can only give good results from my experience. I favor what is known as the gooseneck hanger, which is simply a $\frac{5}{8}$ in. steel forging formed of such dimensions as to allow good clearance for the trolley wheel, and fastened to the soldered ear in a manner to permit it to swivel, also provided with an eye for the attachment of pull-over wires. Such devices are strong and do not present an obstructive object for the trolley to catch in. There is no insulation attached to such ears, and this is the only thing in their disfavor, but as there are many insulating devices to overcome this difficulty which can attached to the hanger, this could be considered a minor point.

A great deal could be said about overhead curve construction, but as there are so many different conditions to meet I will simply conclude my description with a double right angle curve of sixty feet and fifty feet radius. The pull-off ears should be placed 11 ft. 8½ ins. apart on the outside curve, and those on the inside curve 9 ft. 10 ins. apart from center to center (commencing at the point of the curve), so that the pull-off wires between the two curves run longitudinally from the axis of the track curves. The three central pull-off wires leading to the center pole would terminate in an iron ring, three inches in diameter, fixed at a point about twenty feet from the trolley wire, and attached to a single $\frac{3}{8}$ in. cable fixed to the center pole by ending in a strain insulator. Each of the other pull-off wires would lead directly to their respective poles, all ending in a strain insulator fastened to the pole top. Each of the suspension ears should be placed directly perpendicular over the track centers and each provided with a strain insulator between the trolley wire and the pole.

There is a wide difference of opinion relative to the arrangement of sections and the methods of feeding such sections of the trolley wire. In many installations a practice is made of leading each individual section feeder to the station and separating the trolley into sections by sectional insulations, making it possible to cut out the various sections at the power house. This is a convenience in one respect, and that is, it makes every section of the line directly controllable from the power plant, but there are other things equally important to consider, which may convince you that better results are obtainable through another method, and that method would be to have every feeder on the whole line doing a share of work at all times, whether the cars be assembled on one section or distributed over the entire line. This, of course, can only be done by means of connections representing the whole line as being in one general section, making short sections controllable by external switches. In the first method mentioned an accumulation of cars may be assembled on one section not estimated for carrying an abnormal load, consequently, the feeder would be overtaxed on this particular section, whereas the feeders on other sections would be doing little or no work. Consequently, an unevenness of potential between the adjoining sections. If there is a bridge around each section insulator connecting each section together and connected by a feed wire, so that the current will equalize itself between two sections, and so the current will distribute itself from all feeders, then we have a small amount of variation of potential from section to section, and every feeder is auxiliary to each other.

I have observed in almost all instances that when an accident occurs to a trolley wire the whole line is for a time disturbed in its service until the proper attention has been given to the external circuit where the trouble occurs, and those on the ground are the ones who are depended upon for relief before the forces at the power house are aware of the extent of the trouble, and the switchboard tenders are always under instructions or advice from the emergency crew. Consequently, I maintain that efficient external line appliances that are controllable by emergency forces meet the most important requirement, and the most efficient line can be built with a general feeder system leading from the switchboard and controllable as a whole for each individual line, and not separated into sections requiring separate feeders for each section leading from the station. To accomplish this method of uniting the trolley sections the line is divided into sections by means of sectional insulators, each section so proportioned as to meet the estimated feeding point where the feeder is to be attached. A switch box is placed on the pole at a convenient height, in which are contained two switches and fuses, one for the section on either side of the sectional insulator; the feeder is then divided by connection through each switch, so that the feed wire delivers current to either section through feeder span wires attached to connections on each side of the sectional insulator. When the entire line is in operation there is an equalization of current in all sections, and the trolley remains virtually as a solid conductor, but with all necessary features for disconnecting the sections.

Feed wire distribution is an important item in all installations and varies with local conditions such as distances, amount of work

to be done, and cost of producing power. As this is a mathematical problem, that is, made fitting to each of the local conditions, I will only undertake to define a general system for erection and distribution.

In most localities where a large system of feed wire distribution is required it is necessary to erect special construction for that purpose. The most economical plan is to select centers of distribution reached by the most direct routes from the power station and establish at such points what may be called junction poles, to which are attached the heavy trunk line feeders leading from the power plant, and smaller feeders for distribution to the trolley line. By this plan we may erect wires of 500,000 or 1,000,000 c. m. capacity from the plant to the junction pole, and end same to a junction frame or frames attached to the pole, which is provided with a bus bar of sufficient carrying capacity to carry the current of the branch feeders. The large cables are dead ended in the junction by use of eye-bolts and strain insulators and connections are made with the bus bar with copper T connections. The branch feeders are ended and connected in the same way so that it is possible with little delay to cut out any feeder and make changes which are often necessary during progress of operation.

Southern pine cross arms 5 ins. × 3½ ins. bored to receive 1½ ins. pins and doubled on each pole will make sufficiently strong construction to receive the heaviest wires. The pins should be of locust wood bored to receive a ½ in. bolt which should extend vertically through the center of the pin and terminate with a washer and nut on the under side of the arm.

Top grooved glass insulators are desirable in all classes of heavy feed wire construction, and their adoption is to be recommended. Feed wire conductors of larger area than No. 0000 B. & S. gauge should be in stranded or in cable form, triple insulated with the best waterproof covering. Care should be taken in splicing cables so that an even strain is brought on each smaller wire and are not allowed to remain without good contact, and that all flux used in soldering is carefully removed before taping.

Devices have been used for connecting cables, but none are to be recommended in favor of the splice made with the cable itself.

Protection from lightning is now occupying the attention of many railway companies, and there is a wide difference of opinion relative to merits of lightning arresters and their application. I have received correspondence from many different railway companies, and in one instance there are two arresters located for forty-two miles of road, whereas in another instance there were six to the mile. The general idea seems to be two to the mile, and situated at or near the junction where the feed wire is attached to the trolley wire.

The Selection and Management of Employes.

By W. F. KELLY.

"It is a good divine that follows his own instructions; I can easier teach twenty what were good to be done than be one of twenty to follow mine own teaching."

The writer lays no claim to being wiser than his generation, nor to have discovered new and startling facts in human experience. He does not presume to instruct veterans in street railway management, but merely offers for your consideration some stray chapters from the book of experience. Nor is the experience necessarily personal. Much of it is gathered from observation and inspection in a dozen different cities. The suggestions which follow are not specifically *what* to do, but rather what *not* to do.

An intelligent consideration of a man as an operative presupposes a knowledge of the conditions and environments under which the operative exists. What these conditions are, or seem to be, depends largely on the point of view. The public view it from one point, the employe from another, the manager from a third, and the stockholders or owners from still a fourth. From these various points of view arise the complex relations of the street railway to the general public and to its employes. The manager is doubtless familiar with the view of the stockholders, whom he directly represents, but he is too frequently unfamiliar with the view of the general public, whose patronage he seeks, or with that of the employes, whose services he receives.

To the public mind a street railway is the visible, tangible property with which they are in daily contact, and the intangible, shadowy something which they call the management.

The physical character of the property they judge of by observation. The management they judge by the character of the employes with whom they are in daily contact. In a large system perhaps not one person out of 10,000 knows the active manager by sight, and not one in 20,000 has ever seen the president. The mild mannered, long suffering manager, known and beloved by his friends and neighbors for his many kindly virtues, is too frequently in the public mind the embodiment of all that is selfish, cold-blooded and rapacious.

If the common talk of the every-day world is to be believed, he delights in irritating and insulting the public, in the oppression and abuse of his employes, and is always endeavoring to rob the people or the city of their rights.

How does such an impression become current? Perhaps through the publication of his official acts and partly through the men employed on your cars; not that they wilfully malign the management, or openly condemn or criticise it, but by their conduct and bearing toward the traveling public they unconsciously create this impression. The president, manager and entire directory may be the most capable and eminent business men in the city, the personal character of every one above reproach, and yet collectively they are powerless before that common, final tribunal, public opinion. The street is the forum and the street car the tribunal from which emenates public opinion. The employes reflect the character of the management, and whether we wish or not the public consider the car employes with whom they are in daily cantact as representing their policy and attitude toward the public. We touch the public and have our measure taken largely through the men who man and operate our cars.

The average American enjoys a "kick," and unfortunately the operation of a street railway system offers abundant opportunity for the exercise of this glorious privilege. The conductor or motorman affords the readiest victim and the kicker enters up judgment on the management according to the manner in which the innocent employe receives and disposes of his kick.

The pernicious idea that anybody can run a street car has in the past resulted in the employment of an army of careless, coarse and incompetent men, who through their ignorance, carelessness and incivility, have done more to bring street railways into public disfavor than all the official acts of its management and directory.

The manufacturer selects his salesman not on account of his knowledge of his wares, but more largely on account of his ability to meet and treat courteously and kindly present and prospective customers. The merchant insists that his clerks should be courteous, diplomatic and obliging, as well as honest and faithful. We may not know either the merchant or manufacturer, but we judge them by their agents and their salesmen.

In the commercial world, the merchant, banker or manufacturer thinks it of enough importance to personally take great care in the selection of his representatives; the average street railway management is content to leave this most important matter to an overworked, underpaid subordinate, with but a limited conception of the essential qualities of a first class employe.

The manager has time to discuss a fare register, a sand box or a truck, but hasn't an hour to give to the choosing of his public representatives. The selection of the human machine, which is far more important, more difficult to understand, more difficult to operate, causes the most trouble and expense and fails most frequently, is too often entrusted to a man already burdened with many details.

The manager thinks it essential to have a competent, well paid man to purchase necessary supplies. If cars, motors or power station machinery are to be purchased, he gives it careful, personal attention, and calls to his aid skilled experts, in order that there be no error in so important a matter.

But the employment of conductors, motormen, inspectors, foremen, etc., the working force who earn or waste your money, who make your system popular or odious with the public, who operate your cars skillfully and safely or awkward and dangerously, who keep your repair and accident accounts at a minimum or make them a heavy burden, who collect and account for all your earnings, or filch a portion for their personal use, this large body of men, the very life blood of your system, you leave to the selection and care of some one whom you wouldn't trust to buy a street car or select an office boy.

The purchase of supplies, equipment or station machinery are all important matters, and should be carefully considered, but the selection of fifty or a hundred men of the *wrong* kind is far more important and more expensive than a dozen blunders in the purchasing department.

Every employe of a street railway should be considered as an agent with possibilities of harm to his employer. It is not enough that he be intelligent, sober and industrious. He should be of good judgment and sound thinking, and neither communistic, socialistic nor anarchistic in his views; not discontented and at cross purposes with the whole social order, but of cheerful disposition and content to make the best of life as he finds it.

The physical and intellectual qualities of the applicant should both receive careful consideration. Well bred, sound, vigorous men, with a fair common school education, can be readily secured, and the wide-awake management should be satisfied with nothing less. In order to exclude many undesirable applicants, a high standard of physical qualifications should be established and adhered to rigidly. Certain previous occupations are considered as disqualifying. Policemen, firemen, steam railroad employes, political appointees are as a class undesirable. There may be individual exceptions, but they are rare.

Friends or relatives of the directory or other company officials, relatives or political friends of city officials, brothers or near relatives of present employes are most frequently inefficient and troublesome. They are a dead weight on the neck of the active manager, and no matter how excellent the reason, every dismissal involves an explanation, and frequently ill feeling on the part of those who have been favored by having their friends appointed. Fitness should be the sole standard for securing a position. The manager should have no favorites or relatives on his force, and should be wholly untrammeled by his directory or superior officers. Either he is large enough to discharge the duties of his office without suggestions as to details, or else the property needs a new manager.

In large systems the duties of general manager are so numerous that he thinks it impossible to devote his time to the employment and discharge of conductors and motormen. Then by all means relieve him of many of these. Plenty of competent men can be found to purchase materials, jolly the Council, place insurance, adjust damage claims, etc., but few men have the clear judgment and broad mindedness to select the best class of men for their service and to deal fairly, firmly and kindly with their faults and failures.

No place of public service is more exacting than that of the street car employe. In no other business do the public get so much for their money and grumble so much because they don't get more. In no other business is the employe so much the personal representative of his employer as in this. What do we expect and require of him? That he be always prompt in reporting for duty; always quick and accurate in the various details of his business; honest, sober, intelligent, trustworthy, clean, courteous, smiling, patient, good-natured, never weary, always ready to help everybody, always obedient to several dozen or hundred rules; in fact a model of all the virtues for $2 per day. Desiring all these, there are some managers who require yet more. I have in mind one prominent city road, in which nearly all the employes are of one religious belief, and others find it difficult to secure employment. Another, in which all employes are opposed to this belief; and yet another in which they are almost wholly of foreign birth or parentage. In the first two cases this condition arises largely from the personal prejudice of the manager, and in the other through a mistaken notion of economy. It is fair to assume that neither of these managers is of that broad gauge type which places high character and efficient service above political or religious creed.

Granting that there has been careful and intelligent selection, it is equally important that there be wise and considerate management. Rules applicable to individual conduct are not necessarily applicable to men as a class. The class is above the individual and the rule must be adjusted to meet the average requirements. Many of the rules in existence to-day are the heritage of the old days when the street car employe was "Something better than his dog, a little dearer than his horse." Rules were then made to meet the exigencies of the case and in accord with the duty and character of the employe. Frequently the only rule was the whim of the foreman or "barn boss." In time various miscellaneous practices crystallized into custom and finally, became a well settled practice.

The electric motor and the cable ushered in the new era of city surface transportation. New blood and new capital entered the field, but many of the old customs and old employes remained. The change from animal to mechanical traction has been swift and startling. In many places the horse car is but a memory and the mule driver is an extinct species. Track, cars and power station up to date, but the method and management of the men who operate the cars is that of the past decade.

It is conceded that a different type of man is necessary, and on various systems there has been a noticeable change since the horse car days. True to natural law, the fittest have survived and a superior class of men now operate our cars. There has not been on the part of managers in all cases so marked an improvement in the modification and amelioration of various harsh practices. It is urged that the more intelligent, superior type of man is deserving of better treatment than the mule whacker of ten or twenty years ago. Frequent and severe punishment for petty offenses should be abolished and a code of rules established worthy of the men and the business they represent. The almost universal practice in punishing minor offenses is to "lay off" the employe from one to ten days, without pay, which is in effect a fine of from two to twenty dollars. The man is soured, his family suffers from the loss of earnings, and if the man happens to be a conductor it is not surprising if he tries to *get even* by nipping fares. The practice is still adhered to by many railway companies, and the offenses which the punishment is supposed to correct still continue. Such a practice would not be countenanced in a manufactory, a store or in commercial affairs; why should it be on street railways? If the man is valuable enough to be retained in service, why should his family suffer the loss of his wages? If the man were permitted to continue at his work and one-half the amount he would lose by laying off were assessed as a cash fine, the practice would be condemned in unmeasured terms both by the press and an indignant public. If employes are not amenable to reprimand administered in a proper way, then they have not your welfare at heart and should be dispensed with altogether. An entry, together with date, should be kept of all occurrences connected with every employe. It should show his absence from duty, whether from sickness or other cause, his various little lapses from duty, disobedience or neglect of orders, etc. This record should be frequently examined by the manager, and when it is evident that the man is making no improvement, replace him at once without waiting for "something to happen."

All foremen and subforemen should be impressed with the idea that all men under their charge should be treated in a gentlemanly manner and with the utmost fairness; that there shall be no favoritism in recommending men for promotion or in shielding them from punishment. Much depends on the integrity and good judgment of the division foremen. It is, therefore, highly essential that there be no mistake in selecting men for these positions. If they are not active, loyal and interested in their work, discipline will be lax and unsatisfactory service the result.

Employes should not be censured for light or trivial causes or on *ex parte* testimony. Reprimand should be kind, but pointed and manly and never in public or in the presence of his fellows. Deal fairly and justly with every man and teach the man to feel that his case will receive careful unbiased consideration and that for similar offences the same and certain punishment will follow in all cases. Drinking on duty, drunkenness, frequenting saloons or gambling rooms, or association with loose women are all inimical to good service, and merit dismissal.

Revise your rule book and eliminate all useless and harsh rules and insist on a strict observance of the remainder. Study it and see if many old customs should not be abolished and new ones inaugurated. Put yourself in the employe's place and see how many of them you think are necessary in order to secure efficient service.

A number of large railway companies have in recent years furnished comfortable and attractive waiting rooms for their men, with reading room, lavatory, etc. This is neither charity nor generosity. It is a plain business proposition that the company will obtain better and more satisfactory service if the men have cozy and attractive quarters about the car houses. The manager too frequently thinks that when he has done all this, his men have no cause for complaint and that they are ungrateful and unappreciative. Let him look beneath the surface and discover the cause of the irritation. He will probably discover that something or somebody is not receiving fair play; that there is some discrimination in promotion, punishment, hours of labor, etc. The grievance may only be imaginary, but until it is considered and adjusted it creates grumbling and discontent as surely as a real one. To obtain the best service there must be a feeling that the manager has a personal interest in the welfare and success of his men. Prizes for good conduct and satisfactory service, beneficiary organizations, reading and

recreation rooms are all helpful and in the right direction; but courteous, manly treatment and a kind word now and then smooth away the irritations of an exacting service more than all else. The man must feel that you respect his manhood, integrity and fidelity; that aside from his service as an employe you have a human interest in his success as a man. He has a right to feel that years of right living and faithful service entitle him to your confidence and that his good character should shield him from evil report.

Improved conditions, shorter hours of labor and better wages have all contributed to make street railway service more desirable and attractive to a high class of labor. Formerly it was considered that street railway men were necessarily a shifting, thriftless class whose term of service was of brief duration. Street railway managers seemed to think it a part of the daily programme to discharge somebody and employ somebody—anybody—in his place. Men looked upon it as a makeshift job—a chance to pick up a few dollars while waiting for something better to turn up. The result was a miscellaneous aggregation of men with no higher interest in the welfare of their employer beyond receiving their wages. Happily this condition is rapidly passing away, and the best street railway systems to-day are those which have given most care and attention to the selection and treatment of their men.

We may never reach that ideal condition where every man is capable, honest and trustworthy. It is none the less worth striving for, and the manager who most nearly approaches it has within his grasp the highest elements of success. With the whole body of employes loyal, faithful, intelligent and devoted to their duty, gross earnings would be increased and operating expenses diminished, personal injury claims be reduced to a minimum, secret service agents no longer necessary, the occupation of the labor agitator gone, the kicker silenced, and that peace of mind of which the general manager now only dreams will become a reality.

President-Elect McCulloch.

Captain Robert McCulloch, new president of the American Street Railway Association, vice-president and general manager of the Cass Avenue & Fair Grounds Railway Company and Citizens' Railway Company, and general manager of the St. Louis Railroad Company, of St. Louis, is of Scotch lineage. His ancestors settled in Virginia in the Colonial days, the parental side in Amhurst County and the maternal in Roanoke, the male members on both sides having been soldiers of the Revolution. He is a native of Rockbridge County, Virginia, and was educated at the Virginia Military Institution, at Lexington, Va. He went as a cadet in the Confederate service in April, 1861, and followed General Lee until his surrender in April, 1865.

He went to St. Louis in 1869, and in 1871 entered the employ of the Bellefontaine Railway Company of that city, as superintendent, was afterwards made secretary, and then vice-president and general manager of the company. He continued in that service until 1889, when D. G. Hamilton and his friends purchased the Citizens', St. Louis, Cass Avenue, Northern Central and Union lines, and he was made vice-president and general manager of these roads, which position he now occupies.

At the age of twenty-six he married Miss Paxton, of Rockbridge County, Va., and his family consists of his wife, two daughters and a son, Richard McCulloch, who is civil and electrical engineer of the roads named. His elder daughter, Roberta, is a student at Vassar College and his younger daughter, Grace, is receiving an education in the public schools of St. Louis.

LAST month a full line of pipe making machinery was sent to Russia by Morris, Tasker & Company, of Philadelphia.

The plant shipped is a very complete one and includes engines, boilers, the iron framework for the buildings, etc., all of American manufacture. The new plant will be located at Maripol on the Black Sea. Soon after the shipment of the machinery, Jonathan Rowland, vice-president of Morris, Tasker & Company, Max D. Feldman, chief engineer of the company and a considerable number of expert machinists formerly in the employ of Morris, Tasker & Company, took passage for Russia to direct the erection of the plant. Mr. Rowland will return in three or four months, but Mr. Feldman will remain in charge of the plant in which some five thousand men will be employed.

The selection of American machinery and methods in the installation of this plant is considered by Morris, Tasker & Company as a great triumph, as a careful inspection of all the pipe making plants of Europe was made by experts of the Russian Government before the order was placed with Morris, Tasker & Company.

Among the Exhibits.

J. A. McGrath, exhibited a new car brake.

The Michigan Stove Company, of Detroit, showed three Garland stoves.

George P. Jones & Company, of St. Louis, exhibited a full line of oil and greases.

J. H. Wolf & Company, of St. Louis, exhibited a new transfer ticket invented by Mr. Wolf.

The Missouri Malleable Iron Company, of East St. Louis, Ill., exhibited a number of forgings.

D. C. Sweet, of Grand Rapids, Mich., had his patent grinder for car wheels at the Convention.

The Standard Electric Works, of Cincinnati, made no exhibit, but was represented by F. D. Lawrence.

The Ready Rock Asphalt Roofing Company, had an exhibit of its roofing for car houses and car stations.

The Detroit Stove Works, of Detroit, had an exhibition of two Jewel car stoves and three station heaters.

Louis Myers, of the Electrical Installation Company, Chicago, was on hand looking after the interests of his company.

The American Steel Foundry Company, of St. Louis, Mo., exhibited a variety of steel castings for truck frames, drawbars, etc.

HEADQUARTERS OF THE STREET RAILWAY JOURNAL.

Robt. A. Schlegel & Bro., of St. Louis, Mo., had a tastefully arranged exhibit of looking glass plates for interior car decorations.

Wm. S. Silver, represented not only the New York Carbon Company, but Silver springs, and was a prominent figure at the convention.

The Evens & Howard Fire Brick Company, exhibited a full line of fire brick and tiling. The company was represented by Albert Sobolewski.

The American Electrical Works, of Providence, R. I., had its interests well looked after by P. C. Ackerman, of Providence, and F. E. Donohoe, of Chicago.

The Commutator Company, of Minneapolis, was represented by E. F. Keister, who exhibited samples of commutator bars made by the new process of this company.

Krotz, Allen & Kelly, of Springfield, O., presented to attendants an attractive souvenir consisting of four views showing the K. A. K. system of underground conduit.

The Chapman Valve Company, of Indian Orchard, Mass., showed a line of Chapman valves through its St. Louis agents, the L. M. Rumsey Manufacturing Company.

J. H. Stedman, of Rochester, N. Y., explained the merits of Stedman transfer tickets and presented to delegates a tasteful stick pin made in the form of his initials, J. H. S.

The Charles Munson Belting Company, of Chicago, was represented by H. E. Skinner, of Chicago, who distributed a beautiful paper knife as a souvenir for this company.

Garson Myers, of the Standard Railway Supply Company, Chicago, was on hand as usual, shaking hands with old friends and presenting them with a handsome and unique desk calendar.

The De Staebler Automatic Car Fender Company, of St. Louis, Mo., showed a novel type of automatically operating fender, actuated by a vertical apron carried under the front platform.

The Rochester Car Wheel Works, of Rochester, N. Y., was well represented by F. D. Russell and George E. Morse. As a souvenir of the convention the company presented some pocket knives.

Charles A. Schieren & Company, of New York, was represented by M. M. Buck Manufacturing Company of St. Louis, and M. A. Sullivan, of the Chicago branch, who gave out a very handsome memorandum book.

The Bellamy Vestlette, Company, of Cleveland, O., exhibited a novel vest without back, arranged with a series of nine pockets, for the safe retention of coins and other money, tickets, report book, pencil, punch, transfers, etc.

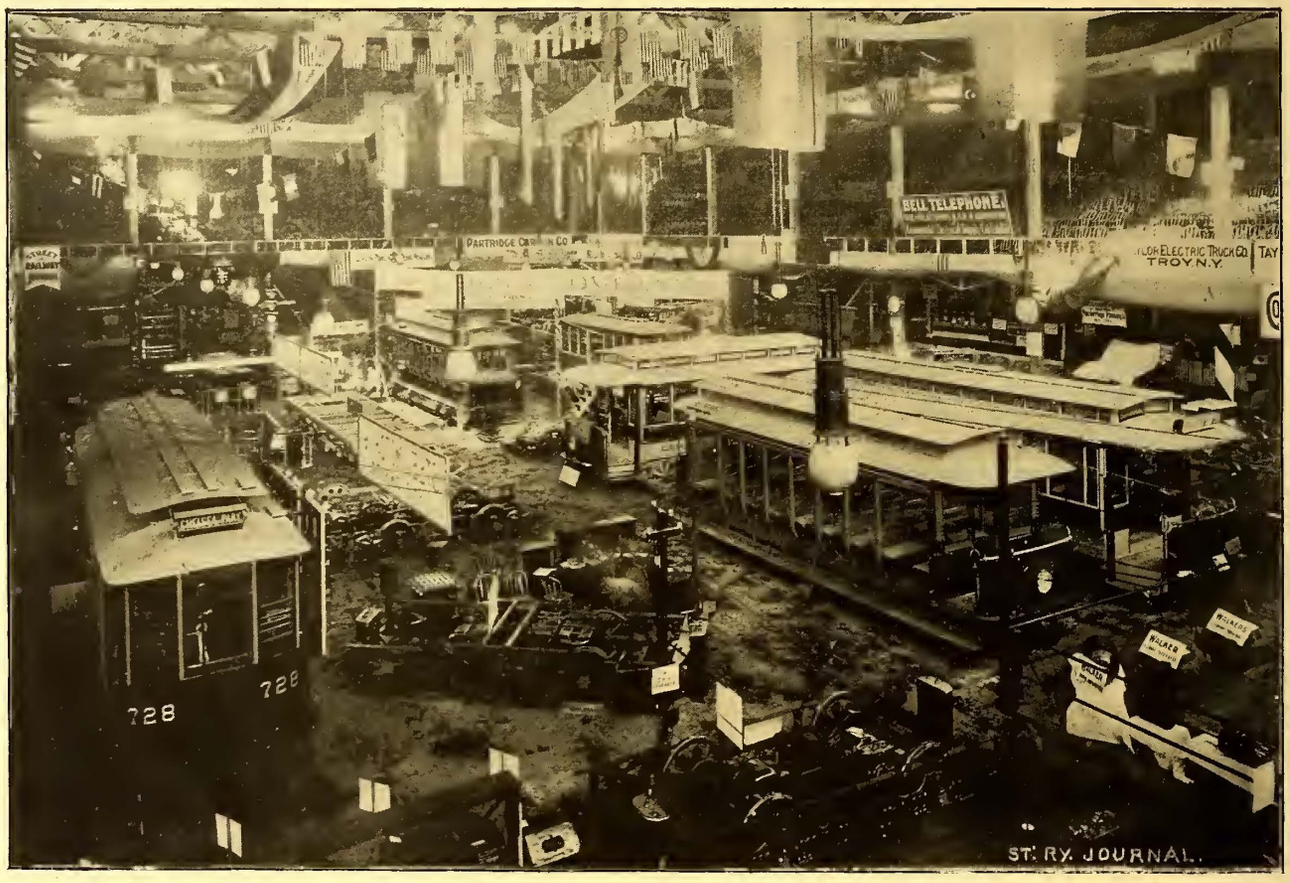
The Windsor Brake Company, of Troy, N. Y., exhibited its emergency brake. This consists essentially of a track shoe made to jam under the front wheels of a car. The portion of the shoe bearing against the track is of emery made up to the form of a cake, giving the greatest possible amount of friction.

E. F. de Witt & Company, of Lansingburgh, N. Y., showed one of their Common Sense sand boxes in the exhibit of the Central Electric Company, of Chicago. Mr. de Witt was present at the convention and explained the working of the box to all interested. Its simplicity and effectiveness were favorably commented upon.

The National Water Tube Boiler Company, of New Brunswick, N. J., exhibited a model of its water tube boiler, together with a model of its shaking grate. A circular was distributed giving a list of the prominent electric railway companies using the boiler. The rocking grate, it is claimed, saves fifteen per cent in coal bills.

The John Stephenson Company, of New York, was represented by D. W. and John Pugh, who have attended a great many conventions, and who were among the best known among all the attendants at St. Louis. The company made no exhibit, but distributed a very handsomely leather-bound notebook, which was eagerly sought after.

The Duff Manufacturing Company, of Allegheny, Pa., exhib-



VIEW OF CONVENTION HALL FROM EASTERN GALLERY.

The National Lock Washer Company, of Newark, N. J., exhibited a number of its lock washers for track bolts and all work where nuts are to be locked. The exhibit was in charge of J. G. Miller, the St. Louis agent of the company.

Ezra H. Linley, of St. Louis, occupied a space in the western end of the convention hall and exhibited a full line of street railway supplies for which he is the agent. These included a variety of Cambria rail sections, springs, engine room supplies, etc.

The American Railway Supply Company, of New York, showed a handsome collection of the different badges for motormen and conductors, which it manufactures, and these were tastefully arranged on a large panel covered with dark blue plush and mounted in a brass frame.

The R. D. Nuttall Company, of Allegheny, Pa., exhibited a fine assortment of gears and pinions, trolley wheels and harps, complete trolleys, etc. The exhibit attracted much attention on account of its completeness and tasteful arrangement and was the center of interest for many delegates.

The Western Electric Company, Chicago, made no individual display, but was ably represented by A. L. Tucker and Thos. G. Grier. The company's goods were shown in the magnificent exhibit made by the company's St. Louis representative, the Commercial Electric Supply Company.

ited four jacks for track and car house use. That for power car house use raises and lowers automatically. The company claims that no cast iron is used in the manufacture of jacks, all parts being of steel or malleable iron. George A. Urling represented the company.

The National Jack Company, of Boston, Mass., manufacturers of the Pearson hub car replacing jack, showed several jacks of different sizes and tackle for raising cars. These jacks have been found extremely useful in street railway service, owing to the fact that they swing, thus permitting a car to be moved from the track or replaced on it.

Jno. T. McRoy, of Chicago, exhibited several splendid samples of his terra cotta conduit made with two, three, four and six ducts and in six foot lengths. This conduit is made from shale finely ground. The surfaces both inside and outside are heavily glazed. The Chicago City Railway Company has put in 40,000 ft. of it and speaks highly of it.

The Charter Oak Stove & Range Company, of St. Louis, exhibited two varieties of car stoves, and showed two sizes of each. One was fitted with iron, and the other with wooden casing. For the former absolute safety from fire was guaranteed. The company also exhibited larger sizes of stoves suitable for car sheds. Leslie Dana was in charge.

The Mississippi Glass Company, of St. Louis, had a very interesting exhibit of its products—glass, specially designed for the deck lights of street cars, wire glass for skylights, and samples of its general line of rough and ribbed and cathedral glass, also an exhibit of high grade firebrick, in all shapes, for construction of glass and metallurgical furnaces.

A. Groetzinger & Sons, of Allegheny, Pa., manufacturers of Dermaglutine pinions for electric cars, showed a full line of pinions which are manufactured by them for all types of motors in use. These pinions, which are of rawhide, are manufactured ready for use or are supplied in blank so that they can be cut by the companies using them, as desired.

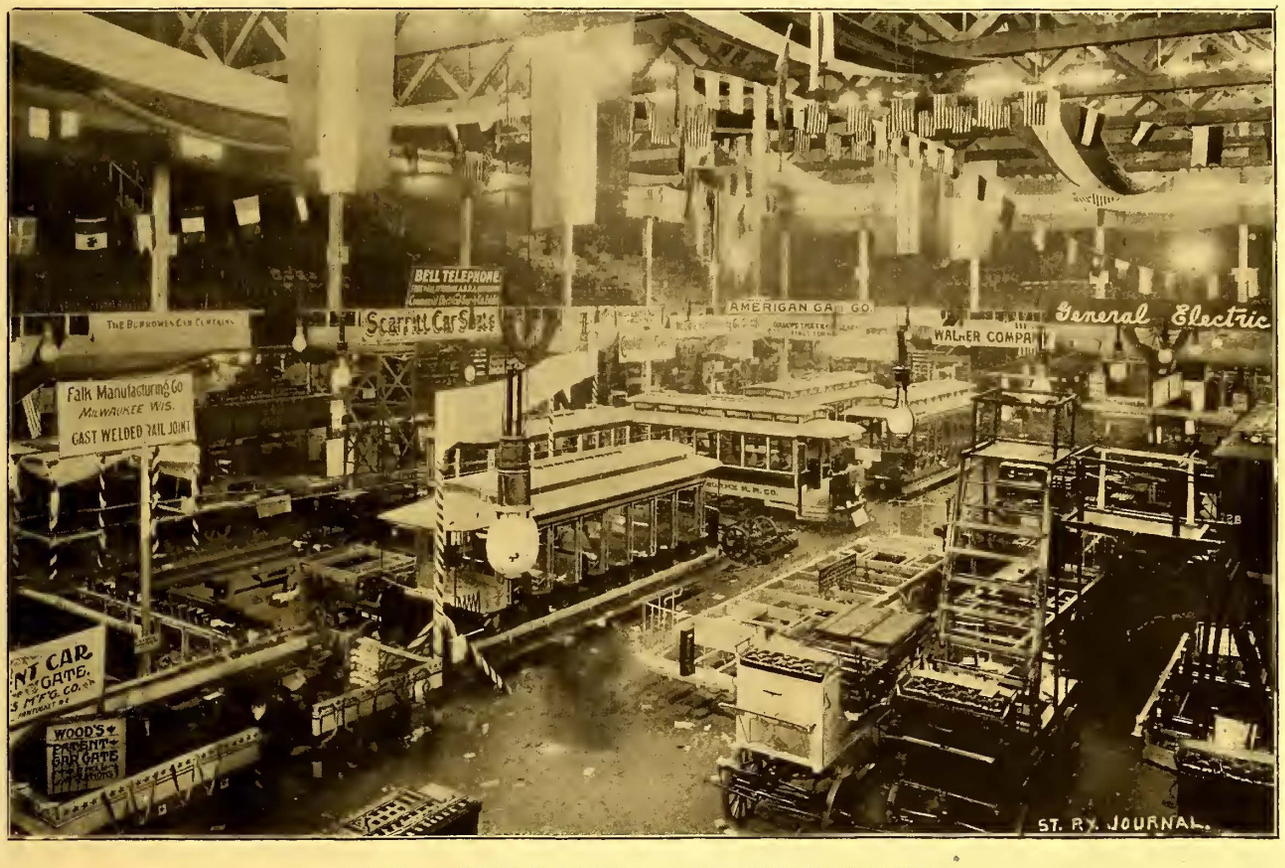
The John A. Roebling's Sons Company, of Trenton, N. J. made a specialty in its exhibit of the new Columbia rail bond recently put on the market by the company. Several rail joints were shown, equipped with this rail bond. Sections of the bond terminals in position in a rail web were also exhibited, as was the powerful clamp used in installing this bond.

Dillworth, Porter & Company, Ltd., of Pittsburgh, had an extensive exhibit of specialtsteel car axles of Glendon steel shown in the rough and finished, also two axles which had been submitted to tests to determine their strength, tie plates and soft steel spikes.

The National Lead Company, of New York, exhibited through its St. Louis agent a full line of material manufactured by it for street railway companies. This included white lead, string solder, babbitt metal bearings, paints, etc. The exhibit was very tastefully arranged and was one of the first to be put in order at the convention. Arthur Benzel, of St. Louis, had charge of the exhibit.

The Pond Machinery Company, of St. Louis, showed a complete line of the company's well known steam separators for electric railway and lighting plants. The company as the St. Louis representative of the Watertown Engine Company also showed a model of the Watertown engine governor and referred visitors to the operation of Watertown engines in the lighting plant of the exposition building.

The American Car Sprinkler Company, of Worcester, Mass., had on exhibition one of its electric sprinklers for street railways. This was in operation on the track immediately in front of the convention hall, and passed the hall at stated intervals which were published on a circular distributed by the American Car Sprinkler Company. Frank D. Perry, general superintendent of the company, attended the convention.



VIEW OF CONVENTION HALL FROM WESTERN GALLERY.

The representatives of the company in charge of the exhibit were A. Morrison, engineer, J. G. Miller, sales agent.

The W. H. Coe Manufacturing Company, of Providence, R. I., exhibited the gilding wheel for car builders and car paint shops described in our last issue. W. H. Coe was present and personally explained the operation of the device. It has been adopted by many of the principal car builders and steam railway corporations, as well as by several street railway companies.

The Billings & Spencer Company, of Hartford, Conn., was represented by W. B. Post and had an exhibit in connection with its Western agents, Bowers Brothers, and the Central Union Brass Company, of St. Louis, mentioned elsewhere. The commutator bars of this company are drop-forged from the best Lake copper, and the line exhibited at the convention attracted great attention.

The Morrell Electric Works, of St. Louis, showed samples of commutators, both in refilled and assembled forms. Their shop equipment for producing this work is most complete, and the company is prepared to execute orders for commutator work of every description, particularly for street railway motors. The company was represented by A. W. Morrell and W. A. Ferguson.

The Shickle, Harrison & Howard Iron Company, of St. Louis exhibited some splendid specimens of cut gears and blanks, and a large variety of truck and track material are made of open hearth steel. It also showed a car thrower for running a car from one track to another where there are no switches. Its representatives were J. M. Harrison, Jr., J. Daniels and Wm. Burow.

The Partridge Carbon Company, of Sandusky, O., had a complete exhibit of the well known Partridge self lubricating motor brushes. The exhibit was in charge of Arthur S. Partridge, of St. Louis, agent for the company, and B. S. Speer from the Sandusky office. A large variety of copper brushes from those suitable for the smallest motors up to the largest generators were shown, and attracted much attention.

The Babcock & Wilcox Company, of New York, was represented by Messrs. Ashburner and Bonner. The wide adoption of Babcock & Wilcox boilers made an exhibit of these boilers unnecessary. The representatives of the company found many users of Babcock & Wilcox boilers among the delegates and all of them seemed to be well satisfied with the results secured by them with these boilers in their power stations.

The R. Bliss Manfacturing Company, of Providence, R. I., made an exhibit of Wood's patent car gate which attracted much attention. The principal feature of this gate is that it can be easily locked in position, either open or closed, and when closed does not occupy any valuable space, and folds close against the side of the car. It has been adopted, according to a notice in the exhibit space of the company, by over fifty corporations.

Arthur S. Partridge, of St. Louis, being one of the active members of the Entertainment Committee, made no attempt at a special display beyond showing in a nicely arranged booth a few of the many first class specialties which he handles. He distributed

very liberally one of the most acceptable and handsome souvenirs at the convention in the way of a splendid memorandum book with the recipient's name printed in gold on the cover.

The Bradford Belting Company, of Cincinnati, made a display of its Monarch insulating paints through its St. Louis agent, Arthur S. Partridge. The souvenir of this company was a small glass barrel labeled "Monarch Insulating Paint," but the color and taste strongly suggested a fine old Kentucky Bourbon whisky. The company was well represented by Arthur S. Partridge, of St. Louis, O. M. Hubbard, of Cincinnati, and Elmer P. Morris, of New York.

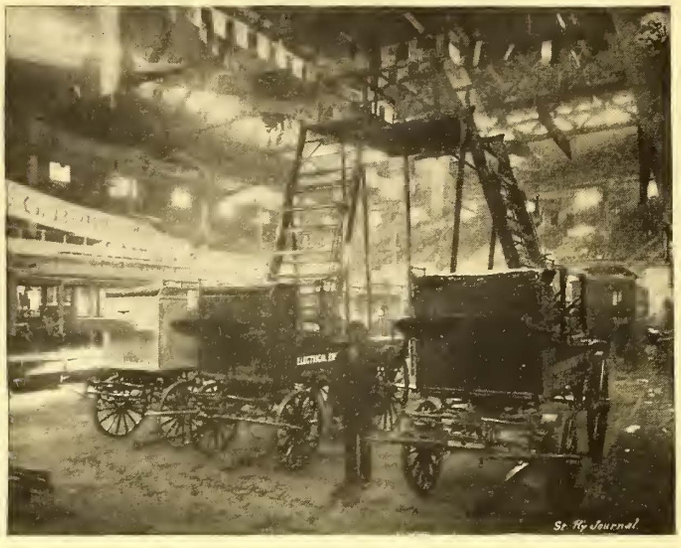


EXHIBIT OF IVES & M'CLERNAN.

The Taunton Locomotive Manufacturing Company, of Taunton, Mass., was represented by Messrs. Wendell and MacDuffie, of New York, and Edward P. Sharp, of Buffalo. The company distributed a number of attractive pamphlets illustrative and descriptive of the Taunton sprinkler and plow which have had a remarkable popularity during the past season. Messrs. Wendell and MacDuffie also represented the Rochester Car Wheel Works.

The Wells & French Company, Chicago, exhibited the Chicago truck manufactured by it for the Chicago Truck Company. In this truck the car body is supported on four levers pivoted over the journal boxes, making the car, it is claimed, a non-oscillating one. The Wells & French Company was represented by O. W. Meysenberg, T. A. Fraser, and E. F. Carry, Jr. The Chicago Truck Company was represented by O. W. Meysenberg and E. A. Curtis.

The Electric Insulating Paint Company, of St. Louis, made a very creditable display of its insulating compounds which were put up in one, three or five gallon cans, also in half barrels and barrels. This compound is for use anywhere that insulation is needed, principally in the winding of armatures and fields, and is employed by a large number of the street railway companies of the country. The company was represented by Louis Honig and S. J. Stein.

The Security Bank Note Company, of Philadelphia, showed a full line of samples of tickets manufactured by it for street railway companies. Among those whose tickets were shown was the Columbus Street Railway Company, Metropolitan Railway Company, of Washington, D. C., and the trustees of the New York and Brooklyn Bridge. The company also engraves bonds, and judging from appearances, its work seems to be of a very high character.

The Consolidated Electric Purifier Company, of Chicago, exhibited one of its electric feedwater purifiers. The operation of this purifier depends upon electrolytic action, as the water is made to pass through a series of electric positive and electric negative plates which separate the objectionable ingredients from the water. The president and general manager of the company, C. E. Whitmore, was present and explained the operation of the heater to many attendants.

The Safety Insulated Wire & Cable Company, of New York, was represented by Lieut. E. J. Spencer. The company has installed a large amount of underground feeder cables for electric railway companies in Boston, Chicago, Philadelphia and other cities, and as many miles of underground feeder cables promise to be laid by railway companies during the next year, Lieutenant Spencer was kept busy in explaining the merits of the Safety armored insulated cable for this service.

The Gold Street Car Heating Company, of New York, exhibited both its electric and hot water heaters in operation. The latter were arranged in the rear of the space of the company and are, of course, specially suitable for cable cars. The electric heaters were of both the individual and panel type for longitudinal or cross seats, the panel type of heaters being shown arranged either to be placed inside or outside of the panels. E. H. Gold, of Chicago, cared for the interests of the company.

D. P. Shields, of St. Louis, showed his new automatic fender arranged to cover bumper and drawhead and with sliding gates in top and bottom sections of the fender, so in case of a breakdown it is possible to pull the drawbar through to couple with another car. This fender was patented May 14, 1896. The fender is arranged with push rods which extend slightly in front of the fender platform. When these strike an object a trigger is thrown which drops the platform to the level of the rail.

The Safford & Moore Railway Jack Company, of Chicago, exhibited two new styles of jacks, one for track work and one for power houses, the difference being that that for track work was arranged to trip when the shaft was raised to a certain height, the other being automatically lowered by the lever. The direction of movement of the load was reversed by the action of the pawl at the side. M. M. Moore, vice-president of the company and patentee of the jack, and M. W. Williams, secretary and treasurer, were present.

The Lombard Hydraulic Brake Company, of Portsmouth, Mass., exhibited one of its new hydraulic brakes for street cars in connection with the Steel Motor Company, of Johnstown, Pa. The brake operates by oil kept under a pressure of compressed air, the compressor being geared to the motor axle. The brake, which was shown in operation, seemed to be very efficient and was constantly surrounded by interested spectators. The exhibit was in charge of Homer M. Daggett, Jr., S. W. Lombard and N. Lombard.

The Mark Railway Equipment Company, of Chicago, showed a large variety of its rail chairs, rail joints, tie plates, brace plates, brace chairs, pole arm hangers, cable track joints, rail joints, etc., for all of the different standard sizes of rails in common use. The exhibit attracted much attention from all who inspected it. The company was well represented by C. E. Mark, inventor of the joint, J. K. Rogers, of Rogers & Baldwin, the company's Eastern agents, and C. F. Parsons, of Cleveland, the company's Ohio representative.

K. McLennan & Company, of Chicago, was ably represented by M. J. Isaacs. The exhibit consisted of the celebrated Gale's commutator compound which is guaranteed to prevent sparking and cutting of the commutators without gumming the brushes. The company gave out at its exhibit a large number of samples, and results reported from trials in St. Louis power stations seemed to justify the strong claims made for this compound. Mr. Isaacs reports that the company will continue to send out free samples on request.

The H. B. Camp Company, of Aultman, O., made an exhibit of its vitrified clay conduit which has come into universal use in street railway work for underground feeder wires. The Metropolitan Railway of Washington, D. C., has put in some 80,000 ft. of this conduit for its feeder wire system. The People's Traction Company of Philadelphia, and the Union Traction Company of the same city are using over 1,000,000 ft. and other large roads are using it in large quantities. The company was represented by A. L. Daniels.

EXHIBITS OF J. T. M'ROY, DE STAEBLER FENDER AND K. M'LENNAN & CO.

The Contra-Twist Door Opener Company, of Wilmington, Del., exhibited, on the special car of the Jackson & Sharp Company, a novel method of connecting double sliding doors. It consisted, essentially, of a shaft with threads in opposite directions, on which were two nuts connected to the top of the doors. The pitch of the thread was necessarily very great, so that the doors will open rapidly. It seemed an ingenious and desirable method of operating double sliding doors. Geo. E. Pratt, of Pittsburgh, Pa., explained the operation of the device.

The Paige Iron Works, of Chicago, was represented by Alonzo W. Paige, the president of the company, and E. S. Nethercut, chief

engineer. They showed specimens of their work in girder and T rail. A new feature of this exhibit was the derailing device to be used at steam railway crossings and drawbridges. This device was illustrated in the October issue of the STREET RAILWAY JOURNAL. The very handsome silk banner this company used to indicate its location was carried by its men in the Sound Money parade on Chicago Day, Oct. 9.

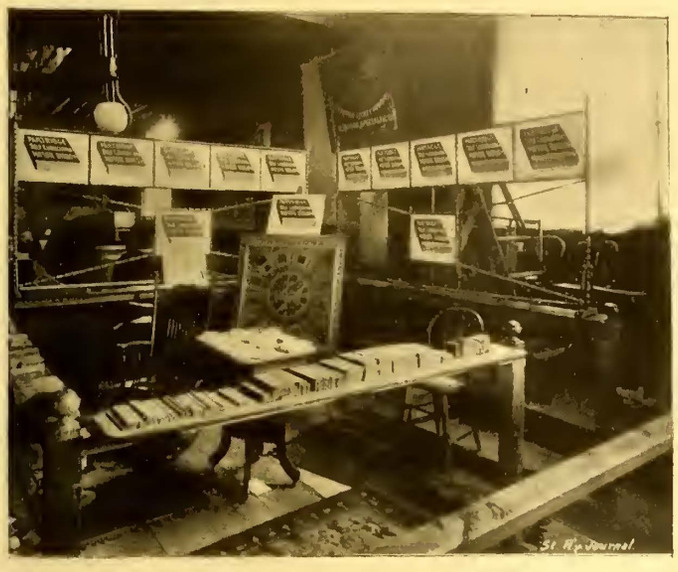


EXHIBIT OF THE PARTRIDGE CARBON CO.

The Hale & Kilburn Manufacturing Company, of Philadelphia, Pa., exhibited four of its seats for center aisle cars. The seats were in different types manufactured by the company, the "walk-over" type attracting particular attention. The seats were upholstered in both cane and plush. Much interest in the construction of the seats was manifested by attendants at the convention, particularly in the arrangement of the springs upon plate metal links which prevents the upholstery from working through the rattan and in the form of rattan cover.

The Meaker Manufacturing Company, of North Chicago, was on hand as usual with an exhibit showing stationary and portable registers, also a line of overhead material entirely different from anything heretofore placed on the market and for which this company claims more points of merit than ever before combined in this class of goods. There was an unusual demand for the company's souvenir which was a miniature trolley wheel and harp prettily adapted as a charm which seemed to strike everyone as just the thing he wanted.

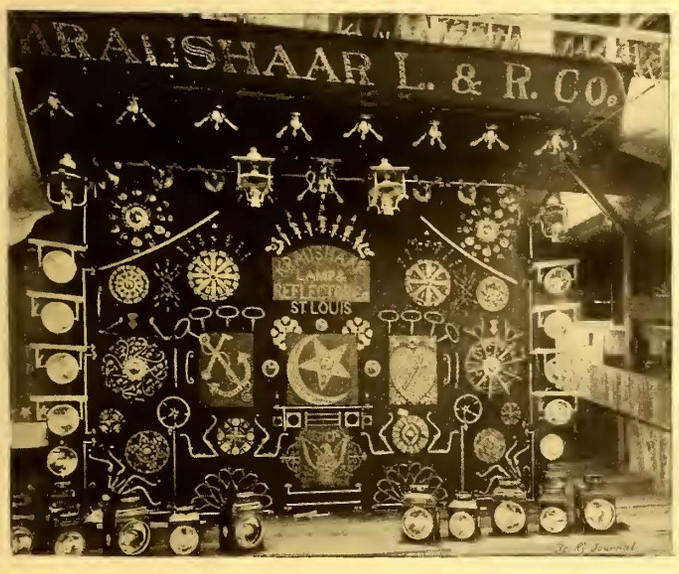


EXHIBIT OF KRAUSHAAR LAMP & REFLECTOR CO.

The White-Crosby Company, of New York, was represented by H. H. Harrison. The exhibit made, while not large, attracted a great deal of interest. It consisted of the upper part of one of the standard poles used in the power transmission line between Niagara Falls and Buffalo, installed by the White-Crosby Company. The pole was fitted with cross arms which carried several of the insulators adopted for this line, which will carry a current at 10,000 volts and which are designed for currents of 20,000 volts. Much interest was manifested in this pole.

The Electric Storage Battery Company, of Philadelphia, had a large delegation present at the convention in the persons of Messrs. Condict, Lloyd, Williams and Arnold. Messrs. Condict and Arnold are the engineers of the Chicago & Englewood Electric Railway, now being equipped with storage battery cars, and much interest was manifested by attendants at the convention in the work of this company, which will be the largest electric railway storage battery plant ever put in operation in this country. The station will also possess a number of novel features.

Elmer P. Morris & Company, of New York, were represented by Elmer P. Morris, one of the best known men in the street railway fraternity. As agent of the Bradford Belting Company, Mr. Morris had much to say about the merits of the Monarch compound and distributed as souvenirs of the convention small bottles of internal paint. Mr. Morris also represented the McClellan patent combination angle brace and the Simplex Interior Telephone Company, of Cincinnati. The latter has recently established an exchange system on the Youngstown (O.) road.

The Elliott Frog & Switch Company, of East St. Louis, Ill., exhibited models of its Eureka spring rail frogs, for main line crossovers. This spring frog gives a clear main track, avoiding jar. The improved switch of the company operated by a new movement, was also shown, as was a frog provided with a removable tongue. The tongue can be taken from the frog without disturbing the ties. All wearing parts are of solid steel. The Doddridge clamp joint was also shown. R. E. Einstein was the company's representative at the convention and explained the novel features of the apparatus.

The Jackson & Sharp Company, of Wilmington, Del., had an exhibit of one of its vestibuled combination cars in operation outside the hall, on the Springfield line. The car was mounted on Peckham No. 14 double trucks, and was fitted with Hunt air brakes. It ran between the Planter's Hotel and the convention hall and carried many delegates, who spoke in the highest terms of its beauty, finish and excellent riding qualities. The Jackson & Sharp Company has built a large number of cars for interurban work, and this one promises to form a type which will be very popular in the future.

EXHIBITS OF SHICKLE, HARRISON & HOWARD AND SARGENT CO.

The Standard Paint Company, of New York, had a prominent exhibit in the space of the Commercial Electric Supply Company, of St. Louis, its St. Louis agent. The striking exhibit of this company was the means of attracting many visitors to its space and all had a favorable word to say about the merits of P. & B. The representatives of the company present were J. C. Shainwald and C. D. Jones, of Chicago, and R. J. Redick, of St. Louis. The exhibit not only included samples of P. & B. paint and insulating compound, but of the new P. & B. motor cloth manufactured by the company.

W. W. Doty & Company, of Chicago, exhibited an electric track switch. The switch consists of a double solenoid motor and a current reversing switch, all contained in a box under the switch tongue, 18 ins. × 36 ins. in size. No special devices are required on the car to operate the switch, the usual method of insulating a short section of track before the switch being employed. The motorman can then control the switch by passing on to this section with the current on or leave it in its previous position by passing on to the section with the current off, as he desires. W. W. Doty was present.

The Adams & Westlake Company, of Chicago, Ill., made the principal features of its exhibit, its new No. 7 ball bearing ratchet brake handle, and its Acme curtain fixtures. The brake handle is not only ball bearing, making it very easy to turn, but is also springless and noiseless. The ratchet works by gravity, and as an old style brake handle was placed close to the new form, the difference between the two could be readily appreciated. The following gentlemen in behalf of the company attended the convention: F. B. Jones, L. A. Gray and W. S. Bartholomew, all of Chicago, and H. E. Keeler, of New York.

The Sargent Company, of Chicago, made an exhibit of its "Congdon" and "Compo" brake shoes. The "Compo" shoe is made of special cast iron with plugs of seasoned spruce wood forced into pockets in such a manner that they cannot come out. The "Congdon" shoe is of soft cast iron with wrought iron inserts. They give practically the same friction as ordinary cast iron shoes, but, it is claimed, wear much longer and cost but little more. The

Sargent Company has an enormous brake shoe trade on steam roads and is building up a large trade with electric roads. E. L. Adreon, Jr., represented the company.

The Trojan Button Fastener Company, Troy. N. Y., exhibited the Ham sand box recently drawn out by it. The box consists of two boxes set side by side. The larger box is a storage reservoir with an opening through which the sand flows into the second

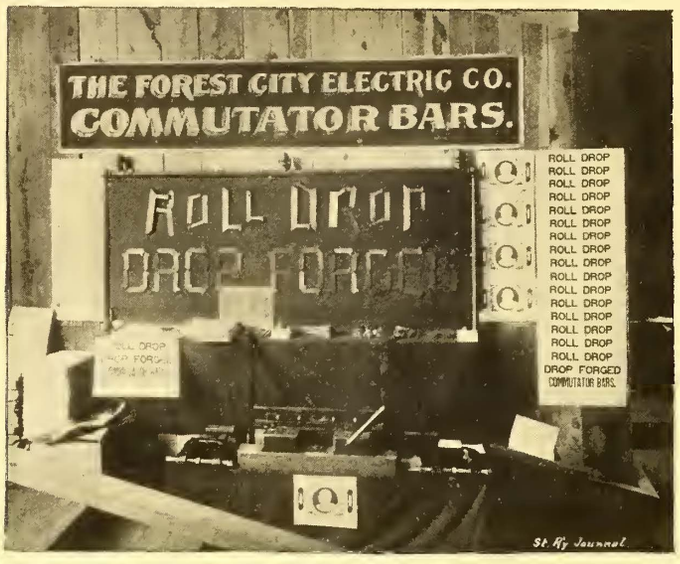


EXHIBIT OF FOREST CITY ELECTRIC CO.

which is in reality only a curved shelf with upturned edges. A paddle reciprocates over this shelf and each movement of it pushes the sand over the upturned ends of the shelf to the feed spout which leade to the track. It will be seen that the operation box really consists of dipping the sand out of the top of the box and feeding a small quantity at a time. R. T. Ham was present.

Limburg, Sickel & Company, sole agents for the Trenton trolley wagon for the patentees and manufacturers, McCardell, West & Company, exhibited one of their trolley wagons for overhead line construction. The tower in this wagon is telescopic in construction and when lowered occupies but little room on the street. The upper part is raised by a crank and windlass and can be locked with the tower at any height. When the desired height of the tower is reached, the platform can be revolved in any position desired and can then be set. The body of the wagon was painted a rich maroon. J. R. McCardell represented the company.

EXHIBIT OF ST. LOUIS CAR WHEEL CO.

The Devlin Street Car Brake Company, of Memphis, Tenn., was represented by A. S. Buchanan and E. Prouty. It had on exhibition a model of the Devlin brake and referred to cars on both the Lindell and the Suburban roads in St. Louis, where these brakes were in practical operation. The principal points claimed for this brake are economy of construction, absolute prevention of flat wheels and quick stops. The company claims to be able to stop a car running at the rate of twenty miles an hour within the car's length. A novel feature of the brake is the combination of the rail and wheel shoes, both acting together on the wheel and rail.

The Electric Railway Equipment Company, of Cincinnati, O., was unable to make its intended exhibit, owing to sickness in the family of S. J. Wick. The company, however, was worthily represented by E. P. Morris, New York agent, and by W. R. Mason, of the Mason Electric Equipment Company, Chicago agent. This company is making a specialty of electric railway supplies, and its manufacturing facilities are such that it is enabled to furnish everything used either for the equipment or maintenance of such roads. The most careful and exhaustive tests for strength and insulation are made, and as a result the company is enabled to guarantee all material.

The Leonhardt Wagon Company, of Baltimore, occupied a conspicuous space in the hall with an exhibition of three of the company's revolving tower wagons for overhead construction. One was shown with the tower raised, another with the tower partly raised and the third with the tower completely lowered. In this way visitors could easily see the compactness of the wagon and equipment when the tower was not in use; also the ease with which the tower could be revolved, set at any angle and manipulated. The representatives of the company present were Wm. M. Ives and R. H. McClernan, of the firm of Ives & McClernan, who have taken the exclusive agency for this tower wagon.

The Taylor Electric Truck Company, of Troy, N. Y., was represented by both Mr. Taylor and A. T. Reynolds, foreman of the truck works. The company showed one of its latest designs in single trucks with all of the most recent improvements adopted by the company and also a set of the Empire State radial trucks, one arranged to receive two motors on one truck, and the other for one motor on each truck. Another part of the exhibit which attracted

EXHIBIT OF NEW YORK CAR WHEEL WORKS.

no little favorable comment was a new design of half elliptical spring with swinging shackle over the journal boxes. This was examined with a great deal of care by a number of street railway managers who spoke in the highest terms of it.

The St. Louis Car Company, of St. Louis, Mo., exhibited in the main portion of the convention hall a standard truck which attracted much attention. The truck was equipped with a Verstraete electric brake and as the truck was blocked up so that the wheels could be revolved the brake and equipment could be seen in operation. The speed with which the wheels could be braked up by means of this device, which is described elsewhere, attracted universal admiration. Many of the attendants at the convention took the opportunity of visiting the extensive works of the St. Louis Car Company and seeing the practical construction of cars as carried out by the company's workmen.

The Western Telephone Construction Company, of Chicago, exhibited 100-drop switchboard, with latest improved type of telephone for central station work, also a power generator adapted to be driven by water motor or other small motor for operating the bells. Photographs were shown of recent stations installed by the company in Ft. Wayne, Ind., and Richmond, Va., both with 1500-drops. The company recommends its system for street railway companies desiring a dispatching system and has recently installed a complete system for the Union Traction Company, of Philadelphia, and Metropolitan Railway, of Chicago. The representative of the company in charge of the exhibit was Chas. P. Platt.

Ford & Bacon, of New York, Philadelphia and New Orleans, exhibited in connection with the American Car Company, one of

a lot of twenty cars recently built by the latter company for the Canal & Claiborne Railway Company, of New Orleans, of which Messrs. Ford & Bacon were the engineers. The car is more particularly referred to in the description of the exhibit of the American Car Company. It was built from specifications drawn up by Messrs. Ford & Bacon. Much attention was also attracted by a pamphlet recently written and published by Mr. Ford on the effect of the free silver movement upon the condition of street railway employes. A number of these pamphlets were at the convention.

The Manhattan General Construction Company, of New York, was represented by the Creaghead Engineering Company which exhibited a number of the Manhattan lamps in various types and patterns. There were shown in continuous operation five of these lamps in series on the regular street railway circuit, the lamps being an enclosed arc, and one pair of ½ in. carbons will burn 150 hours. These lamps were all of the nominal 2000 c. p. type. The company also showed a standard lamp for 110 volt direct current and its Junior lamp for the same voltage, also its new alternating current lamp which attracted more than usual attention. Its souvenir, which was a warranted cure for snake bites, proved very popular.

EXHIBIT OF HEINE SAFETY BOILER CO.

The Standard Underground Cable Company, of Pittsburgh, Pa., was well represented by J. R. Wiley, manager of the Chicago office, and Frank Clark Crosby, superintendent of construction. The company had an attractive exhibit, showing principally samples of its cables and feeder wires for both electric light and railway service. The insulation used was paper, rubber and fibre. The samples were arranged in a rack and were of all sizes. In the rear of the booth was also a large reel of 500,000 c. m. cable. The company had a large number of catalogues and price lists for distribution, and also a souvenir in the form of cardboard which showed, in an ingenious way, the fundamental laws of electric power transmission.

The Electric Mutual Casualty Association, of Scranton, Pa., made no regular exhibit, but was represented by the secretary of the Association, Newton Jackson, the president, W. B. Rockwell, treasurer and general manager of the Staten Island Midland Railway Company, Chas. H. Stoll, president of the Lexington (Ky.) Belt Electric Line, Dr. John McFayden, of the Chester Traction Company, Chester, Pa., and Wm. W. Wharton, general manager of the Scranton Manufacturing Company, both directors of the Association. Mr. Jackson had for inspection a number of testimonial letters from members of the Association speaking in the highest terms of the purposes of the Association and the benefits conferred by it.

The Jewell Belting Company, of Hartford, Conn., had an exhibit in the northern part of the hall. Attention was attracted to the exhibit by a sign directly over the space occupied by the company on which it was announced that the Jewell Belting Company had constructed the largest belt in the world. This belt was 118 ft. long, 78 ins. wide, 1 in. thick, 4 ply, weighed 3208 lbs. and was supplied to the Washburn & Moen Manufacturing Company, of Worcester, Mass. In the exhibit proper a number of reels of belts were shown illustrative of the types manufactured by the company. The company distributed a handsome printed pamphlet giving engravings of a number of station interiors showing belts in operation. C. E. Newton was present.

The Hunt Air Brake Company, of Pittsburgh, Pa., had an object lesson of the value of its air brake system in the equipment of one of the long cars used on the Springfield electric line, of St. Louis. This car, which was of the Jackson & Sharp make, and was mounted on Peckham trucks, was operated between the Planters' Hotel and the convention hall. The opportunity of riding on this car and watching the operation of the brakes was improved by many visitors, and many commendations were made of its smoothness in working. The company's representatives, General Manager George E. Pratt and H. E. Hunt, received many congratulations upon the eminent success with which the details of the brake seem to have been worked out.

J. M. Atkinson & Company, of Chicago, made a very attractive exhibit of their horseshoe rail bond. Their display card was freely distributed, stating that this was not a gold bond, but bears a big interest in gold. Everybody was studying the money question through the X-ray souvenir given out by this company. The company reports that the demand for the horseshoe bond is gaining rapidly in popularity. J. M. Atkinson & Company took a number of orders for bonds at the convention. The company also showed its Buda pattern of track drill, which is meeting with great favor with practical street railway men. The company was represented by J. M. Atkinson and F. W. Atkinson, of Chicago, A. H. Englund, of Philadelphia, and S. B. Condit, of Boston.

The Exhibit of the Falk Cast Welded Joint was visited by nearly every street railway man present at the convention and the interest shown therein promises large business for the future. Street railway men are now becoming convinced of the practicability, both mechanically and electrically, of this joint, and the recent testimony of some of the most prominent street railway managers of the company in its favor, together with the excellent records made by the joint in St. Louis, promise to increase the adoption of the joint in the country. This convention has been the means for the best advertisement the cast welded joint could secure. All managers who have had the welded joint in use were free to recommend it to their colleagues, and the result was that further new contracts were made.

The Creaghead Engineering Company, of Cincinnati, O., made an extensive exhibit of its various specialties, including its overhead line material, malleable iron cross arms and a full line of iron pole fittings. The flexible brackets were shown in a variety of patterns. These brackets have become standard on suburban high speed roads and where center pole construction is used in cities. The Lindell system, of St. Louis, is equipped throughout with them, and attracted considerable attention from the street railway men in attendance. The exhibit of the company was very complete and nicely arranged, attracting universal attention. It was in charge of G. R. Scrugham. The souvenir of the company was much sought after, and was distilled in the celebrated Kentucky blue grass region prior to 1880.

The Broderick & Bascom Rope Company, of St. Louis, placed its big "jumbo" wagon on the terrace near the main entrance to the exhibition hall. The wagon was built expressly for hauling the enormous cables manufactured by this company. The wheels are twelve inches wide, the axles are of steel, six inches in diameter, and the weight of the wagon is 14,000 lbs. On the wagon was a large reel showing a duplicate sample of a cable sent to the Metropolitan Traction Company, New York City. This cable is 33,200 ft. long, 1½ ins. in diameter and weighs 135,000 lbs. In hauling this wagon four horses are driven abreast, and as many as fifty-six horses have been used in hauling one of these big cables. To the rear of the wagon were fitted two hydraulic jacks arranged for immediate use should the wagon strike an unsafe spot in the street.

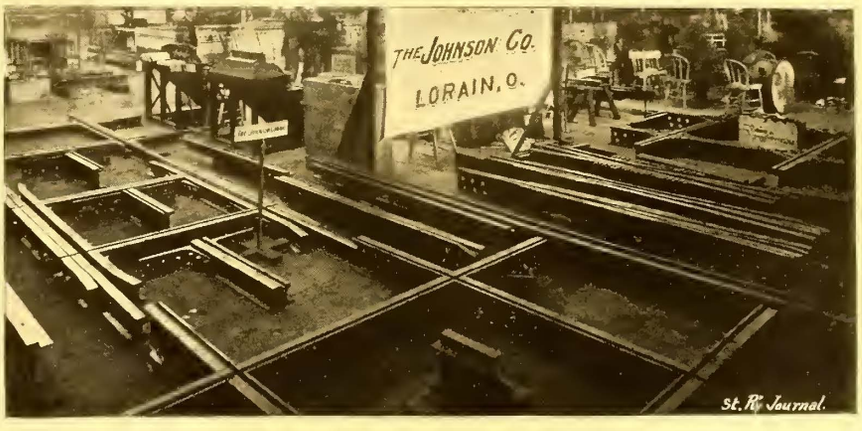


EXHIBIT OF JOHNSON CO.

The Kraushaar Lamp & Reflector Company, of St. Louis, made one of the most attractive and artistic exhibits ever seen at a

convention. The company is an extensive manufacturer of metal car trimmings of every description and these were so combined as to form beautiful scrolls, shields, anchors, stars and crescents, an eagle and other designs all mounted on a black background twenty-five feet square, and all arranged in a most artistic manner. The company also showed the St. Louis reversible electric headlight, oil headlights, car center and end lamps, electroliers, reflectors, etc. It is also the exclusive manufacturer of the Kling ratchet brake handle which was also shown. This is the latest improvement in

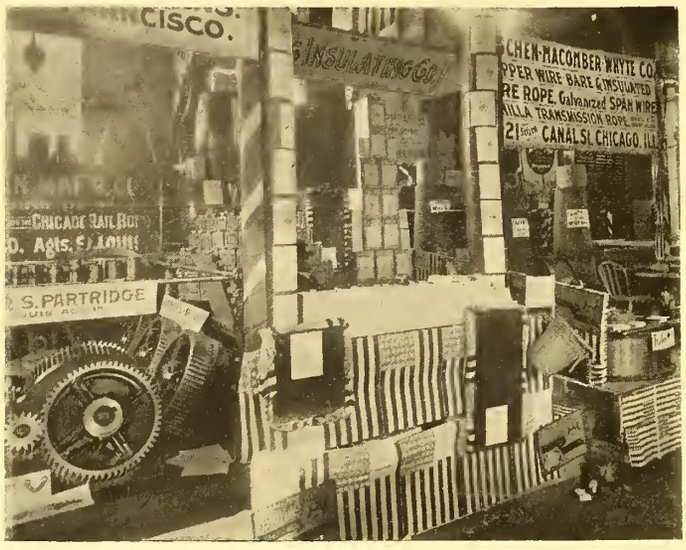


EXHIBIT OF ELECTRIC INSULATING CO.

the Kling pattern, and is having a very large sale. Its representatives were C. F. Kraushaar, Al. Mynders and Garson Myers, of Chicago.

The Ohio Brass Company, of Mansfield, O., made an exhibit of hanger bodies of all the standard forms and certain special designs of hangers. One of the new features was a full line of fittings for the figure 8 wire of which the company has sold some 150 miles of fittings this season in the No. 000 size. A variety of strain insulators in the globe form and other shapes were also shown. Another feature was the well known flexible pole brackets. An insulator strictly applicable for roads in coal mines attracted attention. The company reports a large business in bell metal bearings for motor and axle bearings, some splendid specimens of which were shown. A large variety of trolley ears and clamps was also exhibited, also adjustable track brush holders and all shapes of track brushes, over-

EXHIBIT OF CONSOLIDATED CAR HEATING CO.

head crossovers and trolley splices. The company was represented by C. K. King and A. L. Wilkinson.

The Hunter Fender Company, of Cincinnati, showed one of its automatic fenders on an American car. This fender has been adopted by the Cincinnati Street Railway Company, the Cincinnati & Covington, and the White line and People's line of Dayton, and on these lines it has justly proved itself a life saver, in fact, not even a limb has been broken with this fender. The company took quite a number of trial orders from some of the largest Eastern roads. Lytle Hunter, the president, who represented the company, showed one of his latest inventions which was an illuminated sign placed on top of the hood of an American car. This sign is made so as to rotate and indicate the destination of car plainly either day or night. This seems to be one of the best things brought out this season and attracted more than usual attention from street railway people. A number of sample orders were taken for these signs.

The Phœnix Carbon Company, of St. Louis, was represented by Col. S. G. Booker and Henry L. Page. The company displayed samples of its motor and generator brushes, battery material and carbon specialties, which have become justly celebrated throughout the country by all users and experts. The company's souvenir demonstrated its ability to produce from carbon a product as fine in its appearance as it is in its electrical quality, and shows that carbon is susceptible of as high a degree of finish as if the same shape were made of metal. The company's carbon souvenir was a carbon medal, with a Phœnix bird in relief on one side and a street car on the other. The company also presented a very handsome souvenir in the form of a paper weight, showing a fac-simile of its well known motor brush. The company reports good business right along, and in many of its departments is weeks behind with orders.

The Mark Railway Equipment Company, Chicago, made an extensive exhibit of its track specialties, consisting of rail joints, brace plates, tie plates, pole arms, etc. This exhibit embraced a variety of rail sections, fitted with its different styles of brace plates and rail joints. This company is meeting with phenomenal success and is equipping some of the most prominent street railway lines with its goods. It has received some very flattering testimonials from different roads that have used its line of equipment, many of whom have used them for the past four years or more. The brace plates and rail joints of this company have long since passed through the experimental stage and are now almost an absolute necessity in the construction and maintenance of a first class roadbed. This company has assurances for a large business during the coming year. It was represented by C. E. Mark, of Chicago, and J. K. Rogers, of Rogers & Baldwin, New York City.

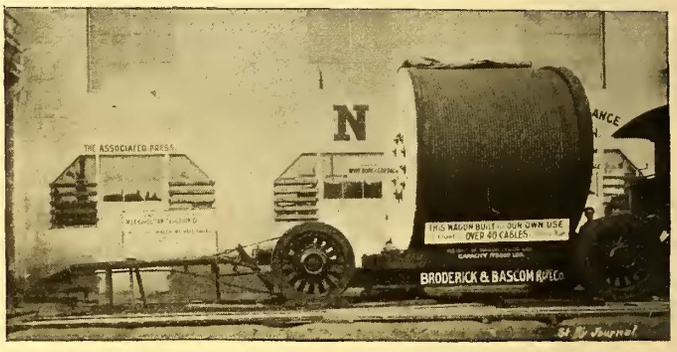


EXHIBIT OF BRODERICK & BASCOM ROPE CO.

The Commercial Electric Supply Company, of St. Louis, made a display that would have done justice to the World's Fair. Its space was large and was elegantly arranged and lighted. Samples of goods and appliances from the various companies which it represents were tastefully displayed, and represented the Bryant Electric Company, Clifton Manufacturing Company, Electrical Engineering & Supply Company, Holmes, Booth & Hayden, Hugo Reisinger, India Rubber & Gutta Percha Insulating Company, Pass & Seymour, Perkins Electric Switch Manufacturing Company, W. T. C. McAllen, Western Electric Company, Wagner Electrical Manufacturing Company, A. O. Schoonmaker, St. Louis Car Heating Company, the Miller rail bond and the Standard Paint Company. The company was represented by Jos. Franklin, Jr., Paul D. Cable, V. E. Raggio and Jas. O'Brien. The souvenir was a bottle of amber colored liquid of high potential, used as a booster.

The Diamond Truck & Car Gear Company, of Kingston, N. Y., had one of the most tastefully arranged and attractive exhibits in the convention hall. The principal object shown was one of the company's 5 A Diamond trucks for single truck cars. It was painted a light gray, and its peculiar form of side bars, which make two diamonds, seemed to meet the approbation of those who inspected the truck. The space occupied by the company was decorated with potted palms and surrounded by a fine rope railing. The company's apparatus was also represented in the exhibit of the General Electric Company, where there was a single Diamond truck equipped with General Electric motors and supplied with Hyatt roller bearings. The company was represented at St. Louis by Mr. Wilkinson and W. H. Ten Broeck, and its exhibit was critically examined by the delegates present, who expressed many favorable comments on the design and construction of the truck.

The Sterling Manufacturing & Supply Company, of New York, was represented in the portion of the building devoted to the exhibition of registers, and while the exhibit made by it was not extensive, it made up in quality what it lacked in quantity. The exhibit consisted of four registers, mounted on a graceful white pedestal. Two of the registers were of the numeral and two of the dial type, and one of each type had its cover removed so that the operation of the register in service could be easily inspected. Models of the Sterling Brake, the invention of Thomas Millen, master

mechanic of the Broadway Cable line, New York, were also shown. This brake is the standard of the Metropolitan Street Railway Company of New York and is being adopted by a number of prominent street railway corporations. J. J. Kennelly, superintendent of the company's works, had charge of the company's exhibit.

The National Air Brake Company had an exhibit in the convention hall in connection with the American Car Company. One of its improved axle geared compressors with complete air brake system was installed on one of the closed cars in the exhibit of the American Car Company. This compressor is not driven continuously, but is so arranged that it is in operation only when needed to maintain the pressure in the reservoir, and it is only thrown into connection with the axle while the car is coming to a stop. In this way no electric power is used, and hence there is no consumption of current for braking purposes. The compressor is encased entirely and runs in a bath of oil. The pipes are not carried to the controller handle, but terminate just below the platform in a valve which is operated by a shaft by the motorman. The exhibit of the company was well cared for by John Nef, of New York, treasurer of the company, and F. W. Olin, of St. Louis, one of the directors.

The Columbia Machine Works, of Brooklyn, had an exhibit, which though small, was of considerable interest. This concern manufactures a variety of specialties for electric railways, including car trimmings, commutators, and commutator bars, ratchet brake handles, reversible armature bearing linings, etc. J. G. Buehler represented the company. One of the most striking of the appliances shown was the interchangeable armature bearing lining. This invention is designed so that it can be reversed and when worn out can be removed and replaced by a new one. A self oiling trolley wheel and the patent controller handle of the company were also shown. This latter is so designed as to take up any wear which there may be on the controller spindle, thus making the handle tight fitting. Unfortunately the company did not have a very favorable space for its exhibit. As it was, however, those who inspected the objects shown were well repaid for the time occupied in so doing.

M'GUIRE SNOW PLOW AND SWEEPER.

The Safety Car Heating & Lighting Company, of New York, whose system of Pintsch gas has been adopted on a majority of the leading steam railroad lines and which is coming into more extended use on street railway cars, had a very ornamental, though small exhibit near the main entrance. In a canopy supported by pillars of old Colonial architecture, the company showed four chandeliers burning Pintsch gas. Two of these were Argand burners and two were of the four burner flat flame type. The company claims that the gas is the best illuminant for electric cars, as there is no flickering such as is common with electric lights when the motors are turned on or off. Outside of the hall visitors to St. Louis had a chance of inspecting the operation of the system in the cars of the Olive Street line. The company was well represented at the convention by Wm. St. John, from the New York office, C. H. Howard, of the St. Louis office, and G. N. Terry, of the Chicago office.

The M. M. Buck Manufacturing Company, of St. Louis, had an attractive display of headlights, motor and grip car lamps of every description, car trimmings, track tools of all kinds, and miscellaneous electric railway supplies. The M. M. Buck Manufacturing Company is one of the largest street railway supply houses in St. Louis and acts as manufacturers' agent for a number of prominent electric railway supply houses. In the center of the space occupied by the company was a full line of Joyce jacks and at the back of the space a number of Shelton oil filters, several of the Buck patent curtain attachments, and a large line of engine room supplies, car trimmings, etc., arranged in a tasteful way. The company also acts as agent for Chas. A. Schieren & Company in the sale of Schieren belts, for the Verona Tool Company, for the Union Manufacturing Company's trucks, Rainbow rubber belting, etc. The company was represented by A. H. Hamblan, E. W. Hamblan, Leigh Moyle, C. E. Robidoux and W. T. Donovan.

The Heine Safety Boiler Company, of St. Louis, had one of the most interesting exhibits at the convention. The principal object was a fifty horse power Heine water tube boiler. This was painted gold and as the back of the booth and sides were draped in dark blue bunting, with gold stars, the boiler was a very prominent object in the hall. On a table in front of the boiler was a complete working model of the larger sizes of Heine boilers. The ease with which the boiler pipes can be cleaned by the simple removal of a header, the circulating system of the boiler, etc., were easily seen.

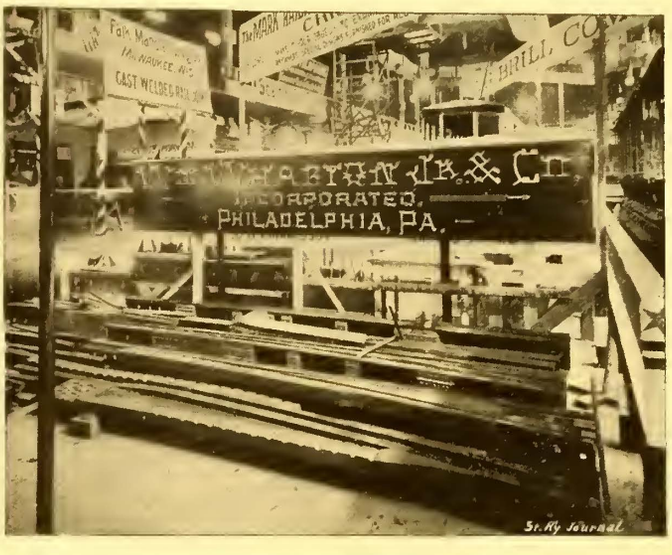


EXHIBIT OF WM. WHARTON, JR., & CO.

A 250 h. p. boiler head was also shown. The representatives of the company present were Col. E. B. Meier, Russell Walker, D. S. Merton and Adolphus Meier. As a souvenir of the convention, the company presented to the visiting delegates an aluminum pocket piece of the size of a dollar. On one side of this piece was a representation of Helios, on the other was an engraving of the boiler. The company also distributed its book on steam boilers entitled "Helios."

The Brussels Tapestry Company, of New York, had a tastefully arranged exhibit, showing car curtain materials of every description, including the famous Brusselette, which has met with a large demand, and car curtains and shades of wide variety. The company's representative, W. S. Calhoun, who is manager of the railway department, explained that Brusselette had been found by experience to be a very desirable material for the purpose to which the company is applying it. It has the qualities desirable in a street railway car curtain or shade; that is, it is waterproof, it holds its color well, is pliable, and the action of the sun has no effect upon it. The company manufactures a self-adjustable curtain fixture, the great advantage of which is that it is perfectly automatic. No pinch handles or cables are required to operate it and the shrinking or

EXHIBITS OF STANDARD AIR-BRAKE CO., MEAKER MFG. CO., AND NEW HAVEN CAR REGISTER CO.

swelling of the posts in an open or closed car will not prevent it from working freely. The company had a number of frames in which these curtains were shown, and exhibited a wide variety of patterns in wool terries.

The Kinzer & Jones Manufacturing Company, of Pittsburgh, Pa., showed a large variety of its patent brake shoes. Among the shoes shown were some which had been in service for thirty-three days on the Pittsburgh, Allegheny & Manchester Traction Company and they were only half worn out. The wearing part of the shoe is a special compound of cast iron borings, rosin, sawdust, plumbago, linseed oil, this compound being held in an iron frame or box. At the recent meeting of the Master Car Builders a report

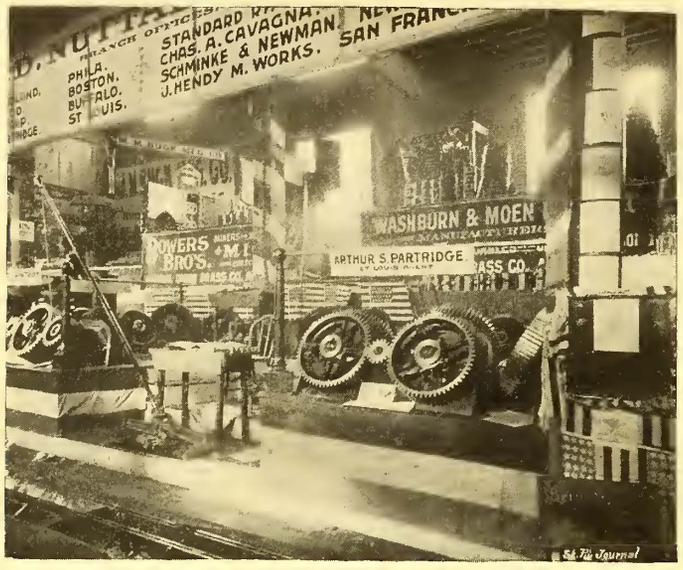


EXHIBIT OF R. D. NUTTALL CO. AND ARTHUR S. PARTRIDGE.

was read by the Committee on Brake Shoes under whose direction a long series of tests, extending over two years or more, had been conducted. The test, which was carried on by practical railroad men, showed a very high efficiency for the Kinzer & Jones brake shoe. In the report, S. P. Busch, superintendent of motive power of the Pennsylvania Railroad and chairman of the committee, states that the life of the shoe compared with that of an ordinary cast iron shoe, is as three to one. The company was represented by Wm. Weierbach of Pittsburgh.

The Seamless Structural Company, of Milwaukee, manufacturing the Christensen air brake and appliances, made no exhibit at the exposition. The company's brakes have been in continuous use on some of the single and double truck cars of the Milwaukee Electric Railway & Light Company for fourteen months and it was the intention to ship one or two of these cars to St. Louis to be run on the tracks during the convention, but the difference in gauge did not

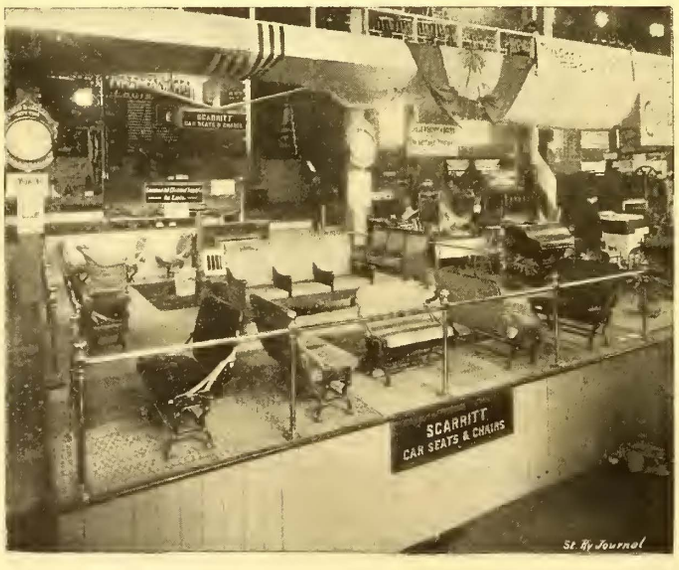


EXHIBIT OF SCARRITT FURNITURE CO.

admit of this being done without extensive changes. N. A. Christensen, the mechanical engineer and representative of the company at St. Louis, is one of the pioneers in the street car air brake field and claims to be the first to construct a thoroughly dustproof, self coutained air pump for this work. The company claims to have made great advances in air brakes and appliances and believes that it has a system that will meet every objection heretofore brought up against the use of air brakes for street cars. It is now prepared to supply this apparatus under written guarantee both as to reliability and cost of repairs.

The National Carbon Company, of Cleveland, O., had a very attractive exhibit in the southeastern corner of the hall. The company manufactures electric light carbons, battery carbons, carbon brushes for dynamos and motors, smelting carbons, etc., and exhibited a wide variety of these different forms of carbons. The motor and generator brushes attracted most attention, but a great deal of interest was also taken in the other products exhibited. The smelting carbons for the reduction of aluminum and other metals attracted a great deal of interest. These pieces exhibited were fifty-two inches in length and three feet in diameter. A number of specialties, including carbons for telephone transmitters, lightning arresters, and for the manufacture of filaments in incandescent lamps were exhibited. A tasteful feature of the exhibit was the arrangement of the variety of the small products of the company in a frame so that they would show the name of the company. The representatives present were Benjamin F. Miles, vice-president, M. M. Hayden and R. P. O'Connor.

Morris, Tasker & Company, Incorporated, of Philadelphia, was represented by C. Y. Flanders, who was one of the best known and popular attendants at the convention. Mr. Flanders was also a delegate to the convention, representing the Trenton Passenger Railway Company, of Trenton, N. J., but explained as well the merits of the Morris, Tasker poles, and the large facilities of the company for the manufacture of poles and tubing. Considerable interest was expressed at the convention in the recent large order received by the Morris, Tasker Company, for the installation of a large pipe factory in Russia. This factory will by installed by Morris, Tasker & Company, and will be operated for some time under the direct supervision of the officers of the latter company. The permanent manager of the company will be Mr. Feldman, who was recently foreman of the Morris, Tasker works. The fact that this order was given to Morris, Tasker & Company in the face of the keenest competition from pipe makers all over the world was generally regarded

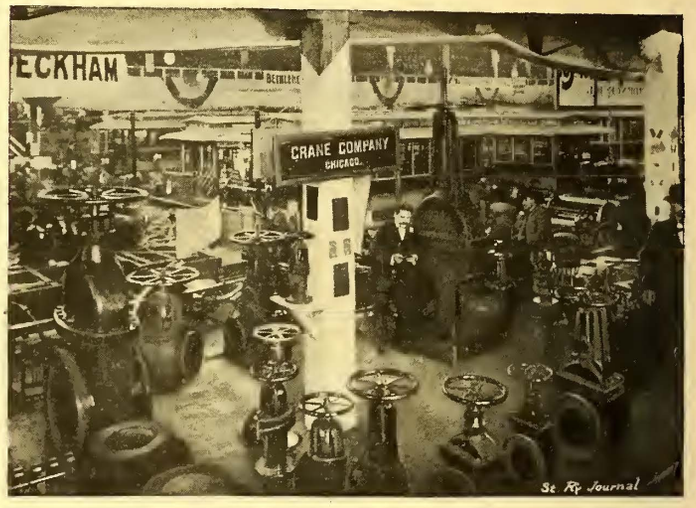


EXHIBIT OF CRANE CO.

as a high tribute to the methods of this well known American corporation.

William Wharton, Jr., & Company, Incorporated, of Philadelphia, Pa., occupied a large space in the section devoted to rail manufacturers, and made a very interesting exhibit of their special work, standard sections and track supplies. The manganese steel special work of the company was, of course, the principal object of interest. This material was brought out by the company several years ago with the hope of obtaining a metal which would withstand the enormous wear to which points in frogs, crossings and special work are subjected. That the experience of several years has shown that this material amply fulfills the expectations of the Wharton Company, the manufacturers believe, admits of no doubt. Among the objects shown were a nine inch tongue switch and mate, manganese frog, a Carver long radius switch and special work of manganese steel, T rail construction. At the rear of the exhibit a novel sign, spelling the company's name in rail sections, was shown. The representatives of the company present were F. B. Howe, vice-president, of Philadelphia, and A. W. Slee, the St. Louis representative.

One of the Most Attractive and Interesting Exhibits at the convention was that of the Mica Insulator Company, of New York, Chicago and London. This exhibit consisted of a large variety of the various forms of its well known insulation "micanite." The booth occupied one hundred square feet of space, was handsomely decorated under the personal supervision of the company's St. Louis representative, Arthur S. Partridge. Some of the most prominent forms of insulation which attracted the attention of railway managers, electricians and superintendents of motor equipments were the following: commutator segments and rings for all the standard railway motors and many of the standard makes of power generators, micanite plates, field spools, armature slot troughs, armature disks, washers, tubes, "micanite" and "Empire" insulating cloths and

papers, etc. The large W. P. 50 armature which was insulated throughout with micanite, fooled a good many, it being made of wood, and very closely resembled the genuine. The company was represented by Henry C. Onick, of the Chicago house, who expounded the value of micanite as an insulator.

The New Haven Car Register Company, of New Haven, Conn., exhibited a full line of its well known fare registers. These included the standard form with Philadelphia dial for registering single fares, double and triple registers. The latter are employed when two or three rates of fare are to be registered, or if railway managers desire to keep a record of transfers issued. The company gave away several souvenirs which were eagerly sought after. One of these was a stick pin showing a standard register of the company with the name "New Haven Fare Register" appearing below the dial. The latter was colored crimson, while the rest of the pin was gold, making a very handsome ornament. Another souvenir for which there was great demand was a perpetual calendar. This was bound in leather, bore the name of the company and gave a view of the New Haven register. The names of the months were printed on one set of cards and calenders for the commencement of each month on a different day in the week on another set of cards, so that the calender could be used indefinitely. W. M. Anthony, president, and F. C. Boyd, vice-president of the company, were present.

The St. Louis Register Company occupied a space directly over the main entrance and exhibited several different types of registers, both numeral and dial. The fronts were removed from several of these so the working of the register could be readily seen. Considerable interest was manifested in a double connected register manufactured by the company for the Lindell Railway Company, and termed the "Baumhoff" style of register. The object of this device was to have a register on the roof of the car as well as within

EXHIBIT OF PAIGE IRON WORKS.

the car, and have them so connected that the fare on one would be indicated as well as on the other. In this way inspectors can read the register from the sidewalk without boarding the car. The two registers are connected by a steel rod. The company also showed its double connected registers for double-deck cars, one register being on the roof, the other within the car. As a souvenir of the convention the company presented a handsome collection of views showing the effects of the cyclone of last spring in St. Louis. The representatives of the company present were President E. F. Wickham, J. A. Stephenson, New York agent Giles S. Allison.

The New York Belting & Packing Company, of New York. had an interesting exhibit of all kinds of belting, hose and packing, This company has made a specialty of mechanical rubber goods, and its interlocking rubber tiling attracted especial attention. This is something new which has been recently brought out by the company for the floors of railroad stations, car vestibules, etc. The rubber tiles are moulded in a variety of forms which interlock with each other, and being supplied in different colors, can be made into a very tasteful pattern for floors. As it is noiseless, odorless and very durable, it has a wide range of use. The company showed a letter from the architect of the Union Railroad station in Philadelphia, in which it was stated that the tiling had been used in that station for a number of years. In spite of the fact that it is subjected to an immense amount of wear, it has as yet shown no signs of deterioration, and is considered the ideal material for that purpose. The company also showed mats and matting of rubber for car floors, rubber cones for car springs, etc. The merits of the company's products were explained by A. G. Francis and T. H. Dickinson, both of the Chicago office.

The Crane Company, Chicago had on exhibition a 24 in. extra heavy outside screw and yoke wedge gate valve with by-pass, capable of standing a working pressure of 250 lbs. to the square inch which is the largest high pressure steam valve ever made. Street railway men easily recognized it from the cut shown in advertising pages of the STREET RAILWAY JOURNAL and also from the handsome steel print which has been sent throughout the country. The company also had a varied assortment of angles, wedge-gate, globe valves, pop-valves, and blow-off valves. It also showed a sample of large header pipe such as is used with the Louisville and Akron street railway companies, the ends of the pipe being paned over and then

EXHIBIT OF Q. & C. CO.

faced off flush with the face of the flange, making the ends of the pipe a part of the joint. All of these goods are tested to 800 lbs. hydrostatic pressure before leaving the shop. It also showed a variety of cut samples of brass bodied goods in the way of globe, angle and check valves. A familiar feature of this exhibit is the aluminum valve which Mr. Hurd has shown in nearly every street railway station of the West and South. The Crane Company was represented by J. B. Berryman and Geo. A. Hurd.

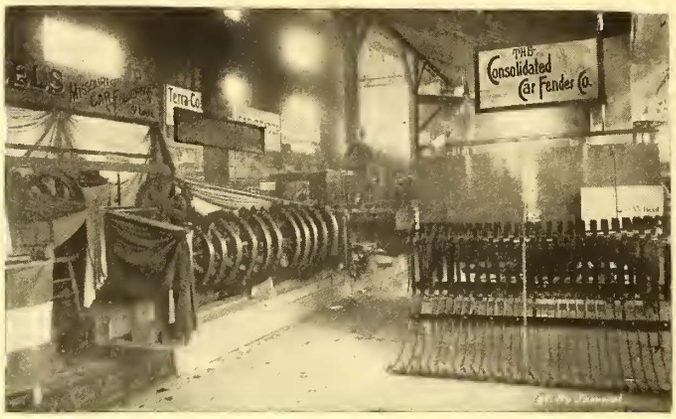
The Steel Motor Company, of Cleveland, O., was represented by Geo. W. Henry, general sales agent, 1505 Monadnock Block, Chicago, and Eug. C. Parham, electrician, Johnstown, Pa. Mounted on a Du Pont truck, now winning much favor as a symbol of simplicity and durability, were two C No. 3½ Steel motors operated by two C No. 3 controllers. The C No. 3½ motors are the latest tested and time tried production of these pioneer makers of Steel motors. The motor is constructed upon substantial lines, has remarkable staying powers and durability, and enjoys the distinction of offering easy access to any part without disturbing any other. The C No. 3 controller is of the series-parallel type, and has the usual locking and interlocking devices, but has also the unique feature that the motor cut-outs are incorporated within the control of the reverse lever, making it unnecessary to open the controller to cut out a motor. This innovation seems to have been indorsed by technical admirers

EXHIBIT OF CREAGHEAD ENGINEERING CO.

and by the many practical motormen who availed themselves of the opportunity to witness and also try its operation. The Steel motor exhibit was a "hit," and its business and "get there" aspect created a favorable impression.

The Forest City Electric Company, of Cleveland, O., occupied a part of the northwestern corner of the hall and had an at-

tractive display of its drop-forged and roll drop commutator bars and protected rail bonds. The latter are formed of heavy copper terminals connected by flat stranded wire, the terminals being forced into bond holes drilled in the rails. The bond is of such a shape that it can be covered by the channel plates, completely protecting it from being tampered with by evilly disposed persons. The application of the bonds was practically shown by three models showing rail joints bonded as they would be in service, but with part of the channel plate removed to show the position and location



EXHIBITS OF CONSOLIDATED FENDER CO., AND MISSOURI CAR & FOUNDRY CO.

of the bond. At the side of the exhibit was a large sign in which the name of the company was ingeniously spelled out in commutator bars. The company presented to visitors as a souvenir of the convention a raised portrait of Major McKinley, with a gold back ground and at one side a view of the protected rail bond. The major being the chief exponent of protection in this country, the connection was obvious. The company was represented by W. B. Cleveland from the Cleveland office and John C. Dolph, of New York.

The Laclede Car Company was well represented at the convention, as St. Louis is its home, by the principal officers of the company. Owing to the fact that its works are located in the city, and as a large number of its cars were in operation on the different lines of St. Louis, the company did not make any regular exhibit in the convention hall. The general manager of the company, Mr. Robinson, and the other officers of the company, were, however, prominent during the four days of the convention, and many delegates took the opportunity afforded them by their visit in St. Louis to visit the extensive works of the Laclede Company. Those who did so stated that they no longer entertained any surprise at the leading position as car builders occupied by the Laclede Company.

EXHIBIT OF OHIO BRASS CO.

Every detail in car construction is carefully and systematically followed out at the company's works, and by improved machinery, expert workmanship and careful supervision, the company has been able to supply the very highest grade of work at very low cost. The works of the company were described in the Souvenir issue of the Street Railway Journal, and the illustrations of the factory and of the many handsome Laclede cars published in that number were frequently referred to.

The Leschen-McComber-Whyte Company, of St. Louis, and the Chicago Insulated Wire Company, of Chicago, made a joint exhibit of its different wires for different purposes, the former showing bare and the latter insulated wires. The feeders shown by the Chicago Insulated Wire Company were of all sizes up to 500,000 c. m. capacity. In one corner of the booth was a large pyramid made out of eight reels of weatherproof and magnet wire. Spools of annunciator wire and magnet wires were also shown. The Leschen-McComber-Whyte Company had an extensive exhibit not only of copper wire, but also of galvanized iron wire for span construction and power transmission purposes, as well as reels of manilla rope for power transmission. One of the most interesting objects shown was a special rope with a patented form of strand, for power transmission. Owing to the peculiar construction of this rope more than 150 per cent of wearing surface is presented than in the old style of wire rope. The two companies were represented by Edward M. Vossler, vice-president, F. T. McComber and George S. Whyte of the Leschen-McComber-Whyte Company, and Wm. M. Smith, secretary and treasurer of the Chicago Insulated Wire Company. The company presented as a souvenir a neat memorandum book, bound in leather.

The Q. & C. Company, of Chicago, was ably represented by Chas. F. Quincy and Edward W. Hodgkins, both of Chicago. A familiar feature was the well known Bryant cold metal rail saws. These were shown in both the power and hand patterns, the latter being in constant operation and attracting the usual amount of attention. The leading feature of this exhibit was the Servis tie plate, over 30,000,000 of which are now in use on steam roads. These plates are now being extensively adopted on electric roads for the reason that on long lived soft wood, ties protected with Servis tie plates, hold gauge better and are rendered more enduring than are oak ties unprotected with plates. On short curves and heavy grades the plates prevent the cutting of the tie and canting of the rail, so that the true gauge of the rail is preserved without the use of rail braces. The company showed also a specimen of tie with tie plate

EXHIBIT OF MICA INSULATOR CO.

and rail as used on the Calumet & Blue Island Electric Railway, Chicago, which has placed about 75,000 of these tie plates on cedar ties this season. The company also showed the Perfection oil purifier which is capable of filtering all kinds of oils without waste no matter how often the oil has been used, and claim that the filtered oil is better than when new. The company gave out a handsome memorandum book as a souvenir.

The Hyatt Roller Bearing Co., of Newark, N. J., had an exhibit which attracted a great deal of attention. The company claims to have solved the problem of reducing the friction in car journal boxes by means of its roller bearings, a result which is much to be desired. The company has applied its roller bearings very successfully to many industrial uses, including the support of shafting, etc., and has made a very good record for its roller bearings in street railway service. In a rack were shown samples of all the different sizes of roller bearings used in ordinary work, from ¼ in. to 1½ ins. in diameter. These, besides being of different diameters, were also of different thicknesses to suit the various conditions, such as speed and load, met with in practice. A journal box fitted with the bearings and several pillow blocks for shafting were shown. The company had also on one of the Diamond trucks shown in the space of the General Electric Company an equipment of its roller bearings as described elsewhere. The truck was mounted on rails so that the slight power required to push it could be observed. Although weighing some 5000 lbs., it was easy to move it on the rails by the thumb and forefinger. F. V. M. Hudson, secretary of the company, attended the convention and clearly explained the advantages claimed for the bearing.

The Shultz Belting Company, of St. Louis, Mo., had an exhibit near the main entrance. Although direct connected generators are being adopted in many of the very large stations, the advantages of belting over direct connected apparatus for small stations are, the company claims, exceedingly important, and it was a significant fact that the exhibits made by the manufacturers of belting received much attention from managers of small roads, of which there were a large number at St. Louis. The Shultz exhibit consisted of a section of No. 72 in. belt, used by the St. Louis & Suburban Company, and several rolls of smaller belting, both link and regular dynamo belts. A patent pulley cover of leather was also shown.

The feature of this cover was that instead of cementing the leather to the base of the pulley the covering was made wider than the pulley face and its edges are brought over the edges of the lid, turned toward each other and fastened together with malleable iron clamps. In this way there is no possibility of the belts being cut with rivets sometimes used to hold leather covering on pulleys. The covering of a pulley with leather, the company claims, adds very much to its driving qualities. As a result, belts can be run much slacker, preventing heated journals and wear and tear of machinery. J. A. Ferguson, of the St. Louis office, was present.

The Fitzgerald-Van Dorn Company, of Chicago, Ill., exhibited a model, showing two car trucks equipped with the No. 5 standard coupling of the company. This coupling was full size and as the trucks ran upon a track, the operation of the device could be very clearly seen. The cars were coupled as they ran together and were only released by drawing a pin in the top of one of the couplings. The company makes a variety of sizes of couplings, depending upon the weight of cars in which they are used. The other sizes shown at St. Louis were the No. 7 coupling employed on the Washington, Mt. Vernon & Alexandria Railway, the No. 6 coupling, adopted for the motor cars of the Lake Street elevated in Chicago, and the No. 4, employed on the motor cars of the Metropolitan Elevated Railway, Chicago. A special design of couplings of the regular Fitzgerald-Van Dorn type was also shown. This coupling was designed for the cable cars of the Broadway railway, New York, and was of special form, owing to the fact that the ordinary swinging bar could not be employed to advantage. W. T. Van Dorn, the inventor of the coupler, explained the merits of the coupler to those present. The souvenir given away by the company was a patent toasting fork invented by Mr. Van Dorn some time ago. It was eagerly sought after by those present.

The International Register Company, of Chicago, was represented by its manager, A. H. Woodward, and secretary, A. H. Englund. The company showed samples of its well known portable registers, a large number of which are in use throughout the country, also its numeral stationary register with both black and aluminum dials, and one with the internal mechanism exposed. The company's latest achievement is its double register for cash and transfers, and one of these machines was a part of its exhibit and received more than usual attention from street railway men. A special feature of this exhibit was a catalogue taken from one of its registers with a notice placed over it reading as follows: "We offer a silk hat to the first person who can set back the reading of this totalizer, or prevent it from registering when the chain is pulled, without leaving marks of violence." This would seem to mark an advance in the construction of register totalizers, as the company

EXHIBIT OF DETROIT STOVE WORKS

claims that nothing has been made heretofore that could not be manipulated when the entire mechanism of the register is exposed. The company has gone so far in perfecting this device as to make it impossible to set it back even when taken out of the case and handled independently. The company reports that it has had a good year's business and feels confident of larger sales after election.

The Consolidated Fender Company, of Providence, R. I., showed a car platform equipped with its well known protective devices for street cars, both the fender and wheel guard. The fender can be adjusted to any height above the rail desired, and can be transferred from one end of the car to the other where the operating company does not wish to provide a duplicate equipment. The method of adjustment is very simple. When not in use in the car house the fender is folded up against the dashboard where it occupies no room available for storage. The bumper as well as the drawbar is protected so that a person falling into the fender is not injured by striking against them. The wheel guard is normally carried at a height which will easily clear it from any obstruction on or between the rails. It can be dropped, however by the motorman,

EXHIBIT OF THE BETHLEHEM IRON CO.

to catch any person passing under the fender, or if the latter should not drop it, it will fall into its proper place automatically by the action of an apron of wood carried under the dashboard. The company also distributed a large number of circulars setting forth the merits of the fender. The company's circulars were particularly novel in design to catch the eye and of great variety. The representatives of the company present were A. C. Woodworth, general manager, A. C. Woodworth, Jr., superintendent, and George H. Hale, secretary.

The Central Union Brass Company, a prominent manufacturer of brass and bronze car trimmings and electrical supplies for motor cars in St. Louis, Mo., had a very attractive display in the northern end of the hall between those of the Washburn & Moen Manufacturing Company and Bowers Brothers. The chief object in the exhibit of this company to strike the attention of the visitor was a very handsomely framed panel, 9 ft. ×6 ft., containing in tasteful arrangement a large variety of car trimmings. At the center of the panel was a large brass gong and from this was made to radiate in the form of stars and other decorations, car trimmings of every variety, ratchet brake handles, bells, etc. The panel had a background of dark plush which brought out strikingly the polished brass parts. The whole was lighted up by two brackets of electric lights. The company also showed a line of brass castings used for motor bearings and in overhead line parts, also a full assortment of gear wheels and pinions. The Stow flexible shaft and assortment of commutator bars of the Billings & Spencer, and Commutator Company's manufacture also formed part of the company's exhibit. The company was represented by George Kingsland, president, and T. C. White, and presented to visitors as a souvenir of the convention an attractive little trolley wheel, made of aluminum and brass.

Bowers Brothers, of Chicago, exhibited in connection with the Central Union Brass Company, their St. Louis agents, a full line of mica for different electrical purposes. Along the side of their booth was shown a large variety of solid sheet mica rings for use in commutator construction, mica segments, and solid sheet mica washers. The segments were all gauged to thickness and ready for immediate use. In a number of boxes were also samples of different grades of India sheet mica from A1 to 4, and of amber mica in the same grades. The India mica being a better insulator is used on machines wound to high voltages. Amber mica is, however, suitable for machines of low voltage, where such a high resistance is not required. As agent for the Billings & Spencer Company, of Hartford, Conn., the company also showed a full line of drop forged commutator bars manufactured by that company. An assembled commutator, which used the Billings & Spencer copper bars, and the Bowers Brothers' solid sheet mica segments, was also shown. One object which attracted much interest from a historical point of view was the exhibition of one of the first sheets of mica mined in this country. Mica was discovered in New Hampshire about 1814 and was first used in stoves. This historical piece of mica was framed and appeared in a prominent position in the exhibit. The firm was represented by E. S. Bowers.

The Exhibit of Eugene Munsell & Company, miners and importers of mica, New York and Chicago, with agencies in the principal cities, consisted of India and amber mica in a variety of forms.

Large clear sheets untrimmed, as they get it direct from the mines, mica segments, for all the standard railway motors, mica washers, carefully selected India and amber mica cut to size for electrical insulation, rheostat mica, etc., were shown. The exhibit of drop forged commutator segments, for which the company is the general selling agent, attracted considerable attention on account of the excellent

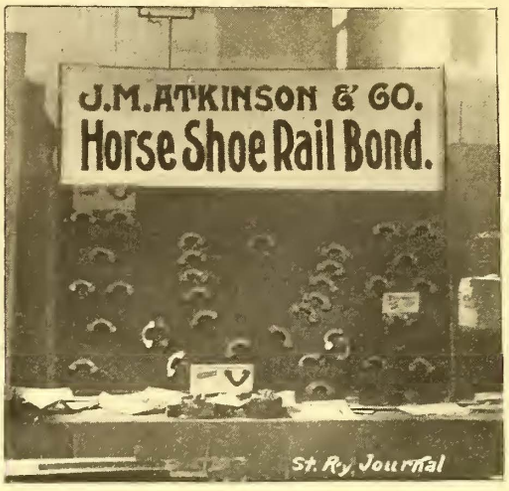


EXHIBIT OF J. M ATKINSON & CO.

quality of drop forgings exhibited. The blotters which were distributed on the writing desks in all of the hotels, and at the places of registration in the convention hall, did effective work, as they conveyed to the visiting delegates the fact that the exhibit was one of special interest. The fact that the mica was received direct from the mines was made apparent by the burro or mule shown, which had several large packages strapped on his back. The little mica souvenir which was given away, was well received, and no doubt was taken home by a large number of the visiting delegates. Many were seen wearing them in the lapels of their coats. The exhibit was displayed in connection with that of the Mica Insulator Company, and the company was represented by Henry C. Onick, of the Chicago house. The firm's representative in St. Louis is Arthur S. Partridge.

E. Verstraete, of St. Louis, showed an electric brake in connection with the exhibit of the St. Louis Car Company. The brake works on the solenoid principle. It consists of a solenoid magnet inside of which are two iron movable cylinders or plungers. One is larger than the other and to it is fastened the chain connecting with the brake mechanism. This plunger is operated by the current sent through the solenoid and travels over a desired distance, thus tightening or loosening the brake. The second or auxilairy small plunger floats inside of the solenoid and is held in a certain space by a brass bolt. Its function is to so change the connections as to make the pull on the large plunger a continuous one, thus giving the machine the enormous amount of power not obtainable otherwise in ordinary solenoids, except at the expense of a large

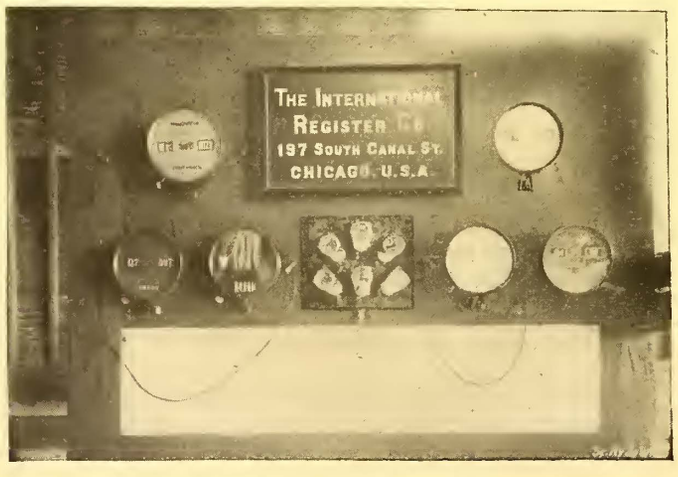


EXHIBIT OF INTERNATIONAL REGISTER CO.

amount of current. The maximum current used in this brake is fifteen amperes, but after the brake is once set, it only requires three amperes to hold it in this position for any desired length of time. The brake can be perfectly regulated from a mere slacking up of speed to the severest emergency stops by means of a rheostat and controller. The brake is now in use on some the cars of the St. Louis & Suburban Railway Company. The cars are forty feet long and are running at a rate of twenty-five miles per hour outside of the city. Mr. Verstraete personally operated the brake during the convention.

The Missouri Car & Foundry Company, of St. Louis, Mo., occupied a space in the northern portion of the hall, and exhibited there all of the different classes of wheels manufactured by it for electric railway purposes. Among these was an extra heavy wheel with 3 in. flange for suburban and interurban work. This wheel weighed 550 lbs. In front of this wheel were all of the other types of wheels which the company casts. Its wheels are used not only in St. Louis, but as far east as Brooklyn, as far south as Galveston and as far west as San Francisco and Los Angeles. A very striking method was adopted of showing the extreme accuracy in which the wheels are cast, being perfectly round. A pair of wheels was mounted in a frame and close to the tread of each was fastened a piece of brass which closely fitted the tread, without actually touching it. As the axle was revolved, the wheels passed under the pieces of brass without touching them and without being far enough from it to admit of light passing between the two surfaces. The exhibit also included cable sheaves, brasses, brake shoes, etc. A good idea of the growth of the company's business is shown by the fact that in 1889 the business of the manufacture of wheels for street railway companies amounted to only 60 a month, whereas now the company turns out 2000 during the same time for this industry alone. The exhibit was in charge of Scott H. Blewett, secretary of the company.

Fletcher & Stone, of St. Louis, showed two new devices for overhead line construction, which promise to meet a large demand. One of these was an automatic trolley cut-out. The object of this device is to destroy the connection between a broken trolley wire and the rest of the line, making the former dead in case of accident in the overhead coustruction, by which the trolley wire is broken. This cut-out is also of benefit in case of fire, where it is necessary for firemen to cut the trolley wire before they can use their ladders.

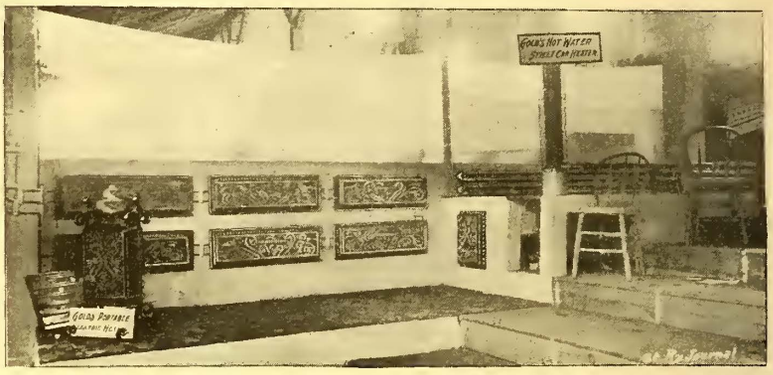


EXHIBIT OF GOLD STREET CAR HEATING CO.

The device is in three parts, two end parts, which are held to the central part when there is a tension on the wire, but dropping out from contact with it when the tension is released. The device has been adopted in the following cities among others: Brooklyn, Chicago, Toledo, Detroit, Rochester, Baltimore and Philadelphia. In all of these it is said to be giving good satisfaction. The firm also showed a novel hanger, by which a flexible trolley suspension, both transverse and lateral, is secured. It consists of two end pieces, several inches apart, which hold the trolley wire and also connected by a stranded galvanized iron wire. The whole is supported from the span wire or bracket by means of a special bracket with pulley, which allows the stranded galvanized iron wire to pass loosely through it, so that all strains are equalized. The object of the device is to avoid the pounding of the trolley wheel against the hanger support, consequent upon the use of rigid support of the trolley wire.

The McGuire Manufacturing Company, of Chicago, was well represented at the convention. One of the first objects seen as a visitor approached the hall was a large McGuire snow sweeper which stood just outside the main entrance. After passing through the doorway, the McGuire exhibit was found by the visitor at his right. It contained two of the standard trucks of the company; the single truck with A 1 suspension and the No. 26 double truck. Both looked strong and serviceable and the representatives of the company were kept busy explaining the merits of these trucks for electric railway service. Close to the trucks the fact that the company also enjoys a large business in the manufacture of car heaters, was easily made apparent. The Columbia stove has come to be regarded as indispensable by many street railway managers, and the stove, both dismounted and in position on a car seat, was shown. By this arrangement the peculiar feature of the stove, that it does not require cutting of the car seats, could easily be seen. The ratchet brake handle of the company was also exhibited. The company's apparatus was also represented in the exhibit of the General Electric Company. In this company's space was a large McGuire

truck built for the heavy electric motor cars of the New York and Brooklyn Bridge. The truck weighs 20,000 lbs. complete and seems amply strong enough for all the heavy work which it must necessarily perform. Views of this truck have been published in recent issues of the STREET RAILWAY JOURNAL.

The Stever Rail Joint Company, of Canton, O., and St. Louis, Mo., was represented by L. B. Collins, of Canton, and Geo. Stever, who represents the interests of this joint west of the Mississippi.

EXHIBIT OF BRUSSELS TAPESTRY CO.

The exhibit consisted of a variety of this well known joint mounted on rail sections embracing sizes from 4½ ins. to 9 ins. of both T and girder types. There was also shown a cable yoke with a specially constructed joint of the Stever type, particularly adapted for making the joint on the yoke head when necessary. This joint clamps the rails on each side of the support or yoke head rigidly and carries from one clamp to the other a bridge-like truss of sufficient material to equal the strength of the rail, thus making the joint as stiff and strong as the body of the rail. The Stever joint has now been in use in actual and severe service for over five years and in no case has it failed to justify the strong claims made that when properly put in it will hold without attention during the life of the rail and tie. These joints have been installed on some thirty-five of the leading roads of the country, and as the joint becomes known its popularity increases. Two sections of six inch girder rail were shown specially with the Stever joint and tested at the Pittsburgh Testing Laboratory, showing that the ends of the rails were placed upon supports three feet eight inches apart and a pressure of 1,000,000 lbs. was made on the top of the center of the joint; a permanent set of .88 in. was given to the rails without any injury to the Stever splice, this set occurring in the rail and not in the splice.

The St. Louis Car Wheel Company, of St. Louis, had a very complete and extensive exhibit of its car wheels for all varieties of service. The company occupied a space under the northern gallery and the articles shown appeared to good advantage as arranged on rising tiers in that part of the hall. Wheels of all sizes were shown, from thirty-six inches in diameter down to eight inches in diameter. For street railway service one set each of thirty-six inch, thirty-three inch and thirty inch wheels were shown on axles. The chills in these wheels were made clear by sections exhibited of forty-eight inch and thirty-six inch wheels, and by a large number of specimens of charcoal iron test pieces arranged in the front part of the exhibition space. Some special wheels, including a reversed dish wheel, different styles of brake shoes and a variety of iron and steel axles hammered and in the rough were also shown. The method employed by the company in casting chilled wheels was made clear by the exhibition of one of the company's standard contracting chills. The form of contracting chill used by the company differs from that usually employed, in that the inwardly projecting plates which contract on the wheel in cooling are made in a zig-zag form. In this way there is no danger of producing on the surface of the wheel transverse ridges which sometimes cause more or less jar and rattle until worn down. The chill was mounted in trunnions and could be easily revolved so that this peculiarity was clearly observable. The company was well represented by R. W. Green, secretary, John W. Nute, general agent, and William Fawcett, superintendent.

Clarence Whitman & Company, of New York, had a very attractive exhibition of their well known Pantasote for car curtains, car shades and car upholstery. At the back of the booth a frame was arranged to represent the side of a car. In the center was a shade, such as used in a closed car, made of Pantasote, and on each side were curtains of the same material such as are used on open cars. Both were fitted with Acme fixtures. Above the framework was another horizontal frame to represent the ceiling of the car and this was covered with headlining made by Clarence Whitman & Company, for this purpose. The advantages of Pantasote for curtain use are becoming more generally recognized, as could be seen from the fact that four of the five cars forming part of the exhibits of the car manufacturing companies were fitted with curtains of this material. The New York, New Haven & Hartford Railroad Company and the New York Central Railroad Company have also adopted it as standard for their cars, while many street railway companies are also large consumers of it. As Pantasote is waterproof, curtains and shades made of it can be cleaned very easily by means of a sponge, where this process would be impossible with the old canvas curtain. The use of Pantasote leather for car upholstery was illustrated by the exhibition of a Scarritt spring car seat in the booth of the company. Pantasote leather is both water and fire proof and will not crack, peel or dry, and, it is claimed, wears as well as the leather itself. R. M. Grier, the Chicago agent, for Clarence Whitman & Company, and John M. High of the New York office were present.

The E. T. Burrowes Company, of Portland, Me., had one of the most attractive and tastefully arranged exhibits at the convention. The attention of the visitor upon entering the exhibit was attracted immediately by two frames, one on each side of the entrance. That to the left was similar in form to a revolving bookcase, but instead of containing books each side was devoted to exhibiting a style of the company's closed car shades. One of these was fitted with pinch handles of the ordinary kind, another with anti-friction tips, so that a person in raising or lowering the shade can use either the handles or not as desired, etc. At the right of the entrance a similar frame contained samples of open car curtains. Both cases were of mahogany. A prominent feature of the exhibit was Oakette, a special material manufactured by the company for car curtains and shades. The material has proved not only very popular, but very desirable for this service, and during the last year the company has sold over 10,000 shades of this material alone. At the rear of the exhibit were several other frames of mahogany exhibiting the other different styles of curtains and shades made by the Burrowes Company, including Crown and Star fabrics. A small frame contained samples of different silk curtains, with trimmings to match the color of the curtains, and among the patterns were twenty of the Star fabric and eighteen of the Oakette. On the rear wall hung a very handsome water color of the extensive factory of the company at Portland, Me. The representatives of the company present were H. H. Russell, of Portland, and H. B. Potter from the New York office.

The Bethlehem Iron Company, of South Bethlehem, Pa.,

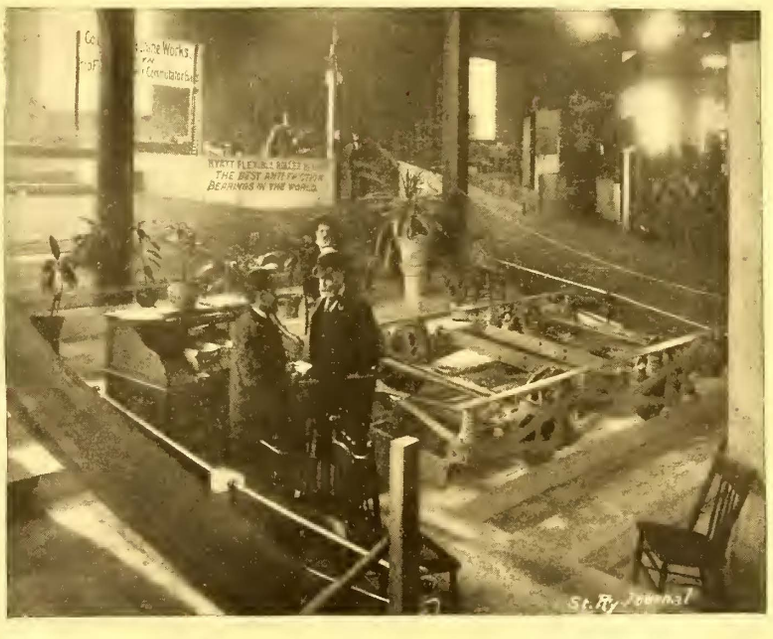
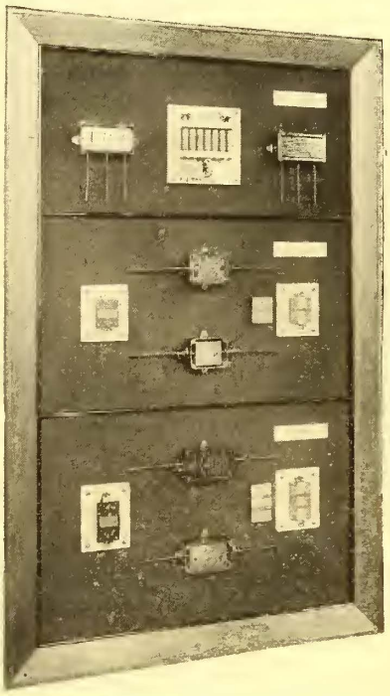


EXHIBIT OF DIAMOND TRUCK & CAR GEAR CO.

startled the exhibitors by showing what at first sight looked to be a gun trained to shoot as visitors approached it. On closer inspection however, a sign told that it was a hollow forged shaft, one of twelve now being made for street railways in Chicago. Four go to the Northwestern Elevated Railway and four to the Union Loop Railway of both of which roads S. Potis is chief engineer; and J. K. Chapman electrical engineer. Four others go to the Chicago City Railway of which R. J. Hill is chief engineer. The shaft on exhibit was on its way from Bethlehem to the works of the Edw. P. Allis Company, where it will be fitted with a flywheel, cranks and

electric generator. It is 22 ft. 6 ins. long, 28 ins. diameter in center, 22 ins. diameter at journals and has an 11 in. hole throughout its entire length. It weighs fifteen tons. The processes employed in making this and similar shafts as well as the advantages in their use were fully described by H. F. J. Porter, general Western agent, who had charge of the exhibit and who had illustrated pamphlets for distribution which contained a full account of how hollow forged shafts are made. An abreviated description appeared in last month's Street Railway Journal on page 657. On the walls of the exhibit space were photographs illustrating the processes of manufacturing hollow forgings for shafts, guns, armor plate, etc. Altogether this exhibit was a most interesting and instructive one and an innovation highly appreciated by the street railway men who admired the enterprise of the Bethlehem Iron Company in bringing to their attention the highest stage of the forge master's art.

The Consolidated Car Heating Company, of Albany, N. Y., had a very attractive exhibit in charge of H. M. Ransom, who has attended a great many conventions, and knows just what delegates want to see. In the back of the booth a panel was erected to show the use of heaters in the panel of closed cars. Three heaters were installed here. At the side of the exhibit was a row of Scarritt seats, each with a heater underneath the seat. At the left of the exhibit was a Hale & Kilburn seat for center aisle cars, equipped with another style of heater. As each heater had an incandescent lamp in circuit with one of its coils, the variation in the current to secure various intensities of heat was easily shown, the amount of illumination given out by the lamps being in the same ratio as the amount of heat given out. The six heaters under the cross seats were controlled by a five and ten point switch, and the four heater equipment by a three point switch. In addition to the regular lines of heaters, the company also showed a special heater for parlor cars, where it was impossible or undesirable to cut the panel of the car. Several of these heaters have recently been built by the Consolidated Car Heating Company for parlor cars on the Brooklyn Heights Railway Company and the Portland (Me.) Railway Company. They are five feet in length and surrounded by a tasteful casing. The growth of the heater business was made manifest by several significant notices which were conspicuous in the company's exhibit. These stated, among other facts, that the company had equipped over 3700 cars and more than 200 railways in the United States and Canada. Mr. Ransom was assisted in caring for the exhibit by W. P. Cosper.



SWITCHBOARD, WESTINGHOUSE EXHIBIT.

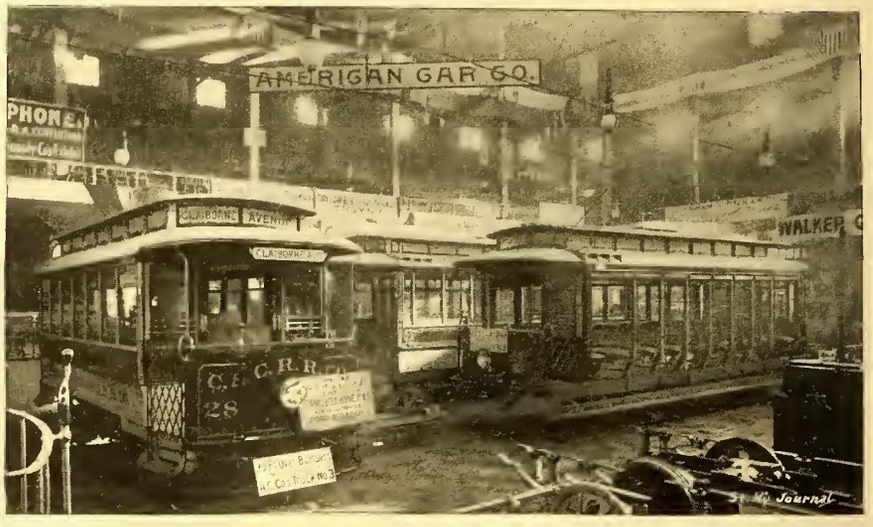


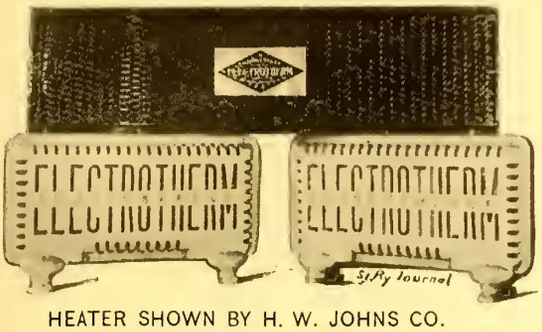
EXHIBIT OF AMERICAN CAR CO.

The Washburn & Moen Manufacturing Company, of Worcester, Mass., had a very complete exhibition of its specialties. One of these, is as well known, is the figure 8 trolley wire. A reel of this formed one of a group of four reels in the back of the space of the company. The other reels contained different kinds of cables of 500,000 c. m. capacity. In front of these reels was probably the largest cable in the building from a conductive standpoint. This was of 2,792,000 c. m. capacity and was a piece of an order filled by the Washburn & Moen Manufacturing Company, for the Westinghouse Electric & Manufacturing Company. In front of these large reels were three smaller reels containing magnet wire of different shapes, square, round and flat. Another part of the space of the company was devoted to an exhibition of the well known Chicago rail bond manufactured by it. To illustrate the use of this bond, four rail joints were shown. These rails were from four inches to nine inches in height and were connected by different types of bonds, both stranded and solid. On a table in the front of the space were also sections of the bond terminals inserted in pieces of rail, showing the close metallic connection made between the rail and the copper of the bond. Here were also shown trolley springs, annunciator and office wire, lamp cord and sections of rubber covered wire of every description. The exhibit was made in connection with that of the Central Union Brass Company. The company was represented by the following gentlemen: Chas. H. May, of St. Louis; F. H. Daniels, of Worcester, Mass., general superintendent of the company; L. Brittan, superintendent of the Waukegan Works of the company at Waukegan, Ill., and T. H. Taylor, of the Chicago sales department.

The Johnson Company, of Lorain, O., had a very extensive exhibit of special work and track fittings. Major H. C. Evans was, of course, on hand and was one of the most popular and well known figures at the convention. The principal object shown in the space of this company was the guaranteed special work. The wearing parts of this special work are, as is well known, of Harveyized steel. This is let into the frog or mate casting and fastened firmly in place. The guaranteed special work was shown in crossings with 9 in. section, in switches, frogs, mates, etc. In the tongue switch shown, the switch tongue was extremely long, extending into the tangent. Another interesting portion of the exhibit was that devoted to steam and street railway crossings. The standard Pennsylvania steam and street railway crossing and a specially heavy crossing of this kind made of solid steel were shown. In the latter the straight pieces forming the steam railroad rails were first rolled and then the cross pieces electrically welded on. The characteristic of the Pennsylvania standard crossing shown was in its extreme strength. The interior angles were very heavy forgings. Another department of the exhibit contained the company's latest method of avoiding a combination of joints. When a six and nine inch rail have to be joined, a short section of the shorter rail is electrically welded to the deeper rail. An ordinary joint can then be made between the short piece of shallow rail and the rest of the rail of the same height. Samples were shown of other products of the company for track construction such as brace tie plates, a specimen of its electrically welded work in which a 9 in. girder rail, a 9 in. guard rail and 4½ in. tram rail were welded together. A large collection was shown of standard templates of rails. The representatives present, besides Major Evans, were A. S. Littlefield of Chicago, W. W. Kingston, of Atlanta, and W. Jens, assistant chief engineer from Lorain.

The Central Electric Company, of Chicago, had an extensive exhibit and was represented by W. R. Garton who was in charge of the exhibit, C. B. White, C. W. Cobb, and E. F. deWitt. C. E. Sharp and Mr. McNeill, of the Southern Electrical Supply Company, of St. Louis, also represented the company. In its display the company exhibited the Billings & Spencer products, Colophite insulation and drop forged commutator bars, a full line of the company's mica products, including segments and commutator rings, cut and uncut sheet, etc., and the changeable electric headlights. The Central Electric overhead material for figure 8 and all sizes of round trolley, the new Central Electric 500 volt, waterproof lamp socket, which is a radical departure, the Bound Brook Graphite Lubricating Company's full line of trolley bushings, bearings, and collars which are carried in stock at Chicago and St. Louis, interior conduits both iron and brass armored, manufactured by the Interior Conduit & Insulation Company, of New York, for whom the Central Electric Company is Western agent, were also shown. Other attractive exhibits were a complete line of Okonite wires and cables, Candee weatherproof wires, etc., and the Garton lightning arrestors connected in circuit, illustrating fully the merits of this well known device. The handsome board of the Partridge carbon brushes brought to the minds of the railroad managers the ability of the Central Electric Company to furnish satisfactory material.

Hill switches were also in evidence. The company's space brilliantly illuminated by Sawyer-Man lamps of all designs, colors and shapes. Hart 500 volt railway switches and Nelson crossover and section insulators were also prominent. The company's booth was handsomely decorated with bunting of national colors, and Billings & Spencer link ball strains coupled, with frog attachments and turnbuckles, added to the sightly appearance of the tastefully decorated space.



HEATER SHOWN BY H. W. JOHNS CO.

The Brooklyn & New York Railway Supply Company, of Elizabeth, N. J., exhibited a very handsome car, one of a number recently built by the company for the Brooklyn Heights Railroad Company, of Brooklyn, N. Y. Owing to delays in the delivery of this car at the convention hall, delays for which the Brooklyn & New York Railway Supply Company was not responsible, as the car was shipped in plenty of season, it was not delivered at St. Louis until Thursday, the last day but one of the meeting. For this reason many of the delegates did not give as much attention to the car as its fine appearance and construction deserved. Those who did, however, expressed themselves as very much pleased with the general appearance of the car. The inside finish was of cherry with headlining of curly maple, decorated. The trimmings were of solid bronze, and hand rails were supported by brackets of the same material. The car shades were of the E. T. Burrowes make, and the seats were of Hale & Kilburn manufacture, covered with rattan. The doors were double and automatic. An interesting feature of the equipment of the car was the fact that two registers were used, one for cash and the other for tickets. One was located at each end of the car. Both were rung by the same rod, one direction of movement of the rod ringing up tickets and the other cash fares. An ingenious device was introduced so that conductors either intentionally or by mistake could not ring up cash fares on the transfer register. Each register was fitted with a sign indicating whether a cash fare or a transfer had been rung up on it. If a transfer were rung up on the cash register or *vice versa*, the sign on the register on which the fare was rung up would change to indicate the true nature of the fare. The bells on each register had also different sounds. The exterior of the car was painted a handsome lake and the car was mounted on Peckham trucks. The representatives of the company present were J. A. Trimble, W. A. Brownell and Frank A. Morrell.

PANEL SHOWN BY H. W. JOHNS CO.

The American Car Company, of St. Louis, Mo., had one of the most extensive and important exhibits of the convention. Three complete cars were shown in the main portion of the convention hall. One of these was an open car thirty feet over bumpers. It was of the center aisle type with reversible Scarritt seats, upholstered in cane. The car was fitted with sliding doors, bronze trimmings, pantasote curtains, veneered ceilings of the Frost make, metal panels, and sliding side guards. The curtains were so arranged to reach the floor so that in case of rain the car could be practically resolved into a closed car, the center aisle affording to all access to the interior. In the advertising racks were a set of views of some of the recent cars turned out from the company's works. The interior was finished in light wood, was mounted on a single truck and equipped with New Haven registers. Adjoining the open car was a twenty-six foot closed car measuring thirty-five feet over all. It was painted a rich maroon, was mounted on two of the American Car Company's double trucks and was equipped with a Hunter fender. It was of the Standard type used by several of the St. Louis roads. The interior of the car was exceedingly attractive. The interior finish was in mahogany with gold plated trimmings, Scarritt reversible cross seats upholstered in cane, Forsyth roller shades and H. W. Johns heaters. The windows were double and so arranged that in the summer they could be removed, making the car practically an open car. Electric push buttons at every seat communicated with the platform for the purpose of signaling the conductor. The car was fitted with a Kraushaar headlight. The third car exhibited was similar to that already described, except that the trimmings were nickel plated instead of gold plated, the body was twenty feet long and the seats were of the Adams & Westlake make instead of Scarritt's. The representatives of the company present were Wm. Sutton, E. J. Lawless and George Kippenberger.

Smith of New York, the well known manufacturer of lamps, headlights and lamp supplies, had a very attractive booth in the northern part of the hall, devoted to the exhibition of the specialties manufactured by him. The exhibit was in charge of T. C. Millen. The company showed a full line of almost every conceivable form of lamps for street railway purposes. The standard oil headlights were, of course, shown, as were also two or three types of electric headlights. One form was arranged to be bolted to the dashboard and another to fit in a hole cut in the dash board so that it would project only two inches beyond the latter. These electric headlights were shown in different sizes from eight inches to eleven inches in diameter. A hood light eleven inches in diameter was also exhibited. All were fitted with highly polished parabolic reflectors. Among the headlights was one of 200 c. p. recently built by the company for steamship service and used by the sanitary officers in inspecting steerage passengers. It was so arranged as to throw the light in any direction. Upon the ceiling of the booth a very interesting and unique variety of electroliers were shown together with a few oil center lamps. The electroliers which were attached to the ceiling had three, four and five branches and one particularly handsome one was fitted with a silvered glass reflector and attracted much attention. One of the handsomest was of a style built for the Lenox Avenue division of the Metropolitan Street Railway Company, of New York, and was fitted with three arms by which it was secured to the ceiling, making a very handsome and solid electrolier. The form of combination oil and electric center light used by the Union Traction Company of Philadelphia, and the oil light employed on the cable cars of the Third Avenue Railway Company of New York, formed part of the exhibition. Upon a table near the front of the space that belonged to this company a complete line of hand lanterns, carriage lamps, etc., and globes of all kinds in ruby, white and green were exhibited. The booth was draped in black which brought out well the polished brass and silver of the lamps.

EXHIBIT OF WEBER RAILWAY JOINT MFG. CO.

The Exhibit of the Westinghouse Electric & Manufacturing Company was found in a very central location, in fact, in the middle of the hall, where this well known company had a display of motors, switchboard apparatus and sundry literature describing the same. Among the motors the No. 12 A. and No. 38 B. mounted on Peckham trucks and on a Brill Company snow sweeper attracted general attention of those railway men, who were not familiar with their construction and mechanical design. The particular novelty, however, of the Westinghouse exhibit, and from an electrical point of view one of the most interesting, it might be said, of the entire exhibition, was the display of switches and circuit breakers. These appliances are of recent design and embody some very novel features of improvement, which strongly appealed to the practical men who manage the power house and who are engaged in the operation and attendance of the generators and switchboards. The chief characteristics of the switches which were especially commented upon,

were their enormous carrying capacity and ease of operation as compared with older types. The company manufactures these appliances up to 3000 amperes capacity. The circuit breakers were of equally easy operation. They have copper carbon shunts preventing all posssbility of burning at main contact points; it has a releasing device without the use of the solenoid. The means of adjustment are sliding weights over scale arm. These instruments were

EXHIBIT OF SAFETY CAR HEATING & LIGHTING CO.

shown on a two-panel switchboard, one being a 2000 ampere generator panel and the other a 1200 feeder panel. In addition to these instruments the exhibit also contained samples of the well known Wurts non-arcing lightning arresters, tank arresters, as well as pyramidal arrester for high potential transmission circuits. The company was represented as strongly as at any previous convention. The gentlemen present were G. H. Lewars, Albert Schmid, W. F. Zimmerman, C. E. Bragg, A. J. Wurts, H.P. Davis, A. Hartwell, J. A. Rutherford, C. E. Skinner, T. A. Cleland, H. C. Ebert, M. Coster, W. R. Brown, A. F. Gordon, N. W. Storer and E. H. Heinrichs.

The Standard Air-Brake Company, of New York, had an exhibit which attracted a great deal of favorable comment from the street railway men present on account of the great advance made by the company during the past four years, in the science of air braking. The compactness of all the apparatus exhibited shows that great attention has been paid to the mechanical design and construction of the braking apparatus. As the company was the first in the field and has applied the results of many years of experience in air brake design to the Standard apparatus, its success is not surprising. The apparatus shown was as follows: one axle-driven compressor, one geared compressor, one compound motor compressor; a new automatic controlling device for the motor-driven compressor, which makes the latter entirely independent of the rest of the mechanism, simple and chime whistles and a new leakageproof reservoir. A unique device was also shown for giving an ocular demonstration of the responsiveness of the jam cylinder used in the company's braking system. The piston rod of the jam cylinder worked against a spring which took the place of the brake gear. The motor-compressor was connected with it and the whole process of compressing the air, admitting the air into the jam cylinder, exhausting the latter and bringing up the pressure again to the desired amonnt, was shown to all visitors. It was noticeable that many of the visitors were motormen and conductors, who took a special interest in the practical features of the apparatus. The motor-compressor probably attracted the most attention of all the apparatus shown and as this was exhibited in operation delegates had an opportunity of observing its great compactuess and freedom from noise. The space also contained a number of neatly lettered signs, describing where apparatus is in use at home and abroad, and the World's Fair diploma, awarded the company at Chicago in 1893, for its air braking system. The representatives of the company present were its general manager, E. J. Wessels, its chief engineer, H. P. Merriam, and several assistants. Not the least interesting part of the exhibit was the unique railing which surrounded the apparatus shown. This railing was composed of trailer connections, controller heads and gauges.

The Munson Electric Conduit System as exhibited by Messrs. Munson and Roberts attracted universal attention. The exhibit consisted of a handsome car one-fourth the size of a regular twenty-eight foot car and sixty feet of track made to the same scale. The track was constructed with a sharp curve and steep grade and with a portion of it under water. The conduit is patterned after the most improved cable road construction, excepting that the conduit is but eighteen inches deep and eight inches wide through the center. One of the principal features of this system is the switch-box arrangement. The switch is of the plunger type, the plunger working horizontally and operating a knife switch. The switchbox and switch are well designed with a view to being moistureproof and not liable to getting out of order. The switches are placed opposite each other about twenty feet apart throughout the length of the conduit. If forty foot cars were used exclusively the switches could be placed this distance apart. A complete wire circuit is used with this system, the positive side at the station generator being connected with the switches on one side of the conduit and the negative to the other. These boxes can be easily and quickly gotten at wherever necessary. The switches are operated by an ingeniously constructed, flexible plow which is preferably the same length as the car. The plow has a wedge-shaped nose of insulated material, which striking the wheels on the ends of the plungers of the opposite switches force the plungers back and close the switches before the wheels of the plungers come in contact with the metal of the plow, thus obviating any sparking. The wheels on the plungers of the switches are separated four inches normally and six inches by the plow so that each plunger travels but one inch. The plow or collector consists of metal strips five inches wide, separated by six inches of insulating material. A special construction of this system has been devised for use in existing cable conduits. For elevated roads the owners of this system claim that the cost of their system would be no more than that of the third rail. For interurban and long distance work the company claims to have devised a simpler and cheaper system of construction than is required for city work.

W. G. Price and W. H. Carter, both of the Chicago City Railway Company, exhibited a very interesting car for testing purposes, designed by them for the Chicago City Railway Company and in use on the line of that company. The object of the car is to determine rapidly any defects which may exist in the alignment of the track, in the gauge, and high or low joints. The car is supported on four wheels and has an auxiliary pair of wheels in the center. These are on a split axle so that the wheel flanges are kept tight against the heads of each rail. Each wheel is connected by two cords and levers to markers which record on a revolving chart carried in the car. The chart is made to travel at one one-thousandth the speed of the car. Connections between the indicators and the wheels are such that a running record is kept of the vertical and transverse motions of the wheels, the former indicating high and low joints for each rail, and the latter any variations in the gauge. Two other records are kept on the chart—the drawbar pole and the variation in track level. The latter is determined by an ingenious balance consisting of two cups of mercury connected by a pipe. The car has been in operation for some time on the line of the Chicago City Railway with excellent results. Mr. Price, who had charge of the exhibit, also had on exhibition plans of a new friction brake adopted by the Chicago City Railway Company. In it the brake chain is wound upon a drum which is mounted on a sleeve on the axle, but is revolved when the drum is forced against

EXHIBIT OF SMITH OF NEW YORK.

the side of the wheel. The latter is especially cast with flat side, covered with a lever washer to make a good friction surface. The drum is forced against the friction surface by a pair of expanding jaws worked by a lever from the front platform. The platform brake lever is of the ordinary type, and the brake, it is claimed, will stop a car at full headway in eighteen inches. Another interesting

feature of the exhibit was a rigid drawbar invented by the same gentlemen and also in use on the Chicago City Railway cars. The pin used in coupling is wedge shaped, and when the cars are coupled with this drawbar there is no lost motion. Consequently there is no lurching when the car stops.

The New York Car Wheel Works was well represented at the convention by R. C. Mercur, of Buffalo, and John Granger from the New York office. The company had a very attractive exhibit, which while not large, elicited many favorable remarks. Among the objects shown was a cold rolled axle, which had recently been removed from one of the cars of the Buffalo Railway Company, after making a record of 105,000 miles. In spite of this very severe service, the appearance of the axle would not indicate that it had traveled one-fourth that distance. Another interesting object shown was a ⅛ in. sand casting about twelve inches square through which had been punched twenty or more holes. The fact that in spite of the thinness of the casting no fractures were discernible where the punch had passed through the metal, demonstrated very clearly the closeness and toughness of the iron which went to make up the casting. The samples of wheels shown were as follows: one pair of 33 in. 360 lb. wheels, one pair 30 in. 300 lb. wheels, one 24 in. cable wheel weighing 180 lbs., and one 33 in. T. M. special plate wheel for the Consolidated Traction Company, of New Jersey, weighing 450 lbs. The latter wheel was built specially heavy for use under a Brill sprinkler and will, the manufacturers think, find large use for interurban electric railway work. The T. M. special mixture is one which the Consolidated Traction Company, of New Jersey, has been using for the last six months with excellent results, as described in the August issue of the STREET RAILWAY JOURNAL. The company also showed a number of sample chills and several Corning brake shoes. The brake shoe business is one which the company has done little in the past, but after a careful investigation the managers of the company have reached the conclusion to place on the market the Corning brake shoe. The latter is a composite shoe with outside of chilled charcoal iron and inside of soft gray cast iron annealed. The result of a number of experiments conducted by the New York Car Wheel Works with this shoe has demonstrated the claim of a saving of twenty-five per cent in annual cost of shoes, a large decrease in percentage of skidded wheels, together with a brake efficiency equal to that of the ordinary cast shoe.

EXHIBIT OF E. T. BURROWES MANUFACTURING CO.

The Brownell Car Company, of St. Louis, Mo., had an exhibit which attracted the attention and elicited the admiration of every attendant at the convention. The principal object in the exhibit was a large double truck car, one of thirty built by the company for the Metropolitan Street Railway Company of Kansas City. One of the cars of this order was illustrated in the last issue of the STREET RAILWAY JOURNAL. The car, which was a closed one with Accelerator door, was 26 ft. long inside dimensions, 7½ ft. wide and was supplied with 3 ft. platforms. The vestibules were removable. The car was fitted with gates of the Minneapolis pattern, operated by the motorman; the body color was an orange chrome and the car was equipped with two G. E. 1000 motors. Within, the appearance of the car was exceedingly tasteful. It was finished in cherry with longitudinal seats, and was heated with a Columbia stove. On the hood was a reversible illuminated sign and under the platforms a Christopher fender. Close to the car the Brownell Company exhibited two styles of seats; one was a folding form which has proved very popular in Cincinnati on the lines of the Cincinnati, Newport & Covington Railway, and was very favorably commented upon by a large number of persons. By means of it the seats in an open or closed car can be placed much nearer together than if the seats were rigid, as when a passenger leaves his seat to step into the aisle he can fold the seat up, giving plenty of room. The other style of seat was an armless reversible one. Two other objects were shown by the company. One was the Standard 3 E. truck, of which descriptions have been published in these columns; the other, the Brownell B. P. No. 2 farebox. The significance of these letters will be understood when it is stated that the Brownell Company claims that this fare box is burglarproof. After the fares have once been dropped into the box they cannot be removed except by legitimately unlocking the receptacle for change, even if the box be turned upside down and shaken. The representatives of the company present were F. B. Brownell, W. B. Allen and F. A. Baier. Many of the delegates also embraced the opportunity afforded them during their visit in St. Louis of visiting the extensive shops of the Brownell Co. Those who did so expressed themselves as well repaid for their trouble.

The Weber Railway Joint Manufacturing Company, of New York City, made a very interesting and attractive exhibit of its special joints and one that attracted a great deal of attention from street railway managers suffering from track difficulties. George A. Weber, president of the company, was himself at the convention together with Percy Holbrook, the company's chief engineer, George Daggett, its inspector and manager of the Boston office, and D. O. Ward, of Chicago, Western manager. Perhaps the most interesting feature of the company's exhibit was a seventy pound 4½ in. T rail joint cut out of the track of the Manhattan Elevated Railway system of New York last month. This joint has a history. About four years ago the Manhattan Company purchased a large number of Weber joints for the purpose of giving additional life to its seventy pound rail which has already been in service for nine years and in which the joints were so badly depressed as to necessitate the entire replacement of the rails unless the Weber joint should bring them to surface. The Manhattan Company hoped for but two years' additional life from these rails, but instead of this, it has obtained, as before stated, nearly four years' life, and in the joint shown in the exhibit was found as perfect a rail surface as could be seen in any new track, though the rail head itself was more or less worn. Another joint shown was that just adopted as the standard of the Northwestern Elevated Railway Company of Chicago in its five inch T rail construction. Other joints more especially applicable to usual street railway work were for six inch, and nine inch girder rails and for seven inch T rails. The first named was massive in appearance, the joint itself being 38 ins. long and having 12 bolts; the second joint was 27½ ins. long with six bolts. These two joints are in use on a number of street railway systems in New York and Massachusetts and are giving excellent service, and the Lindell Railway of St. Louis has just given a large order for the six inch joints to be used in its reconstruction work. The Weber Company also exhibited its insulated joint for signal work on steam railroads, and its step joint for joining rails of different sections and depths. These are made on the same principle as the regular Weber joint, this principle being applicable to practically every kind of joint used in street railway work.

The Scarritt Furniture Company, of St. Louis, Mo., occupied one of the most prominent spaces in the convention hall. The space occupied by it was the platform from which Major McKinley was nominated in the receut Republican convention in St. Louis. Burke Cochran, W. J. Bryan and other politicians and speakers of national reputation have also spoken from this platform. The space was finely fitted up with rugs and was surrounded by a handsomely polished brass railing. The space was devoted to the exhibition of the well known reversible seats of the company. The principal objects shown were the Scarritt reversible cross seats for holding two passengers, used with center aisle cars, especially those for interurban service where the center aisle is especially popular. The seats were all fitted with the well known Scarritt springs. Cane chairs for parlor cars, longitudinal spring seats, settees of various kinds for railroad stations and waiting rooms were also shown. The reversible seats were fitted up in different ways to show the variety

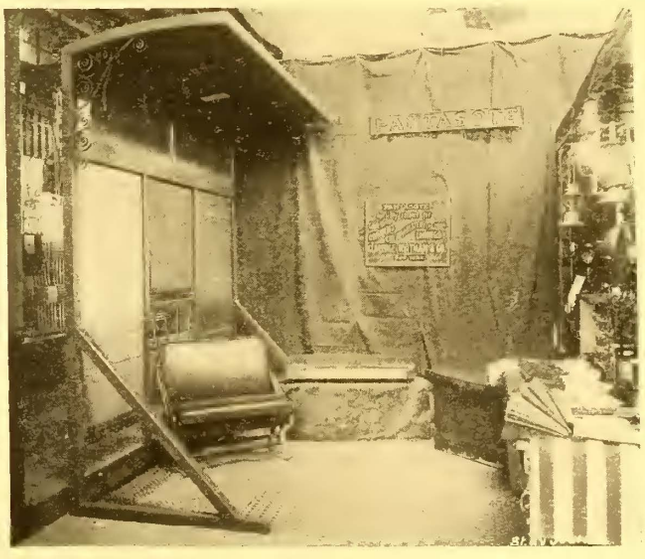
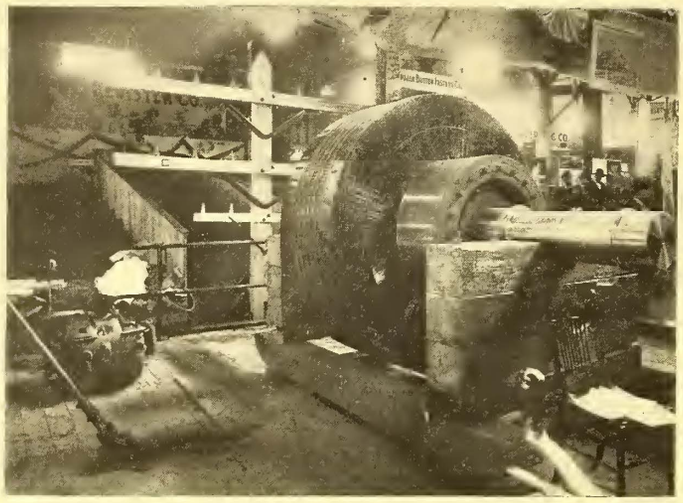


EXHIBIT OF CLARENCE WHITMAN & CO.

in which they can be supplied. Some were upholstered in plain rattan, others in figured rattan, still others in leather, imitation leather and plush. The seat supports were also of various forms, to show the variety in which the seats can be supplied by the Scarritt Company. The Scarritt Company was early in the car seating business, and furnished a great many steam railroad cars with the seats before engaging in the street car business about three years ago. Since that time the company has installed over 10,000 of its seats on the street railways of St. Louis alone, and has also supplied car seats to forty other cities in twenty different states. The visitor to the convention was not confined to the space of the Scarritt Com-



800 K. W. WALKER GENERATOR ARMATURE

pany to inspect Scarritt seats. The 25 ft, 18 bench, American Car Company's closed car and the open car of the same company's manufacture were fitted with Scarritt rattan seats, the former with spring backs and the latter with spindle backs. In the exhibit of the Consolidated Car Heating Company six Scarritt seats were also shown, fitted with electric heaters. In the space occupied by the STREET RAILWAY JOURNAL one of the Scarritt settees occupied a prominent position and seemed a favorite resting place for the many visitors to that space. In the exhibit of Clarence Whitman & Company another Scarritt seat was shown, covered with Pantasote.

Harold P. Brown, of New York, the well known inventor of the Edison-Brown plastic bond had, from an engineering standpoint, one of the most interesting exhibits at the convention. Mr. Brown has devoted a great deal of attention to the question of bonding the rails of an electric railway, and since the invention of his plastic material, has conducted personally a large number of tests upon his own and other makes of bouds to determine the carrying capacity of the bonds and under different couditious of service. In a case in the front part of his booth he presented an object lesson, as he called it, of what not to do. A number of bonds of different makes were shown by Mr. Brown in the condition in which they have been removed from tracks inspected by him. Some of these bonds showed by their condition that, when in position, they had afforded little, if any, path for the return current. The testing of the carrying capacity of rail bouds is by no means an easy task. Most of Mr. Brown's experiments were made by means of a special millivolt voltmeter constructed specially for the purpose by the Weston Electrical Instrument Company. By taking to the power station sections of the rails to be tested and by then passing a measured current through them it was possible to get at the drop occasioned in one foot of rail. This being determined a constant was secured by which, after any measurement had been made on the line, the voltage drop could be determined. This millivoltmeter Mr. Brown had at St. Louis to repeat any of the tests if so desired. Of his own styles of bonds Mr. Brown showed a full line. These included the ordinary plastic plug bond used in the base of the rail, the plastic bonds in which connection is made from the web of the rail to the channel plate, the plastic socket bond in which a copper strip equal to No. 0000 wire is used set into sockets filled with the plastic material and the plastic cup bond. The latter is designed for specially heavy currents and has only recently been brought out by Mr. Brown. With it the ends of the rails must be slotted in a V shape, before the bond can be applied. The cup, which is of triangular shape, is then slipped into the slots at the ends of the rails and is filled with the plastic material, making as complete a metallic contact as can well be imagined. Mr. Brown also showed two joints of girder rail connected by his bond, one that had been in service for about a year and a half, and the other, while not in service, had been exposed to the weather for about the same length of time. In both the material seemed to be in as good condition as when originally installed. The exhibit attracted much interest.

The H. W. Johns Manufacturing Company had an attractive exhibit at the west end of the hall, in charge of J. Emory Meek, of the New York office. This company manufactures a large line of materials suitable for electric railways, but made the chief feature of its exhibit its new car heater. These have been described in recent issues of the STREET RAILWAY JOURNAL, so that the readers are familiar with the novel features contained in them. Iustead of using the single wire, the resistance is formed by weaving the wire into a mat with asbestos. The wires are completely protected from the air by being surrounded by a coating of insulating compound and by asbestos. In this way no corrosion can take place. The mat is then enclosed in a shallow steel case. The heat is very well distributed and each passenger gets the full benefit of it. In this way a much greater efficiency is secured, it is claimed, than if the heat was localized at three or four different points in the car. Two styles of heaters were shown, one class for cross-seat cars, the other class for attachment to the panels under the longitudinal seats. In the rear of the booth were two panels showing the principal forms for line appliances manufactured by the company. These included the "J. P." and the "H. W J." styles of hangers and pull-offs, the Giant strain insulators, the Philadelphia insulated crossing and section insulators, iron clad feed wire insulators, etc. In front a number of Vulcabeston controller parts were exhibited to illustrate the large business done by the company in the manufacture of different forms of this valuable fireproof material. In connection with the large car exhibited in the center of the hall by the American Car Company the heaters of the H. W. Johns Manufacturing Company were also shown. The car, which was a center aisle, nine-bench car, was fitted throughout with these heaters, and as the outside temperature of the hall was at times somewhat cool, the visitor had a good opportunity of appreciating the merits of the heater by stepping into this car. The heaters were controlled by the standard H. W. Johns switch, giving three degrees of heat. With this switch it is impossible to change from one degree to another without first cutting off the current, a valuable feature, in the opinion of manufacturers. Mr. Meek, who had charge of the exhibit, took great pains in explaining the merits of the devices shown to all visitors to his department. E. B. Hatch of the Johns-Pratt Company, of Hartford, and Mr. MacLennon of the Chicago office of the H. W. Johns Company, were also present.

The Walker Company, of Cleveland, O., had a very extensive exhibit and one which was the center of a large throng of interested observers. As the company's space was directly in front of the entrance most used, every visitor to the hall could not fail but see it, and most stopped for some time to examine critically the many interesting appliances shown. The largest piece of apparatus was an armature for an 800 k. w. generator. It was one of a lot of fifteen upon the construction of which the Walker Company is now engaged, as a result of an order received from the Chicago City Railway Company. The generator will be rope driven, from a pair of Wheelock-Hoadley engines and will run at a speed of 220 r. p. m. The total weight of the machine is sixty-one tons. The armature itself was a very massive one, and many favorable comments were made of the company's enterprise in exhibiting so large a piece of apparatus. The shaft was fourteen inches in diameter and the commutator had 600 segments. The armature illustrated very

EXHIBIT OF WALKER CO.

clearly the new way of winding adopted by the company in all of its recent generators. As illustrative of the company's work iu the construction of railway motors, a large number of different sizes of motors were shown, ranging from the Walker 3000 to the Walker 800, and including a 2000 and 1200. Controllers for the 3000 and 800 were also shown. Much interest was expressed in the operation of the company's controller. The construction of the three cylinders in the controller, one for reversing, one for making the combinations, and one for breaking the circuit in twenty-eight points, were carefully explained by the company's representatives present. Another feature of the controller which was the object of much favorable comment, was the device by which it is impossible for a motorman to move the handle from one notch to a lower notch without going back to zero. The turning back of the controller

handle breaks the circuit, and contact is only made by turning the handle at once to the starting point and returning it to the point desired. In this way, it is claimed, the motors are much better cared for than if this was not necessary. Opportunity was afforded to see the 800 motors in operation by the equipment of a Peckham truck with two 800 motors. These were operated by a controller with case removed so that the complete system of control could be seen at a glance. In one corner of the exhibit was shown a Walker trolley. Probably no other one object in the exhibit attracted more interest than this. The form of the trolley, as is well known, differs radically from those in general use. The trolley wheel is replaced by a long horizontal cylinder of soft steel, held in a broad fork. The cylinder revolves on ball bearings. The trolley does not follow the transverse variations of the trolley wire as its width admits the wire to slide transversely from one side to the other without slipping off. The advantages claimed for the trolley are numerous, but the principal ones are probably that there is far less danger of its slipping off the trolley wire with consequent destruction of the overhead system. The trolley can be used with an overhead system of the ordinary character, with ordinary frogs, etc., but is capable of being used with a very simple overhead system, as the frogs do not need any flanges to direct the movement of the trolley. Above the trolley were arranged a short distance of overhead construction with hangers, switches, etc., of the latest Walker pattern from which a good idea of the workings could be obtained. The company was well represented by J. Holt Gates, of Chicago, Western agent of the company, and W. J. Davidson, of Cleveland, one of the electrical engineers of the company. Both gentlemen were kept busily engaged answering the inquiries of interested street railway managers about the working of the Walker apparatus.

The Exhibit of the Peckham Motor Truck & Wheel Company.

The Peckham Motor Truck & Wheel Company, of Kingston, N. Y., had an exhibit which, for interest and attractiveness, was not excelled by any other in the convention hall. This company has a reputation for carrying out in a systematic and very complete manner anything undertaken and its former record at conventions has shown that in respect to convention exhibits, the practice of the company of doing good work forms no exception. The exhibit at St. Louis was by no means confined to the space nominally devoted to it, although that was occupied with four trucks, but the company was represented as well in the space of the Walker Company, the General Electric Company and the Westinghouse Electric & Manufacturing Company, besides what was shown outside the hall. In the space occupied by the company proper, there was shown one No. 7 C. Excelsior truck, one of 175 now being built by the company for the Cincinnati Street Railway, and fitted with General Electric 1000 motors, one "extra long" truck fitted with Westinghouse 38 B motors, one standard No. 8 A truck with new type extension trusses and one No. 14 double cushion swivel truck. The first mentioned attracted especial attention on account of its being fitted with the Kilgour emergency brake, for which the company is acting as manufacturer and agent. The brake has proved very popular in Cincinnati where 250 of them are in service. It is entirely an emergency brake and depends for its action upon catching hold of the pavement or ties instead of endeavoring to lock the wheels or brake them. The mechanism of the brake consists of a two-pronged fork of forged steel, three inches square, having pointed ends, and is located near the center of the car in a vertical position, the prongs straddling one of the rails. The stem of the fork is threaded and screwed through a disk having a fixed vertical position, but which can be revolved by means of bevel gear teeth cut in its surface. The revolving disk or nut is connected by bevel gears and shafts to an ordinary brake handle or wheel on the front platform.

When a motorman finds he has lost control of his car, and all other brakes fail to stop it, he gives the emergency brake handle or wheel a few rapid turns, thus screwing the heavy steel fork with pointed ends down into the pavement, one of the prongs being on either side of the rail. The result varies with different kinds of paving. In macadam or asphalt it simply plows two small groves and stops the car with little more jarring than the ordinary brake. In brick pavement the action is nearly the same. In cobble stone or Belgian block pavement it will shake up the passengers considerably, and may turn up paving stones for a short distance, but in none of the many trials made on the Cincinnati Street Railway on all kinds of pavement, has the brake failed to stop the car promptly, without injury to passengers or car, and little damage to the pavement.

Its invention by B. L. Kilgour, electrical engineer of the Cincinnati Street Railway, was prompted by the fatal runaway accident on that road a few years ago, and since its adoption has been used in twenty-two emergencies on the steep grades of that city, saving many times its cost in lives and property. The Cincinnati Street Railway has 250 cars now equipped with these brakes, is putting on 175 more, and will not run a car on its "hill lines" unless so equipped.

In the Walker Company's space the company exhibited an "extra long" truck equipped with Walker No. 10 motors, and in the General Electric space an "extra long" truck with G. E. 1000 motors and electric brake. The truck in the space of the Westinghouse Electric & Manufacturing Company was of the "extra long" type and equipped with Westinghouse No. 12 A motors. Outside of the convention hall the company had in service a pair of No. 14 double trucks on which were mounted G. E. 1200 motors, Hunt air brakes and a Jackson & Sharp twenty-five foot, vestibule, combination car body. One feature of the swivel truck which received general approbation was the fact that the bottoms of the car sills were lifted only 27½ ins. above the track. The company also had a headquarters at the Southern Hotel, in Parlor 64, where models, catalogues and photographs were exhibited. The representatives of the company present were Edgar Peckham, president, of New York; W. E. Cooke, of Kingston, N. Y.; J. A. Hanna, of Chicago; Arthur Field, of Boston.

The General Electric Company at the Convention.

The General Electric Company made, as befitted its eminence in the electrical railway field, what was, from the electrical standpoint, perhaps the most comprehensive exhibit of apparatus in the auditorium. It included almost every device used on electric railroads with the exception of the generators. The most prominent feature of the exposition was one of the motor trucks which is to be operated on the Brooklyn Bridge structure at New York. This truck is of McGuire manufacture, and carries two G. E. 50 motors, a special motor designed to meet the peculiar conditions of the bridge service. One of the controllers used to operate this bridge car equipment, was also shown.

To the right of this compact equipment, was a Peckham truck with complete electrical equipment of two G. E. 1000 motors, and electric brakes, controlled by a B. 3 series parallel controller. This was shown in operation and was the center of attraction for great numbers of electric railway men interested in the operation of the electric brake and the G. E. 1000. Many favorable comments were made on the positive action of this brake, and the startling suddenness with which the motion of the wheels was brought to a stop. Directly opposite this equipment on the other side of the space, was a Diamond trailer car truck, fitted with an electric brake, for use

EXHIBITS OF PECKHAM MOTOR TRUCK AND WHEEL CO. AND M'GUIRE MANUFACTURING CO.

with trailer cars. The center of the space was occupied by one of the Nantasket Beach air compressor equipments, motor, pump, tank and automatic switch. To this was fitted one of the chime whistles used on that important innovation in steam railroad practice, and the shrill musical note served as a means of attracting very large crowds to the space of the General Electric Company. This equipment was described in the last issue of the STREET RAILWAY JOURNAL.

A handsome switchboard of the well known panel type, made up of generator and feeder panels, with full equipment of standard instruments, was set up at the rear of the space. One of the panels was a station panel, carrying a type G recording wattmeter measuring and recording the total watt output of the station.

The motor department was represented by handsomely finished examples of the G. E. 800, G. E. 1000, G. E. 1200 and 2000 types of motors. An unfinished G. E. 800 armature was used to bring home to the delegates the method of manufacture employed in turning out the G. E. railway motor armatures. Two four-faced pyramid stands carried samples of the switches, cut-outs, and nickel plated overhead line supplies, while on a table were shown the latest styles of frogs, turnbuckles, strain insulators and other improved devices of the G. E. overhead railway equipment. Two styles of trolley, the

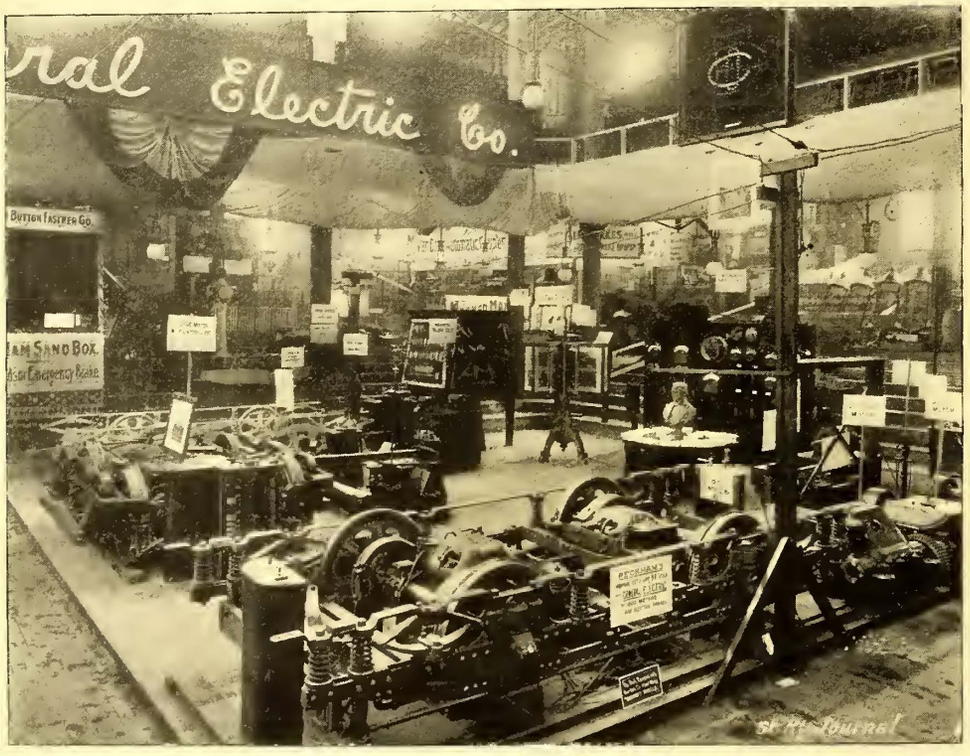


EXHIBIT OF THE GENERAL ELECTRIC COMPANY.

U. S. standard trolley, and the other known as the U. S. S. trolley, for low bridge work were shown. The method of shipping commutators for motor armatures was exemplified by three full sets of commutator segments, bound solid for shipment from the works, devised to simplify the task of repairing injured motor armatures.

The work of the General Electric Company in the steam railroad field was emphasized by a large photograph of the ninety-six ton locomotive, coupled with a Royal Blue express train on the Baltimore & Ohio Railroad and by a sample length of the overhead conduit with the contact shoe, used for the operation of the said locomotive. A length of the third rail over which regular trains are now being operated between East Weymouth and Nantasket Junction, on the main line of the Old Colony Division of the New York, New Haven & Hudson River Railroad served to illustrate another electrical system for steam railroad work.

The magnetic blowout principle applied to G. E. controllers circuit breakers, lightning arresters, etc., was explained by two arc making devices exactly similar in construction so far as the breaking mechanisms went. One only was fitted with the blowout device. Movement of a handle broke the circuit in each alternately. In that fitted with the blowout the arc was immediately extinguished; from the other the bright green flame of burning copper was startling in its volume and intensity. The object lesson was not overlooked by the delegates.

The space was handsomely illuminated by a large script sign, and by the famous G. E. monogram in varicolored miniature incandescents. Around the space, and under the gallery, were a series of ten Thomson arc lamps for use on railway circuits. The new apparatus shown outside of the brake, comprised the M automatic circuit breaker for car and other work, a modified form of the K automatic circuit breaker for station and work of that character, railway and arc lightning arresters and other minor devices.

A full supply of the literature of the company, covering railway matters, was spread upon the table around a handsome bust of Thomas A. Edison, and the company issued for the occasion a beautifully printed guide book of St. Louis, containing illustrations of almost every point of interest in that city, and especially of the fine stations equipped with its apparatus. To its special friends, the General Electric Company presented a photograph in bas relief, of the G. E. 1000 motor.

The headquarters of the company were in the main parlor of the Southern Hotel. This parlor was courteously tendered to the Association by the company for the reception on Tuesday evening. The parlor was handsomely decorated with ferns, and a contingent of the company was always present to receive the visiting delegates. One of the small parlors adjoining was somewhat more frequented than the larger parlor, for in this small parlor, the material welcome was extended.

One of the features of the convention, was the informal reception held by the ladies every evening in the smaller parlor of the headquarters. Here, at about ten o'clock at night, were gathered every body of prominence in the street railway field present in St. Louis, together with the ladies in attendance and for almost four hours the feast of reason and flow of soul ran evenly on its course. Mr. Clark is to be congratulated upon the success which met his efforts to uphold the reputation of the General Electric Company in every particular at this convention.

The interests of the General Electric Company were taken care of by the following gentlemen, to wit: William J. Clark, B. E. Sunny, F. M. Kimball, T. Beran, Ralph Beach, C. C. Pierce, H. J. Crowley, F. H. Strievy, F. M. Boyer, Theo. P. Bayley, G. K. Wheeler, H. C. Wirt, L. H. Parker, E. M. Hulett, George D. Rosenthal, W. B. Potter and John McGhie.

A Mica Volume.

A very interesting addition to existing data on insulating materials has recently been issued by the Mica Insulator Company in the form of a collection of samples of the various insulating materials which it manufactures, together with the results of actual tests on these various materials attached to each sample. Results are given on tests of the necessary voltage to break down a given thickness of each of these materials, and also on the specific insulation resistance of the materials. The figures given are the average of a large number of tests under various conditions, and are taken from the experiments of Messrs. Herrick and Burke, of New York.

The Mica Insulator Company has realized that in order to fulfill the varied requirements of insulation, it is necessary to manufacture various qualities and kinds of materials, as there is no one universal quality of insulation. Its samples cover a number of grades of "Micanite" insulation, consisting of a number of combinations of mica, mica and cloth, and mica and paper, of various degrees of flexibility. Also a number of grades of "Empire" insulation, which consists mainly of specially prepared and insulated cloth and paper. From a technical standpoint, the collection is very interesting, because it not only shows the various kinds of materials manufactured, but also is indicative of the advances that have been made in the preparation and manufacture of insulating materials, both from a mechanical and electrical standpoint, and the high degree of perfection that has been reached in this line of electrical industry.

Veneer Car Roofs and Sides.

The use of heavy veneer for car outside roofs and car sides has been referred to in a series of car articles which has been published in recent issues. Frost Veneer Seating Company, whose veneer products are well and favorably known throughout the country, is doing a large business in the manufacture of heavy veneer for these purposes, selling not only to railway companies who make their own cars, but to manufacturers direct. Veneer for car roofs and sides is claimed to be the most durable and practicable material to use for this purpose as the entire side or roof can be made in one piece instead of being composed of several pieces, and can be bent in any desired shape. Being in one piece these panels or roofs necessarily present greater strength than if made of many parts. The Frost Company has special facilities for manufacturing heavy outside veneer for this purpose.

The company is also doing a large business in the manufacture of ceilings and veneer car seats and backs. Having its factories and mills in three or four different sections of the country it is enabled to ship to different parts from the nearest factory.

The Exhibit of the J. G. Brill Company.

The exhibit of the J. G. Brill Company, of Philadelphia, was the most prominent in the convention hall, and many complimentary remarks were made upon the enterprise of the company in undertaking to make such a large exhibit and the success with which every detail in connection with it was carried out. The exhibit was a very comprehensive one, including apparatus from all the different departments of the company's extensive manufactory.

The car building department of the company was represented by a ten-seat open car of standard style. It was 28 ft., 8⅜ ins. long, 6 ft. 2 ins. wide at the sills, and 7 ft. 1¼ ins. wide at the post, The interior finish was solid ash throughout, with decorated birch veneered ceiling. The special feature of this car was the method of filling a long felt want in the matter of curtains. These reached to the floor of the car, making it possible to completely inclose the car in wet weather. Another interesting feature was the improved and patented round corner seat-end panels of the Brill Company. By the means of this panel the objectionable protruding corner of the ordinary open car seat is obviated, and it is possible to carry the curtain in grooves on the outside of the panel from the water table to the sill, without any possibility of wearing out the curtain, due to contact with the corner. This unquestionably attracted widespread approval, and was acknowledged to be an extremely valuable improvement.

Close to this open car was exhibited one Brill snow sweeper which attracted much attention. The broom was operated by Westinghouse motors mounted on the driving shaft and they were so arranged as to be operated by the current in the hall. These sweepers are used extensively in St. Louis, and in fact all over the country.

There was also on exhibition at the convention hall a Brill No. 21 E truck having the Brill standard solid forged axle box frame. This truck was favorably commented upon owing to the absolute freedom from bolts, nuts or rivets. Another interesting feature of the truck which attracted much attention was the arrangement of the springs, which were of different capacities, for the purpose of overcoming oscillation. The journal box springs are designed of strong tension, having capacity of 5000 lbs. each with one inch compression. Their object is to spring support the entire vehicle. The spiral springs, located at either side of journal boxes, are designed of sufficient capacity to suit the weight of the car body, and are called upon to take up the vertical motion. Outside of the spiral springs is the half elliptic spring, a new feature of the 21 E. truck. By actual tests, the manufacturers have demonstrated that the half elliptic spring under strain will return to its normal condition, with less motion than the full elliptic. Furthermore, it does not possess the tendency of increased movement in regaining its normal condition. The truck had Brill journal boxes, self oiling and dustproof.

The Brill No. 27 truck, which has gained such notoriety by its successful operation on the Buffalo & Niagara Falls Electric Railway, was also shown in the space of the company. It was most critically examined and many favorable comments were made upon it. The manufacturers claim that it is "a perfect passenger truck," and that it develops the only improvements which have been made in passenger trucks since 1873. This improvement consists in suspending the spring plank on equalizing bars through the medium of swinging spring links, located outside the line of the rails. This gives wider base of support to the car body, and precludes any possibility of the bolster coming in contact with the wheel pieces. The swing links being of the draw and recoil type of springs, ease the bolster when the truck strikes a curve. The adoption of this truck by the Akron, Bedford & Cleveland Railway, the Cleveland, Painesville & Eastern Railway, and Cleveland & Lorain Railway, seems to indicate that the manufacturers have introduced in this truck features which commend themselves to street railway managers. There was also on exhibition the Brill patented maximum traction truck with the short frame of car bottom, fitted with angle plates, spring compresssr and draught pin. There was also on exhibition a Dunning patented drawbar and fender which attracted much attention.

Outside the hall and directly in front of the entrance was a Brill standard sprinkling car with patented spraying device, insuring perfect distribution of the water. The water leaves this device in a film, separates at a distance of about two feet from the center, and falls in a spray extending about nine feet outside of the rail line. This accomplishes more in even distribution of the water than can possibly be obtained by the use of perforations. The Brill snow plow "shear-board" was also shown outside of the hall.

The company published in honor of the convention a very handsome souvenir which was a very handsome specimen of typographical work. It gave a history of the company from the date of its inception to the present time, and embodied descriptions of the different improvements in trucks and car building introduced by the company. The engravings were particularly good and as a whole the souvenir is probably the finest publication of its kind ever brought out a at street railway convention.

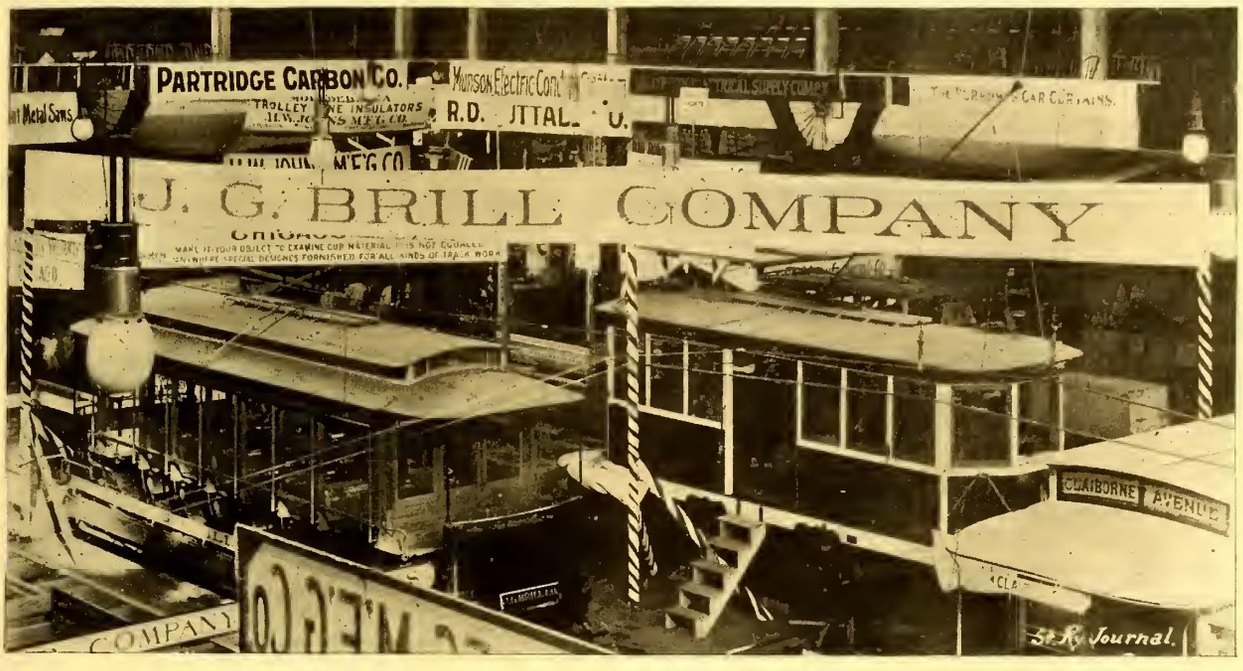


EXHIBIT OF THE J. G. BRILL CO.

The Brill headquarters were at the Southern Hotel, Parlor 82, where models of Brill No. 21 E. truck, No. 21 C. truck, No. 27 truck, the "perfect passenger" truck, and the Eureka maximum traction truck were on exhibition. The headquarters proved very popular and the numerous friends of the Brill Company were courteously entertained by the representatives of the company, John A. Brill, Samuel M. Curwen, F. C. Randall, George M. Haskell and Wm. H. Heulings, Jr.

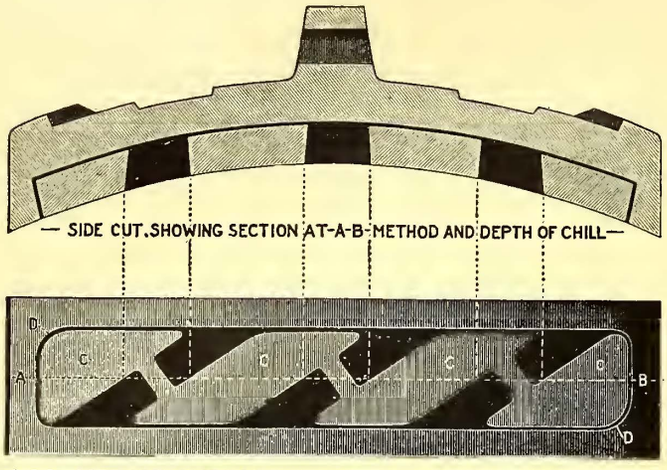
ONE of the most popular souvenirs at the convention was one distributed by the Broderick & Bascom Rope Company, of St. Louis. It consisted of a solid section of cable used for street railroads and 1¼ ins. in diameter. It was fitted with a metal base and ornamental top so that it would serve as a paper weight, and as it was silver plated it made a beautiful desk ornament.

JOSEPH A. JANNEY, JR., of Janney & Steinmetz, who supply iron and steel specialties for electric railways, was present at the convention and had for distribution a number of pamphlets of the firm advertising its specialties. Janney & Steinmetz act as Eastern sales agents for the Shickle, Harrison & Howard Iron Company, of St. Louis.

GEORGE C. EWING, of the Neal Electric Headlight Company, was present at the convention, and while this company did not make any regular exhibit of headlights, Mr. Ewing had one of his standard headlights to show street railway managers.

Brake Shoes.

The Corning brake shoe, of which two views are presented herewith, has given excellent results in steam railroad service and is now being introduced to electric railways by the manufacturers, the



THE CORNING BRAKE SHOE.

Corning Brake Shoe Co. The construction of the shoe is shown in the cuts. The wearing part is composed of two materials, soft grey cast iron, annealed and chilled iron. It will outwear, it is claimed, three to five soft iron shoes, and as it has a braking surface of sixty-six per cent of a special grade of soft iron, the braking efficiency is claimed to be fully equal to that of a soft iron shoe.

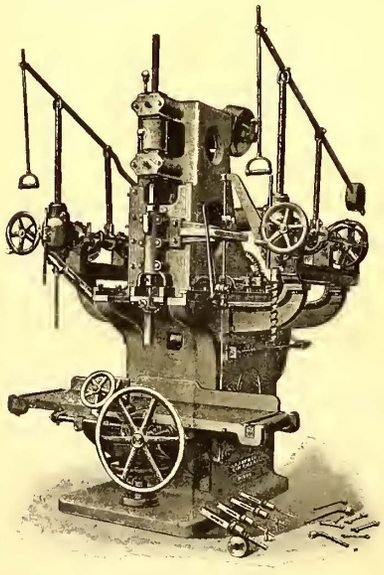
Tests in service have shown that the increased life of the brake shoe does not decrease the life of the wheel on which it is used, as it presents no cutting surface as do shoes composed of mixtures of wrought iron or steel, and cast iron.

On account of a small increase in the coefficient of friction from high to low speed, the Corning brake shoe, it is claimed, will not grip the wheel as the car is slowing down and cause skidding, consequently the percentage of skidded wheels is greatly reduced by its use.

On the Fall Brook Railway of Corning, a steam railroad, a passenger train equipped with the shoes ran 9000 miles, making 3550 stops with a wear on the shoes of $\frac{3}{16}$ in., and no visible wearing or cutting of the tires.

Mortising Machine.

The accompanying engraving shows a vertical hollow-chisel car mortising machine, with auxiliary boring attachments, recently brought out by J. A. Fay & Co. The greatest care has been exercised to incorporate in this machine the essential elements of a strong, simple and efficient mortiser, without the necessity of laying out the work or cleaning the mortises.



MORTISING MACHINE.

The frame is massive, made in a cored form with wide base, giving good floor surface, and carrying a cored housing, and with it the chisel-ram, the auxiliary boring attachments and the timber-supporting table. The housing is gibbed firmly to the frame, with provision for taking up wear, and has a lateral movement, actuated by a lever, for moving the chisel to its required position above the timber. It is counterbalanced by a weight and lever, and supported on rolls that reduce the friction to a minimum in operation.

The chisel-ram is gibbed to the housing, and carries the boring spindle that prepares the material for the chisel-thrust; this boring spindle runs in a long, self-oiling bearing in the frame and through the sleeve, bearings and pulley on the housing where the power is applied. There is a self-adjusting binder provided for always keeping the proper tension to the belt that drives the boring spindle. There are stops provided to regulate the vertical travel of the ram for the depth of the mortise, and also for the lateral movement for its width. The vertical movement of the ram is sixteen inches, and the extreme lateral motion, with the housing, is fourteen inches.

The table for supporting the material is four feet six inches long. It has stops to regulate the travel to the length of the mortise required, is operated by a hand wheel, rack and pinion, has an adjustable clamp for holding the material firmly in position, and a vertical adjustment. The reciprocating motion of the chisel ram is produced by reversing friction and gearing. The countershaft is placed above the machine, driving the friction by two belts, and also driving the boring spindle on the frame and the auxiliary boring attachments. The auxiliary boring attachments are placed one on each side of the frame, at such distance from the chisel as will permit of adjusting them to an angle of 30 degs. in either direction. These are convenient for joint-bolt boring, and save much handling of material. The spindles have a vertical adjustment of twenty inches, and a lateral adjustment of twelve inches.

New Cars for the Brooklyn Bridge Cable Railway.

An engraving was published in the last issue of the STREET RAILWAY JOURNAL of the new cars recently built for the cable railway on the New York and Brooklyn Bridge by Pullman's Palace Car Company. These cars will be equipped with electric motors and will be used, one on each train which passes over the bridge. At the terminals the electric equipment will be employed to switch the train from one track to the other, and in case of a breakdown to the cable the train can be propelled over the bridge by electricity.

The accompanying engraving shows the interior of one of the cars of which twenty have been ordered. The cars are 39 ft. 3½ ins. long over end sills. The inside finish is nicely figured mahogany, ornamented with neat designs of marquetry, made in different colored woods. The ceilings are in delicate color, ornamented in gold.

The windows are glazed with plate glass. The seats are individual spring seats and backs covered with rattan, and arranged longitudinally along the sides of the cars. The cars are heated with small hot water Baker heaters, which are arranged so that they can easily be removed in summer. The trimmings are of solid bronze. Illumination is supplied by four two-light center oil lamps. The cars are, in addition, arranged for electric lighting.

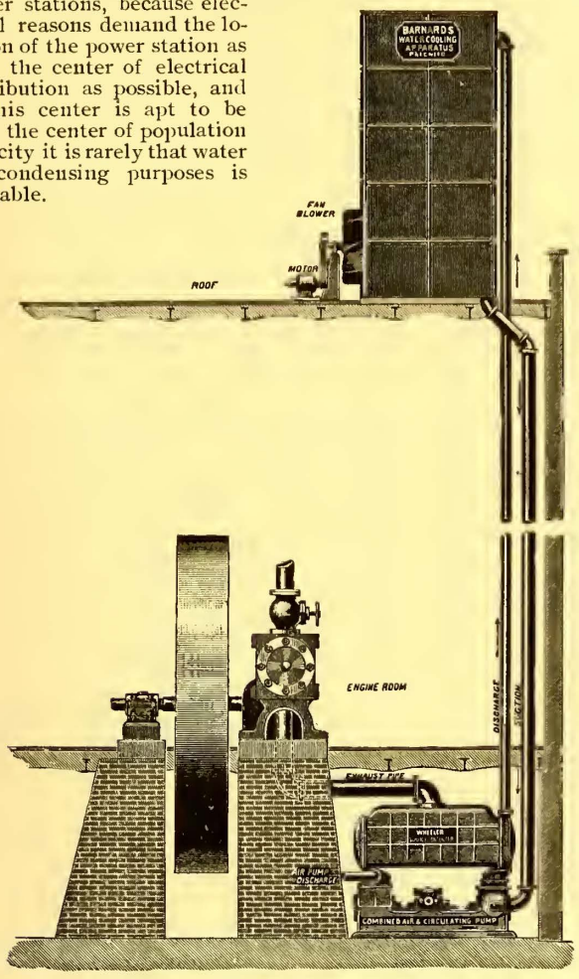
The cars are mounted on McGuire "L" trucks with steel tired wheels and steel axles. These trucks are fitted with two sets of brakes; Eames vacuum and hand brakes, each independent of the other, so in case of accident to the vacuum brake the cars can be controlled by hand brakes. The cars are also equipped with General Electric motors.

INTERIOR VIEW OF NEW BROOKLYN BRIDGE CARS.

THE Santa Barbara (Cal.) Street Railroad Company has completed the equipment of its lines with electricity.

Water Cooling Towers.

A description was published in our last issue of the Barnard water cooling tower brought out by the Wheeler Condenser & Engineering Company, for the use of condensing engines when they are not contiguous to a cheap supply of water for condensing purposes. The system seems to be particularly applicable to street railway power stations, because electrical reasons demand the location of the power station as near the center of electrical distribution as possible, and as this center is apt to be near the center of population of a city it is rarely that water for condensing purposes is available.



WATER COOLING TOWER.

Aside from the large gain in economy, due to condensing engines, the vapors and noise from the exhaust steam are often of considerable annoyance where stations are centrally located.

The engraving presented herewith shows a surface condenser of the "Wheeler" type, located in the basement, attached to a Corliss engine in the usual way. The circulating water after leaving condenser is pumped by the combined air and circulating pump to the cooling tower, located, for want of space, on the roof of the building. The cooling tower is rectangular in shape, made of steel, well braced, and contains a large number of "mats," consisting of wire cloth, which form the cooling surface, and on which the water impinges, which, in turn, is cooled by the volume of air forced into the tower by the fan shown on the side. The circulating water is passed through a distribution system, over the wire cloth or "mats," and falls by gravity to a tank or well, forming the foundation of the cooling tower, and, after being cooled, is again returned to the circulating pump, and used over again.

Electric Railway in Hayti.

The Berlin Iron Bridge Company has recently received a contract for a car house and shop building for an electric road at Port au Prince, Hayti. These buildings will be of steel throughout and will have a steel skeleton framework covered on the sides and roof with corrugated iron. The shop is 33 ft. × 70 ft., and the car house 40 ft. × 160 ft. This building is only one of many which have been gotten out by this same company for export to foreign countries during the past few months.

THE Santa Barbara Consolidated Construction Company of Santa Barbara, Cal., is projecting an electric railway sixteen miles in length from Santa Barbara to Miramar, Summerland and Goleta. Franchises have been secured, the stock has been fully subscribed and the grading has been completed. The company will lay tracks and put in overhead work in 1897. C. W. D. Miller is president, and Harry Wood, chief engineer of the company.

Storage Battery Plant for Electric Railway Service in Philadelphia.

Storage batteries, when applied to electric railways, can be located either in the power house, for regulating purposes, or at the end of long feeders, to supply the variable demand, the feeder capacity being equal to the average load only. A plant for the latter purpose has recently been installed at the end of a feeder, eleven miles long, on one of the most important lines of the Union Traction Company, of Philadelphia. The battery supplies current to a recent addition, several miles in length. It was found necessary either to build a new power house or install a battery sub-station, as the required addition to the existing feeder system would necessitate such an enormous outlay for copper as to render it commercially impossible. It was found that the cost of copper alone, to carry out this intention and double the service on the section, would be four or five times the total cost of a battery installation to fully meet all the requirements; and that a new power house was out of the question on account of the heavy operating expenses.

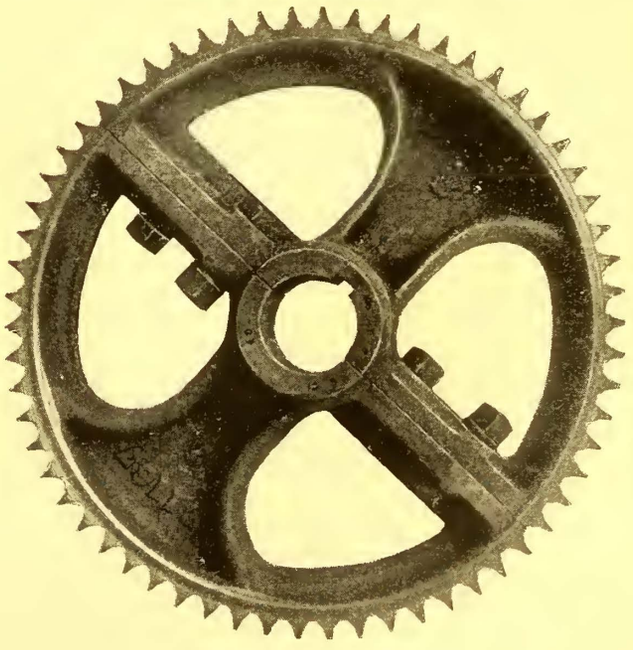
Before the extension was made the pressure at the end of the feeder was barely enough to operate cars on schedule time, and the pressure varied as much as fifty per cent. The voltmeter chart at the station illustrates the effect of the battery as a regulator of pressure. During the four hours between 1 A. M. and 5 A. M., the only time when the battery is taken off the system, the fluctuation in pressure is very marked. The load on the section varies from 100 to 700 amperes; the feeder carries a constant load of 400 amperes, the battery discharging or charging to the extent necessary to maintain this condition. The result in actual practice is found to be that the feeder load remains constant at this average current and is absolutely independent of the fluctuating demand on the line.

The battery house contains 240 cells of the type G Electric Storage Battery Company's chloride accumulator, thirteen plate type. The maximum discharge rate of the battery is 400 h. p. for one hour. The plates are in lead-lined boxes, mounted on two tiers of oil insulators. The connections are made by continuous weld, no mechanical contacts being used throughout the battery.

The switchboard has three panels which control the entire operation of the battery, feeder and line. The apparatus consists only of an ammeter, circuit breaker and knifeswitch in each of the three circuits, together with voltmeter and recording wattmeters in the battery circuit.

A Long Lived Gear.

The electric motor gear illustrated in the accompanying engraving is one recently removed from one of the cars of the Citizens' Traction Company, of Pittsburgh, Pa. It was put in service on Apr. 5, 1894, and from the report of the company's electrician has worn out two steel pinions. It was taken off the car Sept. 17, 1896, not because of a broken tooth, but because the managers of



A LONG LIVED GEAR.

the road were afraid the teeth might break as they were worn so thin, and because they thought, further, that the company had "value received" for the gear. The estimated distance covered by the car while equipped with this gear was over 100,000 miles.

This gear was supplied by the Simonds Manufacturing Company. The stock was the company's mixture of malleable iron, which shows a wonderful toughness, as the wear of this wheel demonstrates.

Personals.

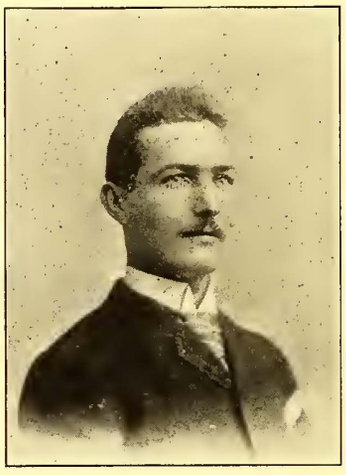
Mr. Alexander McCallum, of London, has been making a tour of some of the principal cities of this country in behalf of the *Herald* of Glasgow, Scotland. The city of Glasgow is contemplating the introduction of electric power, and it was to learn the true condition and efficiency of electrical apparatus that a representative was sent to this country. Mr. McCallum is a well known writer on railway matters and has been a frequent contributor to these columns. He returned to England on Oct. 24, after a visit in this country of about four weeks.

Mr. S. G. Booker, superintendent of the Phœnix Carbon Manufacturing Company, is one of the early pioneers in the manufacture of carbon for electric purposes and is well known in the street railway and electrical trade. He has made a long and careful study of the manufacture of carbons and is well posted upon this branch of electrical business. The extensive plant of the Phœnix Carbon Manufacturing Company is located in St. Louis, and many delegates at the convention took the opportunity of visiting the works and inspecting the manufacture of carbon in its different branches during the recent convention week. The product of the company includes electric light carbons, telephone disks of all sizes, brushes for street railway motors and generators, cylinders and plates for batteries, etc.

S. G. BOOKER.

Mr. Frank X. Cicott, resigned Oct. 9, as manager of the railway department for the Pettingell-Andrews Company, the Boston general selling agent for the Billings & Spencer Company, and accepted an offer from the Ansonia Brass & Copper Company to represent the metal and electrical department of that company. Mr. Cicott was born in Detroit, Mich., went to San Francisco in 1867 and was graduated at the Pacific College in 1869. He has traveled

FRANK X. CICOTT.



ARTHUR S. PARTRIDGE.

extensively in Mexico, Central America, China, made two trips to Japan and has crossed the Atlantic twelve times. Mr. Cicott was appointed in 1874 by President Grant coiner of the mint at San Francisco. During his administration for nearly eight years $173,000,000 gold and $61,000,000 silver was coined aggregating $237,000,000. In the operation of this enormous amount of coin, the legal allowance for wastage to which Mr. Cicott was entitled amounted to $300,000, while the actual loss on the entire workings was only $24,000, or about eight per cent of the amount allowed, thus leaving the Government a clear gain of $276,000. Retiring from political life, Mr. Cicott resumed commercial pursuits, acting for eight years as resident agent on the Pacific coast for Holmes, Booth & Haydens, electrical supplies, etc. Leaving San Francisco he traveled in Europe to study the various street railway systems in vogue there. In 1890 he started a tramway and railway journal in London, England, called the *Railway World* and still continues as a shareholder and director of the board of the English publishing company. Returning to America in 1893, he formed an alliance with the Pettingell-Andrews Company in conjunction with the Billings & Spencer Company, but now of the Ansonia Brass & Copper Company.

Mr. Arthur S. Partridge, of St. Louis, was omnipresent during the convention week and as a member of the Entertainment Committee extended many courtesies to attendants at the convention, which were most heartily appreciated. Mr. Partridge represents in St. Louis a number of prominent electric railway supply houses, including the R. D. Nuttall Company, Eugene Munsell & Company, the Mica Insulator Company, the American Electrical Works, the Billings & Spencer Company, the Kisinger-Ison Company and Morris, Tasker Company, Incorporated. Mr. Partridge has enjoyed a large business in St. Louis and is well known and popular in the street railway fraternity.

Mr. G. Martin Brill, the president and general manager of the J. G. Brill Company, returned recently from an extended trip through Europe. The foremen of the different departments in the Brill Car Works, desiring to show their pleasure at seeing him home again, tendered him a complimentary dinner on Aug. 29, at the Terminal Hotel. After the dinner, which was a thoroughly enjoyable affair, several of those present made short speeches expressing their gratification upon Mr. Brill's safe return and wishing him long life and prosperity. Mr. Brill replied by giving a description which was very entertaining and much appreciated of his trip abroad. The following, each of whom is in charge of a department in the car works, were present: Geo. Sinyard, John E. Kelly, G. Silberschmidt, Harry Blankmyer, R. Clavier, Chas. Buckley, S. T. Bole, R. J. McHale, E. A. Cole, F. Brindley, Chas. Blair, E. Bernaner, J. Myers, H. E. Haddock, C. Reynolds, E. Bucknam and I. D. Shipper.

Among the Manfacturers.

Rankin & Fritsch Foundry & Machine Company, St. Louis, has just issued a new catalogue illustrating and describing its standard heavy duty Corliss engines; also its rolling mill, reversing, blowing and piston valve engines which it builds in sizes from 50 h. p. to 3000 h. p.

The Ball & Wood Company, of New York, seems to be among the fortunate manufacturers in these hard times. The company reports sales to date the largest of any year it has been in business, with sufficient orders on its books to run on comfortably for the rest of 1896. The company is adding to and improving its equipment in anticipation of a revival of business after election.

The J. A. Fay & Egan Company, of Cincinnati, O., states that Charles A. Gilbert, who formerly represented that company in Atlanta, Ga., is no longer connected with the company. Eugene Donnelly, formerly in charge of the company's New Orleans office has been placed in charge of the Atlanta office with headquarters at 36 West Alabama Street.

The Standard Underground Cable Company, of Pittsburgh, Pa., purposes opening an office in St. Louis, at an early date under charge of Frank C. Cosby, who has been one of the superintendents of construction for this company for some time. Mr. Cosby is an experienced engineer and is thoroughly up in all work pertaining to underground construction.

The Crane Company, of Chicago, has secured an order for about five car loads of extra heavy valves and fittings for Johannesburg, South Africa, about two car loads of extra heavy pipe valves and fittings for Yokohama, Japan, for an electric light plant, a contract for the headers of extra heavy valves and fittings for the steam plant of the McCormick Harvester Company, also a header system of extra heavy valves and fittings for the Akron Street Railway & Illuminating Company, Akron, O.

The Westinghouse Machine Company, of Pittsburgh, Pa., has recently published a very tasteful catalogue descriptive of its high-speed engines. The catalogue is illustrated with a number of fine engravings showing its engines in use in the power plants of the Philadelphia Traction Company, United Electric Light & Power Company of New York City, Columbus Central Railway, Brooklyn City & Newtown Railway and in other plants. The engravings are very high class. The principal advantages of the Westinghouse machines are also described and a table of the sizes and dimemsions is given.

The Kisinger-Ison Company, of Cincinnati, is working its shops to their full capacity. The company furnishes all parts for either single or double end sweepers, or builds sweepers complete if preferred; has built fourteen thus far this season and is just finishing several for the Cass Avenue & Fair Grounds road, St. Louis. One of the specialties of this company is the manufacturing of carrying sheaves for cable roads. These are made in steel and in steel and cast iron combined. The company's business in this line is very large. The company also turns out each month from four to six tons of brass goods for motor bearings, etc., sixty to seventy-five tons of malleable castings and seventy-five to eighty tons of steel castings for street railway work. This company states that the sale of its patent trolley wire connectors is very large and constantly increasing.

J. V. E. Titus, who represented the Garton-Daniels Electric Company, of Keokuk, at the convention, remarked that the sales of the lightning arresters manufactured by his company have been unusually large this season, and particularly with street railways, its customers numbering many of the large systems of the country. The railway type requires less than one ampere to operate it, and will not ground the system.

Obituary.

WILLIAM A. HARRIS, the manufacturer of the Harris-Corliss engine, died at the residence of his son, Fred Harris, at Providence, R. I., Oct. 28. He was a very prominent resident of Providence and was well known in the trade. At the time of his death he was sixty-two years old.

H. E. COLLINS, of H. E. Collins & Company, died Oct. 14, at his residence in Pittsburgh. Mr. Collins was a native of New York State, but went to St. Louis at an early age. He enlisted in the U. S. Army during the war and in 1865 returned to St. Louis to engage in the insurance business. In 1876 he founded the firm of H. E. Collins & Company, dealers in ores. In 1895 he associated himself in business with W. C. Temple and took up the introduction of Cahall boilers. This business has now grown to one of great magnitude, with offices in all principal cities.

New Publicatins.

NEW GENERAL SPECIFICATIONS FOR STEEL HIGHWAY BRIDGES AND VIADUCTS. New and revised edition, 1896. By Theodore Cooper. Published by the Engineering News Publishing Company. New York. Twenty-five pages. Price 25 cents.

Mr. Cooper's specifications for bridges have been recognized as standard, and the new and revised edition just published will be found very useful by engineers under whose direction much bridge construction is done.

THE MONEY QUESTION: A HANDBOOK FOR THE TIMES. By Henry V. Poor. Published by H. V. & H. W. Poor. New York. 103 pages.

MOTORMEN, CONDUCTORS, HOW WILL YOU STAND WITH THE COUNTRY ON A SILVER BASIS? FIGURE IT OUT. By Frank R. Ford. Street Railway Publishing Company, New York. 12 pages.

These two pamphlets illustrate the feeling of railway men on the subject af the maintenance of the gold standard. The scope of the two pamphlets is entirely different. Mr. Poor's work is an exhaustive, able treatise on the whole subject of United States finances, and the recommendation is made that the Government retire entirely from the banking business, and that a National Bank of the United States similar in general scope to that abolished by President Jackson, be re-established.

Mr. Ford's treatise aims to bring home to street railway employes the vital interest which they have in the money question and to explain the effect which a change in the present standard would have upon their condition.

List of Street Railway Patents.

U. S. PATENTS ISSUED AUG. 25, 1896, TO OCT. 20, 1896, INCLUSIVE.

AUG. 25.

CAR FENDER.—W. A. Lyon, Danbury, Conn. No. 566,328.

TROLLEY SUPPORT FOR ELECTRIC RAILWAYS.—S. H. Short, Cleveland, O. No. 566,345.

A spring rigidly secured at one end to the car body, an arm or rod mounted on said spring and adapted to engage the same at different points in the length thereof, and carrying a spring at the outer or free end thereof, and a contact device mounted on said last mentioned spring.

TROLLEY WIRE HANGER.—W. Cooper, Schenectady, N. Y. No. 566,376.

An insulating bar, metal pieces secured to the bar to which the trolley wire is secured and a support for the hanger permitting it to slide to and fro, but preventing it from twisting out of line.

FENDER FOR CARS.—W. Grunow, Jr., Bridgeport, Conn. No. 566,394.

MOTOR TRUCK GEARING.—C H. Johnson, Youngstown, O. No. 566,400.

SYSTEM OF CONTROL FOR ELECTRIC MOTORS.—E. A. Sperry, Cleveland, O. No. 566,426.

An electric controller comprising power and brake circuits extending therefrom, resistance included in the circuits and a second resistance carried by the controller cylinder and inserted in the circuit at a predetermined time.

AUTOMATIC TRACK CLEANING DEVICE.—F. Kiefel, Cincinnati, O. No. 566,456.

A bracket, a movable, forwardly and downwardly extending prong carried thereby, an incline on the bracket and an incline on the prong adapted to co-operate and raise the prong when it strikes an immovable object.

ELECTRIC RAILWAY.—C. Skinner, Chicago, Ill. No. 566,542.

APPARATUS FOR REMOVING DUST FROM CARS, ROOMS OR BUILDINGS.—J. R. Young, Leavenworth, Kan. No. 566,554.

ELECTRIC CABLE CONDUCTOR AND SHEAVE WHEEL.—J. F. Place, Montclair, N. J. No. 566,697.

Consists of copper with other metal and insulating material so arranged that the copper forms the outside and the other metal the core or inside of said conductor, with the insulating material as an annular ring between said copper and other metal.

BOND CONNECTOR FOR RAILS.—J. Bryan, Pittsburgh, Pa. No. 566,709.

A plate or holder, provided with a seat for a bond wire, soft or easily malleable metal interposed between the plate and rail, and a bolt for attaching the plate to the rail and pressing the metal against the rail.

SEPT. 1.

ELECTRIC RAILWAY SYSTEM.—J. M. Murphy, Danbury, Conn. No. 566,786.

MAGNETIC TRACTION APPARATUS FOR MOTOR CARS.—W. Robinson, Boston. No. 566,800.

A car axle and wheels, a motor arranged to drive the same and coils of insulated wire surrounding the hubs of said wheels exterior to the surface of the latter and arranged to magnetize the same, said coils being electrically connected together.

ELECTRIC RAILWAY SYSTEM.—W. Robinson, Boston. No. 566,801.

CAR FENDER.—J. R. Thomas, New York, N. Y. No. 566,879.

ELECTRIC CAR BRAKE.—A. B. Roney, Chicago, Ill. No. 566,939.

A motor, a screw-threaded shaft driven thereby, and a yielding connection between said shaft and the armature of the motor, a nut working on said shaft and held against rotation, and a brake rod connected with, and actuated by said nut

ELECTRIC RAILWAY.—R. M. Hunter, Philadelphia, Pa. No. 566,984.

SEPT. 8.

TROLLEY WIRE CROSSING.—H. M. Handshay, San Antonio, Tex. No. 567 133.

TROLLEY WIRE AND TROLLEY WHEEL.—P. Cassidy, Worcester, Mass. No. 567,186.

A trolley wire comprising a cylindrical rib or bead, a tapering V-shaped body portion for engaging the trolley wheel, the rib and body portion of the wire being separated by V-shaped grooves arranged to engage supporting clips or fasteners.

ELECTRIC RAIL BOND. G. H. Scott, Worcester, Mass. No. 567,257.

ELECTRIC RAILWAY TROLLEY.—R. N. Dyer, East Orange, N. J. No. 567,306.

An upward pressure trolley, a solenoid and core for moving the trolley upwardly and a multiplying gear connecting the colenoid core with the trolley.

CAR FENDER.—P. Hennessey, San Francisco. Cal. No. 567,388.

A car fender having a swinging guard or apron, a lever slidably mounted on the car and so connected with the guard that the contact of an obstructing body will cause the lever to contact with the ground and be held while the car continues its movement and causes the guard to move into its carrying position.

STREET RAILWAY SWITCH.—H. L. Dallig, Jersey City, N. J. No. 567,454.

Comprises a pivoted switching point, a segmental rack on the under side of said switching point, a rockshaft provided with a pinion in mesh with the said segmental rack, and mechanism operated from the approaching car, whereby the said rockshaft can be turned in either direction.

TROLLEY FOR ELECTRIC CARS.—J. E. Hewes, Philadelphia, Pa. No. 567,474.

CAR STORAGE ARRANGEMENT.—E. F. Mann, Detroit, Mich. No. 567,487.

A building for storing trolley cars having therein a track and trolley wire extending above said track, a break in said trolley wire near the entrance to said building and a switch located outside of the building adapted to throw said trolley wire in and out of circuit.

ELECTRIC RAILROAD.—C. Sill, New York. No. 567,517.

Comprises switches provided with insulators, consisting of tubes, and alternate layers of cement, the said layers and tubes one arranged within the other.

MOTOR MOUNTING AND DRIVING MECHANISM.—E. J. Bagnall, Cleveland, O. No. 567,560.

SEPT. 22.

ELECTRIC BRAKE.—A. F. MacDonald, Schenectady, N. Y. No. 567,989.

A switch for shifting the dynamo electric machine or machines employed for braking purposes each time the brake circuit is closed.

CAR OR TRUCK.—H. G. Wesenmann, Brooklyn, N. Y. No. 568,059.

CAR TRUCK.—W. S. Adams, Philadelphia, Pa. No. 568,079.

ELECTRIC CAR HEATER.—J. G. Noyes, Milford, Conn. No. 568,168.

CAR FENDER.—G. W. Bennum, Georgetown, Del. No. 568,187.

CAR FENDER.—A. F. S Colburn, Philadelphia, Pa. No. 568,191.
A trundle frame, a rear vertical frame hinged thereto, a bolt secured to the upper part of the vertical frame, a bracket attached to a car having a vertical slot in which the bolt is adapted to slide and a net secured between the forward end of the trundle frame and the top of the vertical frame.

SEPT. 29.

TROLLEY WIRE SUPPORT.—W. A. McCallum, Cincinnati, O. No. 568,452.

TRACK SANDING DEVICE.—D. Pettit, Beverly, N. J. No. 568,489.
A worm conveyor, a rotatable perforated cylinder located above the same, and means for actuating said cylinder in unison with the conveyor.

SAND BOX FOR CARS.—S. S. Schofield, Philadelphia, Pa. No. 568,497.

TROLLEY SYSTEM FOR ELECTRIC RAILWAYS.—C. E. Davis, Chicago, Ill. No. 568,523.
Consists of a series of conductors, each successive secondary conductor taking its departure from its primary conductor at one side and then passing to the other side of said primary conductor.

RAILWAY TRACK SANDER.—A. H. Gilman, Saco, Me. No. 568,530.
A hopper for the sand, a cylindrical tube connected to said hopper, a rod mounted in and working in said tube and operating a plunger, the motion of the plunger regulating the emission of the sand from the hopper.

STREET SPRINKLING APPARATUS.—J. S. McGehee, New Orleans, La. No. 568,540.
A series of connected reservoirs, and a discharge nozzle, of mechanism for supplying air under pressure to the reservoirs, and an independent automatic cut-off mechanism within each of the reservoirs.

ELECTRO-MAGNETIC ADHESIVE DEVICE.—A. A. Honey, Tacoma, Wash. No. 568,682.

RAIL BOND FOR ELECTRIC RAILWAYS.—C. C. Benson, Covington, Ky. No. 568,713.

OCT. 6.

SWITCH.—E. Balzar, Chicago, Ill. No. 568,727.

BRAKE SHOE.—G. W. Stevens, Elyria, O. No. 568,809.
A brake shoe having a flange-dressing portion of greater length than the body of the shoe.

ELECTRIC MOTOR TRUCK.—N. C. Bassett, Lynn, Mass. No. 568,891.

CAR BRAKE.—J. Jamieson, Pittsburgh, Pa. No. 568,908.

AIR BRAKE.—J. E. Reyburn, Philadelphia, Pa. No. 568,923.
A rail shoe, a cylinder having a piston therein, and mounted thereon, a slotted arm suitably fulcrumed, a pin mounted on said rail shoe and adapted to engage the slot in said arm and a brakeshoe attached to the rod of said piston.

CAR BRAKE.—A. Ruthenberg, Rochester, N. Y. No. 568,959.
A wheel and a shaft having three cams eccentric thereon, a brake shoe journaled on the central cam, sleeves on the outer cams, a second brake shoe, and connections between it and the sleeves.

CAR FENDER.—W. B. Baker, Shamokin, Pa. No. 568,969.

SEAT.—J. B. Goodwin, Pittsburgh, Pa. No. 569,153.
In a seat for cars, the combination of an upright rod, a catch arranged on said rod, a seat having arms embracing the rod, a flange arranged on one of the arms and merging therewith at its sides, and lugs below the flange.

TROLLEY SUPPORT FOR ELECTRIC RAILWAYS.—S. H. Short, Cleveland, O. No. 569,772.
A trolley pole, a series of springs connected at one end to said pole, and a second series of springs having sliding connection with said pole.

SIDE GUARD FOR OPEN CARS.—A. De Foe Dimick, Wakefield, Mass. No. 569,786.
A car with reversible seats, the combination of movable side guards, and a gear connection between said guards and the reversible portion of the seats.

CAR FENDER.—J. Gibson, Toledo, O. No. 569,822.

SINGLE-WIRE ELECTRIC RAILWAY.—J. C. Henry, Westfield, N. J. No. 569,827.
Consists of two tracks, and a single working conductor common to both, a zigzag feed and span wire, insulators supported by said feed and span wire, having hangers to support the working conductor, and branch wires connecting said conductor with the feed and span wire.

CAR FENDER.—G. A. Weed, New York, N. Y. No. 569,848.

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SPEED-INDICATING ALARM.—B. F. Card, Brooklyn, N. Y. No. 569,171.
A car, a pole extending therefrom, a trolley upon the pole and adapted to roll along an electric conductor and means, governed by the trolley independently of electrical energy for giving a signal at and beyond a predetermined speed of said car.

CAR FENDER.—C. Fink, Philadelphia, Pa. No. 569,330.

TROLLEY CATCHER.—C. F. Randall, Denver, Colo. No. 569,352.

WHEEL FENDER.—S. Norton, Rochester, N. Y. No. 569,465.
Comprises a scoop-net, a sectional frame therefor composed of vertical side bars and lower side bars pivoted thereto, plates prings designed to hold said lower side bars either extended or raised, and flanges on said lower side bars adapted to limit the movement thereof.

BRAKE.—J. F. Burgin, Allegheny, Pa. No. 569,486.

OCT. 20.

CAR FENDER.—H. D. Fisher, Reading, Pa. No. 569,624.

CAR FENDER.—W. Thompson, Albany, N. Y. No. 569,684.
Has supporting arms arranged to be attached to the car truck said arms having a rotatable bar attached thereto, and adjustable clutch devices arranged to limit the rotation of the b r and retaining devices arranged to receive and removably hold the fender in position.

CAR FENDER.—G. W. Wiley, Philadelphia, Pa. No. 569,699.
A fender, a base or support, a series of bars carried thereby, and springs supported by said bars, said springs forming approximately V-shaped recesses for engagement with obstructions upon the track.

UNDERRUNNING TROLLEY.—N. C. Bassett, Lynn, Mass. No, 569,738.
A support for the trolley pole, a base to which the support is pivoted, lifting springs secured to the support and the base and a spring acting to assist the lifting springs when the trolley is in the lower position.

We will send copies of specifications and drawings complete of any of the above patents to any address upon receipt of fifteen cents. Give date and number of patent desired. THE STREET RAILWAY PUBLISHING COMPANY, HAVEMEYER BUILDING, NEW YORK.

A Few Press Comments on Our October Issue.

BOTH in size and in typographical appearance it is unique in the history of trade journalism.—New Haven *Leader*.

WE congratulate our contemporary on the production of a number which is unique in the history of trade journalism.—*Scientific American*.

THE *Street Railway Journal*, which is always an excellent periodical, both as to contents and as to manner of get-up, makes a special effort at the time of the annual street railway convention. This year it has eclipsed all previous efforts, not only of its own, but, so far as we know, of any other publication, trade or otherwise.
Heretofore we have been accustomed to regard the *Inland Printer* as the highest exemplar of the typographic art in periodic literature, but we think the present number of the *Journal* in some respects even surpasses it.
As regards the quality of the reading matter, it is sufficient praise to state that it is up to its usual standard, and as regards the quantity, the number of pages speaks for that.—*Electricity*.

THE October issue of the *Street Railway Journal* is, in many particulars, a remarkable publication, and is comparable in thoroughness of treatment and extent of illustrations chiefly with the special numbers in which the English technical journals have described such notable engineering works as the Forth Bridge. The number is issued in anticipation of the convention of the American Street Railway Association in St. Louis, Mo., and this city, its transportation systems and the general progress of street railway construction and operation are so thoroughly treated as to make this number a souvenir of the convention.—*Engineering Record*.

WHAT the pyramids are to modern gravestones, in the same ratio is the last issue of the *Street Railway Journal* to other trade publications. The publishers have achieved a decided triumph in this department of literature, and, while it may not be as enduring as these Egyptian mountains of stone, yet recollection of it will last a great many years, as it will be used as the standard of comparison when its contemporaries think they have accomplished something wonderful in the same line. A rough guess would give the weight of this single issue at about four pounds. The finest calendered paper is used, and the illustrations are a marvel in pictoral printing.—*Boston Herald*.

Home-Seekers' Excursions.

On Nov. 17 and Dec. 1 and 15, 1896, the Chicago, Milwaukee & St. Paul Railway will sell round trip excursion tickets from Chicago to a great many points in the Western and Southwestern states both on its own line and elsewhere, at greatly reduced rates. Details as to rates, routes, etc., may be obtained on application to any coupon ticket agent or by addressing Geo. H. Heafford, General Passenger Agent, Chicago, Ill. ***