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THIRTEENTH ANNUAL CONVENTION

OF THE

American Street Railway Association,

Held at Atlanta, Ga., Oct. 17, 18 and 19, 1894.

PAPERS BY SPECIAL COMMITTEES.

Report of the Committee on "A Standard Form of Street Railway Accounts."

By H. I. Bettis—Committee.

On September 7, the committee sent to all the members of the Association a classification of expenditures, which could be readily adopted for use upon any road, and so arranged that any or all of these accounts can be subdivided to any degree desired by the road adopting them, without impairing its value as a basis for comparative statements. Accompanying this was a circular letter, requesting the accounting officers of the several roads to carefully examine this classification, noting such items as in their opinion are erroneously classified, and also requesting that sample reports, blanks and special rulings for account books be sent the committee for inspection. The replies received were in the main very full and complete, and showed an interest in the subject, but the number, compared with the number of members with the Association was very small, and in consequence, there was a postal sent out about two weeks later, but with little effect upon the delinquents. The results obtained from the replies received will be taken up later.

Special ruled account books and ruled forms of reports of various kinds are a *means* to *accomplish results*. To standardize the means, we must first of all seek the same or similar results. If we are seeking the uniform results, uniform methods may be employed, and will naturally *be* employed, those which are the simplest in form and manner of filling out being preferable. For this reason the committee urges you to take some steps toward adopting a standard classification, that the end to be accomplished by all will be uniform, and this done the standardizing of forms and methods of street railway accounting will follow.

At the time the subject was assigned, and until the returns came in from the circular letters, the committee was not aware that a classification of accounts had been presented to the Association at one of its earlier meetings in 1884, and long before this committee had even a speaking acquaintance with the street railway business. Had the committee been aware of the fact, it might have understood that its particular function was to prepare a set of blanks, to conform with the classification presented in 1884. It is, perhaps, just as well, for with the progress in street railway affairs in the past ten years, the classification presented then, for roads operated entirely by animal power, is nearly out of date, and it would be better to frame one which can be adapted to all classes and kinds of roads, with any or all kinds of motive power, which we believe you will find to be the case of that presented with this report.

In adopting a standard classification as a basis for reports from all roads, we must decide upon the *minimum* number of accounts into which it can be divided, and yet give all the information that the majority would desire. Each of these accounts must be carefully analyzed, and so closely defined that each particular account shall have at all times the same constituent elements on every road. This much decided, any company wishing any more detail may divide and subdivide, until there are twice or thrice the number of accounts; but still retaining the distinctive features of each particular group.

With companies formed under the laws of Great Britain, this is provided for by the "Companies Act" by which all railroad corporations are obliged to keep their accounts according to the forms and methods prescribed by the Government, and the books are regularly passed upon by a board of examiners, besides annual or semi-annual audits of the assets, liabilities accounts and vouchers by independent auditors, or chartered accountants. By this system of government supervision and inspection, the methods and reports are necessarily uniform and afford a means for comparative statements, and statistical information, unexcelled by any in the world in precision and accuracy. In the United States the Interstate Commission and the railroad commissioners of many states, have to a certain degree exercised their power in the same direction, demanding yearly reports for publication. In the case of street railways this information is only taken for purely statistical purposes, and so far as the street railway interests are concerned, it could be very well dispensed with.

An English writer upon this subject says:

"Uniformity in railway accounting in every respect is greatly to be desired. Much has already been done in this direction and the periodical reports of our English, Indian, colonial and foreign railways under English control are models of completeness. There is, however, room for improvement. If the able administrators of American railroads could see their way to adopt a more uniform method of compiling their published accounts, setting forth the particulars of capital authorized, raised and expended, revenue earnings and disbursements, assets, and liabilities on defined principles, and in a manner intelligible to any ordinary man of business, it would tend greatly to improve the value of *sound* railway securities."

This is recognized by every thinking man amongst us, especially those who have to do with the securities of our roads, and yet in the construction, equipment and operation of our tramways, we are far in advance of any country in the world, and English capitalists have not been slow to perceive this and demonstrate their faith in our work, by investing in our street railway properties. Before doing so, they prefer to have the accounts examined by an independent auditor, as is the custom among themselves, nor can we blame them for this business-like proceeding—it has been instilled into them. Were there a more uniform system of reports and accounting, there is no doubt but that the stock and bonds of our wonderful street railway properties would find an open market abroad.

The classification presented in 1884 was too elaborate for a small company, many directors and managers not caring for information in such minute detail, even on many of our largest and best equipped roads, there being seventy divisions of the operating expenses, while that submitted to you now has but thirty, and even this might be simplified.

The interests of this committee are, first, last and all the time, with the owners of the property, the stockholders and their directors, and by conjunction with the bankers who secure a market for their loans, and with the bond purchasers. These are the parties whose money and energy have built up our magnificent structures, and they should receive such information concerning the operation, earnings and expenditures as will enable them to know the value of their investment. The managers and superintendents occasionally look at these monthly reports, and are pleased to carry them before the directors in person, if the totals make a good showing, otherwise they are apt to be mailed. Results are what they all want, and it matters but little to them whether the report is divided into 100 distinctive classes of receipts and expenditures, or ten. The road has earned a certain amount, and a certain percentage of that is irrevocably gone, and the subdivision of accounts could not have saved it. This might seem to be an argument in favor of the abolition of everything but the profit and loss account, but we do not go so far as that; we would advocate that the reports be much simplified, and that the standard be simple and concise enough for the smallest road and the most conservative ideas.

The stockholders and directors, having invested their precious dollars with others in an enterprise which has given every promise of noble returns in due time, are anxious to know the results from their venture, and from time to time wish for a report which can be compared with those of other companies in the same or similar fields.

The banker who has your bonds to put upon the market, asks for a statement of your earnings and expenses from the time the road was started. There is, perhaps, another road similarly situated, and with a certain amount or capital, which, to his knowledge, has issued bonds to a certain amount, and this road is not only paying the interest on those bonds, but a certain dividend upon its stock. By a comparison of the reports of the two roads, he makes his calculations which are submitted to the dear public, and purchasers for the bonds are readily found. The creditors, too, and their name is legion, the supply men, manufacturers of cars, electrical, cable and other machinery, are all interested in your financial reports; the lawyers, judges and receivers sometimes knock at the door for a copy of this valuable document. How necessary, then, that it should be all that is required of it.

Who of all this list cares to go into the minute detail of a lengthy report? Very few, if any. These are the persons who take the greatest interest in our affairs, and they seldom have the time or the inclination to wade through the petty and cumbrous detail. Who is it, then, that has served us this "kettle of fish"? None of the parties mentioned could have laid it at their door; they don't want it. We hold the divining rod in our hand, and it points to the auditor and the accounting officer, the secretary and treasurer, the figure fiend, the statistician, assisted by those managers and superintendents who leave the road to work out its own salvation while they record its progress or degeneration, as the case may be. Statistics costing us thousands of dollars per year, laid away upon the shelf to gather the dust of ages, and, after years of repose, finally consigned to the flames. These statistical fiends appear to believe their only security is in being surrounded with such a mystery and maze of figures as will cause their colleagues to hold up their hands in amazement that any human being can exist in an atmosphere of such dense knowledge and remain perfectly sane.

Don't understand this committee to imply that all accounting officers are of this class. There are some of them who belong to the same as this committee and are perhaps too lazy to produce so much fire and perform such intricate work, but so long as the stockholders require nothing better we are secure.

In making *tests* our managers often require statistics as to mileage made by special gears, brushes, truck wheels, trolley wheels and much other similar information. This is perfectly proper and necessary at times for the good management of the road, but it is a side issue, and not to be considered in making up our standard forms. Not only should we seek uniformity in our reports, but in our methods as well. For instance, we find from the sample pages of some of the account books sent the committee that it is the custom on some roads when a bill is *paid* to charge it to the account for which the material was used. While on other roads the charge to expense is made when the material is received and by others when it is used. This committee holds that the latter is the only correct method, as when material is purchased or paid for we are simply making an exchange of cash for another form of assets, and there is no expense until the material is used.

As an illustration of the incorrectness of the first method, let us take a road which should do a splendid summer business and during the month of August there is a county fair, which makes that the best month in the year. Then we will suppose that in the early summer they purchased enough supplies to last them several months, amounting to several thousands of dollars, and the bills all fall due or are paid in August; by this method the charges for several months expense all goes into the expenses of one month. In consequence of such methods the reports for August will be very misleading, and whereas it should show up as the best in the year, it is a question if it is not the worst. Charges to expense should be made as closely as possible in the months to which they belong. When we are of one accord on matters like this, and can agree upon a classification, the balance of the work of standardizing forms of accounting will be very easy and soon accomplished.

There is but one other point upon which the committee wishes to touch, and that is the construction and equipment accounts. There is a great temptation for managers whose roads are running down on account of bad times, no travel, poor motors, bad track (all, of course, due to the mismanagement of his predecessor); we repeat, a great temptation to steer as many items as possible into the construction and equipment account. This is downright fraud, but it is done, nevertheless. Nor are the managers and accounting officers wholly to blame for this. Many of the roads are too heavily capitalized in the start, contracts are let with a huge profit for some one, and the road gets whatever may fall to its lot, sometimes only the broken crust. Burdened with a capital stock of $2,000,000, it could be paralleled by a better road, with better equipment, for perhaps half the money. Next come the bonds to the amount of another couple of millions, and secured by a mortgage upon the property. Half built in the first place, and with inferior equipment and with interest on a funded debt of more than the entire cost of the road, perhaps the officials of the company think that the game must go on, and that the particular part they are to play is to bluff it as long as possible until the receiver calls time.

The committee might dwell at length upon the distinction between the transportation charges and the maintenance charges, which was found to be somewhat confused on many of the reports sent in response to our request, but time is too short. We will say in conclusion, after careful examination of the blank forms and statements sent us, that 40 per cent. are practically the same as the reports used by the committee, and correspond in general detail with the classification submitted to you. Thirty per cent. have practically the same headings, but in each there are instances where expenditures upon the property or maintenance charges are mingled in a confused way with those expenditures which add nothing to the property, either present or future. In 5 per cent. the items are grouped under distinctive headings, but with no regard to the divisions as generally used. In 25 per cent., although the accounts are subdivided to a considerable extent, and some of them have very elaborate statements, the grouping into distinct classes is entirely ignored.

From this you may see that, should the Association adopt the classification submitted, 40 per cent. of the roads would be all right as they stand, and 30 per cent. more would need to change but two or three items—principally putting the repairs of the power plant under the same head as repairs of the balance of the equipment, where it undoubtedly belongs. Twenty-five per cent. more would but need to arrange their accounts systematically, instead of having them in a jumbled state, as most of them have the charges made to the proper accounts, but not arranged systematically in the reports.

Nearly 40 per cent of those replying to the circulars sent out by the committee expressed their approval of the classification sent them, and also a desire that it should be adopted by the Association. None said anything against it.

CLASSIFICATION OF EXPENDITURES FOR STREET RAILWAYS.

CONSTRUCTION AND EQUIPMENT.	1.—Superintendence and Organization. 2.—Engineering. 3.—Right of Way. 4.—Building Construction. 5.—Track and Roadway Construction. 6.—Overhead Line Construction. 7.—Car Equipment. 8.—Snow Plows and Sweepers. 9.—Power Station Equipment. 10.—Tools and Machinery. 11.—Improvements and Betterments. 12.—Real Estate.

OPERATING EXPENSE.

GENERAL OPERATING EXPENSES.
- 21.—Salaries General Officers and Clerks.
- 22.—Miscellaneous Expense General Offices.
- 23.—Insurance.
- 24.—Legal Expense.
- 25.—Injuries and Damages.
- 26.—Contingent Expense.
- 27.—Park Properties.

TRANSPORTATION EXPENSE.
- 28.—Car Service.
- 29.—Car House Expense.
- 30.—Lubricants and Waste for Cars.
- 31.—Supplies.
- 32.—Wrecking.
- 33.—Operating Power House.
- 34.—Fuel.
- 35.—Lubricants and Waste for Power House.
- 36.—Water.
- 37.—Hired Power.

MAINTENANCE OF WAY AND BUILDINGS.
- 38.—Repairs Roadway and Track.
- 40.—Renewals of Rails.
- 41.—Renewals of Ties.
- 42.—Repairs and Renewals Paving.
- 43.—Repairs and Renewals Supply Wires.
- 44.—Repairs and Renewals Bldg's, Docks, &c.
- 45.—Repairs and Renewals Overhead Lines.

MAINTENANCE OF EQUIPMENT
- 46.—Repairs of Cars.
- 47.—Repairs of Electric Equipment.
- 49.—Repairs of Steam Plant.
- 50.—Repairs of Electric Plant.
- 51.—Repairs of Tools and Machinery.
- 52.—Miscellaneous Expenses.

The classification as given here is not subdivided to the extent that some might think desirable, but sufficiently for any practical purposes, as any further division would be purely statistical.

There are two principal divisions of expenditures, viz.: 1. Construction and Equipment. 2. Operating Expenses. The latter is divided into four groups: 1. General Operating Expense. 2. Transportation Expense. 3. Maintenance of Way and Buildings. 4. Maintenance of Equipment.

The construction and equipment charges only include expenditures which *add to the original value of the property.*

The first two divisions under the head of Operating Expense—i. e. *General Operating Expense and Transportation Expense*, include only such expenditures as are necessary for operating the road, while the other two divisions, viz.: *Maintenance of Way and Buildings and Maintenance of Equipment*, include all expenditures made upon the property itself, necessary to keep it in perfect repair.

These maintenance charges are purely Operating Expense, but are essentially different from the first two divisions of the Operating Expense in that they add materially to the present or future value of the property while the General and Transportation charges do not.

The classification as presented is especially prepared for electric railways, but can be easily adapted to use on cable, horse and steam roads, in fact, has been used successfully on a combination of electric, horse and steam roads.

For use upon horse roads.—All the subdivisions of General Operating Expense would be the same.

Under the head of Transportation Expense, for No. 31 would be substituted *Supplies.* Including miscellaneous supplies such as are constantly needed for the operation of horse cars and could not be chargeable to repairs.

For No. 33 would be substituted *Stable Expense*, including wages, stablemen and hostlers.

For No. 34, *Fuel*—would be substituted *Provender and Bedding.*

The latter expense in each case being that in horse roads which is offset by the corresponding expense on electric roads.

Proceeding, we would find that the subdivisions under the head of Maintenance of Way and Buildings are all right for Horse Railways except that No. 43 and No. 45 would be omitted.

EARNINGS AND EXPENSES.

Act No.	EARNINGS.	This Year.	Prev'us Year.	Increase.	Decrease.
....	Cash Fares				
....	Sale of Tickets				
....	Chartered Cars				
....	Freight				
....	Mail				
....	Express				
....	Advertising				
....	Miscellaneous Earnings				
	Gross Earnings				
	OPERATING EXPENSES. GENERAL EXPENSES.				
21	Salaries				
22	Advertising and Office Expense				
23	Insurance				
24	Legal				
25	Injuries and Damages				
26	Contingent				
27	Parks				
	Total				
	TRANSPORTATION EXPENSES.				
28	Car Service				
29	Car House Expense				
30	Lubricants and Waste for Cars				
31	Electrical Supplies				
32	Wrecking				
33	Operation Power House				
34	Fuel				
35	Lubricants and Waste for Power House				
36	Water				
37	Hired Power				
	Total				
	MAINTENANCE OF WAY AND BUILDINGS.				
38	Repairs Readbed and Track				
39	Removing Snow and Ice				
40	Renewals of Rails				
41	Renewals of Ties				
42	Repairs and Renewals Paving				
43	Repairs and Renewals Supplementary Wire				
44	Repairs Buildings and Structures				
45	Repairs Overhead Line				
	Total				
	MAINTENANCE OF EQUIPMENT.				
46	Repairs Cars				
47	Repairs Armatures and Fields				
48	Repairs all other Electrical Apparatus				
49	Repairs Steam Plant				
50	Repairs Dynamos and Switchboard				
51	Repairs Tools and Machinery				
52	Miscellaneous Expense				
	Total				
	TOTAL OPERATING EXPENSES				
	NET EARNINGS				
	FIXED CHARGES.				
	Interest Accrued				
	Taxes				
	TOTAL FIXED CHARGES				
	SURPLUS EARNINGS				
	DEFICIT				

BALANCE SHEET.

RESOURCES.		
CONSTRUCTION AND EQUIPMENT.		
Superintendence		
Engineering		
Right of Way		
Buildings and Structures		
Track and Roadway		
Overhead Line		
Cars		
Snow Plow and Sweepers		
Power Station		
Tools and Machinery		
Improvements and Betterments		
Interest and Discount		
Total Construction and Equipment		
INVESTMENTS.		
Total Investments		
CASH ASSETS.		
Cash		
Accounts Receivable		
Notes Receivable		
Supplies on Hand		
Total Cash Assets		
SUNDRY ITEMS		
Treasury Stock		
Total Sundry Items		
Total Resources		
LIABILITIES.		
CAPITAL STOCK.		
The Paterson, Passaic & Rutherford Electric Ry. Co		
Total Capital Stock		
FUNDED DEBT.		
Total Funded Debt		
CURRENT LIABILITIES.		
Accounts Payable		
Notes Payable		
Total Current Liabilities		
SUNDRY ITEMS.		
Accrued Interest		
Accrued Taxes		
Total Sundry Items		
PROFIT AND LOSS.		
Total Liabilities		

(Under operating expenses item No. 39 in above form can be included in No. 38, and item No. 48 in No. 47; hence these two numbers are omitted in schedule.)

Under the head of Maintenance of Equipment, instead of No. 47, No. 49 and No. 50 we would have—*Renewals of Horses, Repairs and Renewals of Harness, Shoeing, Veterinary Services.*

To adapt this classification for use on suburban steam roads we would have the General Operating Expense the same.

Under the head of Transportation Expense. No. 28 would not include the wages of engineers and firemen, only conductors and brakemen, and for No. 33 would be substituted *Locomotive Service.* This being the corresponding expense to Operation of Power House.

All others would remain unchanged except that No. 35 would be *Lubricants and Waste for Locomotives* instead of *Power House*, and No. 37, *Hired Power*, would be omitted.

Under the head of Maintenance of Way and Buildings no change would be necessary except that as with horse roads No. 43 and No. 45 would be omitted.

Under the head of Maintenance of Equipment, for No. 47, No. 49 and No. 50 would be substituted, *Repairs of Locomotives.*

CASH STATEMENT.

RECEIPTS.		DISBURSEMENTS	
Balance from Last Month		Accounts Payable	
Cash Fares		Notes Payable	
Sale of Tickets			
Chartered Cars			
Freight			
Mail			
Express		Intrest (Sundry)	
Advertising		Interest (Coupon)	
		Dividends	
		Sundry Expenditures	
Accounts Receivable			
Notes Receivable			

RECAPITULATION.

EARNINGS, EXPENSES AND NET EARNINGS CURRENT MONTH.

	Passengers.	Motor Mileage	Trailer Mile'ge	Earnings	Expenses	Per Ct. Ex. to Earn'gs	Net Earnings	Ex. per Mile.
Mo. of '9								
" '9								
Increase.								
Decrease								

CHARGES TO CONSTRUCTION AND EQUIPMENT.

Superintendence	
Engineering	
Right of Way	
Buildings and Structures	
Track and Roadway	
Overhead Line	
Cars and Motors	
Snow Plows and Sweepers	
Power Station	
Tools and Machinery	
Improvements and Betterments	

Having had no experience with cable roads the committee cannot say just what substitution would be necessary, but feel very confident that the same classification could easily be adapted for use upon such roads as well.

CONSTRUCTION AND EQUIPMENT ACCOUNTS.

Too much care cannot be exercised in charges to these accounts. Nothing should be charged to Construction and Equipment except that which adds to the first or original cost of the property.

1. **Superintendence and Organization Expense.**
Salaries of superintendent of construction, assistants, wages of clerks and others employed in the offices of this department. Expense of the office, furniture, fuel, lighting, supplies for office, miscellaneous and personal expense of Superintendent and assistants while on business. Includes stationery and printing for this department. Also all expenses of organization not coming under either of the following heads:

2. **Engineering.**
Wages and expenses of engineers and draughtsmen on preliminary and construction work.

3. **Right of Way.**
Salaries and expenses of right-of-way agent, together with payments for rights of way, easements, franchises and pole rights.

4. **Building Construction.**
Cost of buildings; car houses, stations, offices, store houses, power house, repair shops, wharves, coal sheds, etc., etc.; also furniture and fixtures for the same.
To this account should also be charged the cost of land occupied by the buildings mentioned.
Real estate (land and buildings thereon) not used by the road for actual operation must be charged to Real Estate Account.

5. **Track and Roadway Construction.**
Includes the expense of grading, surfacing, ballasting, ditching and paving; the cost of rails, rail chairs, ties and stringers, tie rods, joint fastenings, track spikes, frogs and switches, supplementary wire, tie wires, channel pins, solder and miscellaneous track material; also the cost of distributing and laying the same, with the supplementary wire and its connections.

6. **Overhead Construction.**
Cost of poles and setting; putting up trolley, feeder and guard wires, including cost of wire and all devices for overhead construction.

7. **Car Equipment.**
Cost of cars built or purchased, including the cost of trucks, wheels, motors, upholstering, painting, lettering, varnishing, &c.

8. **Snow Plows and Sweepers.**
Cost of snow plows and sweepers built and purchased, including the electrical equipment for the same.

9. **Power Station Equipment.**
Cost of steam plant, engines, boilers, pumps, piping, shafting and belting, dynamos and switchboard equipment, together with installation of the same.

10. **Tools and Machinery.**
Cost of tools and machinery for repair shops, car houses, &c. and expense of setting and placing in running order.

11. **Improvements and Betterments.**
All expenditures which improve the *original plant*, and of which a portion should be charged to operating, and a portion to construction expenses.

12. **Real Estate.**
All land and buildings thereon purchased as an investment and not used by the road for actual operation.

GENERAL OPERATING EXPENSES.

21. **Salaries of General Officers and Clerks.**
In this account are included the salaries of the general officers; the heads of departments connected with the supervision and management of the general business of the road. Salaries of division superintendents and assistants may also be charged to this account.
By general officers are meant officers in charge of departments, and whose jurisdiction extends over the entire road.
This account embraces the salaries of all clerks in the general offices, clerks for heads of departments, and all clerks not hereinafter mentioned.

22. **Miscellaneous Expense General Offices.**
The expense of heating and lighting the general offices; wages of porters, messengers, etc.; telephone service and all miscellaneous supplies and expenses of the general offices, including the cost of all stationery, books, paper, stamps, pens, pencils, etc.; also cost of all printing of blanks, circulars, statements, tickets, and the cost of advertising.

23. **Insurance.**
Includes cost of insurance on property of the company, and against injuries to employes, and all expenses of collection.

24. **Legal Expense.**
In this account are included the salaries, fees and expenses of attorneys, witness' fees and other court expenses.

25. **Injuries and Damages.**
Expenses on account of persons injured, and property damaged, with payments of claims, are all chargeable to this account.
Wages of persons while disabled, medical attendance and funeral expenses; also wages of claim agent and others connected with the claim department.
Lawyers' fees and other court expenses *are not chargeable to this account;* nor are damages to property belonging to the company.

26. **Contingent Expense.**
This account includes the miscellaneous expenses not otherwise provided for; traveling and other expenses of general officers and assistants, etc., etc.

27. **Park Properties.**
Includes all running expenses of parks owned or leased by the company.

TRANSPORTATION EXPENSES.

28. **Car Service.**
This account includes the wages of conductors, motormen, starters, aids, inspectors and switchmen; cost of punches, ticket registers, sign sticks, switch sticks and miscellaneous supplies for car service.
The wages of the superintendent of time tables and chief of conductors, with such clerks as may be under them, should also be charged to this account.

29. **Car House Expense.**
This account includes the wages of shed foremen, shifters, cleaners, oilers, wipers, laborers, inspectors and watchmen, except such as are employed on repairs of cars.
The cost of fuel, and lighting the car houses and sheds, lanterns and oil for watchmen, tools used by workmen on cars,

(cleaning and oiling and other work, except repairs), are chargeable to this account.

30. Lubricants and Waste for Cars.
Oil, grease, tallow and other lubricants, with waste used upon car journals and motors, are included in this account.

31. Supplies.
This account includes such supplies as are constantly needed for the operation of the electric cars, but cannot be charged to repairs, such as lamps, fuses, carbon brushes, trolley cord, etc.

32. Wrecking.
Wages of those employed in getting derailed cars on the track, and removing obstructions and wrecks; tools used and all other expense incurred on the same account.
Expense of getting cars back to the car house, when broken down on the line, is also chargeable to this account.

33. Operation of Power Houses.
This account includes wages of engineers, firemen, coal shovelers, dynamo men, oilers, cleaners and others employed in the power houses, except when employed upon repairs.
Also the cost of water, water rates, or cost of pumping where the company furnishes its own water works; carbon brushes, fuses, lamps and other supplies necessary for the daily operation of the power houses, and not otherwise provided for; cost of heating and lighting power houses.
Repairs and renewals of engines, boilers, dynamos, switchboards and station fixtures *are not chargeable to this account.* Fuel and lubricants are also chargeable to separate accounts.

34. Fuel.
This account includes the cost of all fuel used in the power houses, with transportation charges on the same.

35. Lubricants and Waste for Power Houses.
Oils, greases, tallow and waste for use in the power houses, for engines, shafting, dynamos, pumps, etc.

36. Water.
Cost of water when taken from local water works companies.

37. Hired Power.
Cost of power when taken from other electric companies.

MAINTENANCE OF WAY AND BUILDINGS.

38. Repairs of Roadway and Track.
This account includes all expenditures on account of the roadbed and track, *except the cost of rails and ties used, and the cost of repairs and renewals of paving, and the supplementary wire.*
It includes tracks laid in buildings, yards, on turntables, wharves and over bridges; wages of roadmasters, track foremen, laborers, watchmen and others, while engaged in track repairs and renewals.
It includes cleaning, oiling and sanding track, repairs and renewals of drains under the track, repairs and renewals of planking over bridges, repairs and renewals of frogs and switches, joint fastenings, etc., etc. It also includes repairs of rails, and all work on rails, cutting and drilling, *except drilling for tie wires.* Also labor expended in taking up track.
The cost of tools, implements and all supplies used in connection with the track are included in this account.
The expense of removing snow and ice, with the cost of repairs on snow plows and sweepers, may be made a separate account if so desired, but comes under the head of Maintenance of Way.

40. Renewals of Rails.
This account includes the cost of new rails laid in the track, with the transportation charges on the same, less the value of old rails taken up.
The expense of loading, unloading, drilling, cutting, laying and repairing rails *is not included in this account.*

41. Renewals of Ties.
This account includes the cost of new ties laid in the track and the freight on the same.
The expense of loading, unloading and laying ties *is not included in this account.*

42. Repairs and Renewals of Paving.
This account embraces all expenditures on account of the paving.
It includes the cost of paving blocks and sand, and the cost of transportation of the same; the wages of pavers, laborers and others, engaged in repairs and renewals of paving; also the cost of tools and other supplies for the same work.
The expense of taking up and relaying paving, when necessitated by the repairs on the roadbed, the track and the supplementary wire *is not chargeable to this account*, but to the account for which expense was incurred.

43. Repairs and Renewals of the Supplementary Wire.
This account includes all expenditures on account of the supplementary wire and its connections.
It includes the cost of the wire, tie connections, channel pins, solder, and other supplies, also tools and implements used in connection with the work of repairing the supplementary wires; wages of solderers, laborers and others, engaged upon this work.
The expense of drilling rails for channel pins and tie wire rivets, is also chargeable to this account.
Expense on the supplementary wires, necessitated by the taking up of rails, ties, switches, frogs, etc., *are not chargeable to this account*, but to repairs of roadway and track.
Expense on the supplementary wires necessitated by the taking up or laying of paving should be charged to the account of paving.

44. Repairs and Renewals of Buildings, Docks and Wharves.
This account includes the cost of repairs and renewals of all buildings, docks and wharves, and of the stationary fixtures and furniture of the same, not otherwise provided for; car houses and sheds, store houses, car shops, repair shops, blacksmith and machine shops, power houses, coal sheds and bins, stations, etc., etc.
Repairs of pits in car houses and shops, cranes in power houses and coal sheds, etc., are embraced in this account.
Repairs of tracks in buildings and on wharves, *are not chargeable to this account.*

45. Repairs and Renewals of Poles and Overhead Lines.
The account includes the cost of repairs and renewals of poles and brackets, with trolley, span, guard and feed wires, with all appliances for suspension and insulation of the same.

MAINTENANCE OF EQUIPMENT.

46. Repairs of Cars.
This account includes the cost of all repairs on car bodies, painting, varnishing, upholstering, re-lettering cars and car signs; repairs and renewals of the trucks, brakes, brake shoes, axle boxes, springs, track brushes, snow scrapers, pilots, sand boxes, etc.; repairs and renewals of wheels and axles.
The cost of new cars taking the place of old to make the number good, are also chargeable to this account.
On roads using both motor and tow cars it is sometimes advisable to keep each kind separately.

47. Repairs of Electrical Equipment.
This includes the repairs of motors, their parts and connections, the labor of removing damaged parts and replacing same when repaired.
Armatures, fields, gears, pinions, controllers, switches, trolleys, lightning arresters, brush holders, cables, etc., all come under this head.
New motors or parts purchased or made and put in to replace those damaged or worn out must be charged to this account also.

49 Repairs of Steam Plant.
To this account should be charged all repairs and renewals of the steam plant in the power house, including the boilers, engines, pumps and shafting, repairs and renewals of belts, piping, steam fitting, etc.

50. Repairs of Electrical Plant.
Repairs and renewals of dynamos and their parts; armatures, fields, pulleys, commutators, oilers, bearings and boxes, brush holders, etc., are chargeable to this account; also labor removing and replacing damaged parts.
Repairs and renewals of the switchboard equipment are also charged to this account, such as repairs and renewals of station switches, rheostats, circuit breakers, ammeters, wiring and connections.

51. Tools and Machinery.
Repairs and renewals of tools and machinery, shafting, boilers, engines, etc., in the shops of the company; also cost of lubricants for the same.
Small tools (not shop fixtures) are chargeable to the account most benefited by them.

52. Miscellaneous Expense.
To this account should be charged all miscellaneous expense of maintenance and equipment, not otherwise provided for.

Report of the Committee on "City and Suburban Electric Railways."

BY E. C. FOSTER—Committee.

The subject that has been assigned to me for discussion, that of "City and Suburban Electric Railways," is decidedly a comprehensive one. Inasmuch as the interurban electric railways are comparatively few, it covers nearly the whole electric railway field. The latter class of roads is a growing one, however, and, as my work is in connection with lines of this kind, connecting Boston with the smaller cities surrounding it on the north, I shall assume that it is excusable in me to devote a considerable part of this paper to the consideration of the interurban roads.

It is difficult to make the distinction between city roads and suburban roads. The function of nearly all city roads is largely to convey the people from the residential districts, mainly in the suburbs, to the business sections, and likewise, from the latter to the former. In the improvements it has made in this class of transportation, lie the greatest benefits of the application of electricity to street car propulsion. The growth of our great cities has resulted in the appreciation of value of all real estate near the business sections, to a point where the only residence a working man can afford in these districts is a tenement house. These tenements are invariably crowded to a degree that is unhealthful. That the electric railway has done much for humanity in enabling the working population to leave these homes in the congested

districts, and procure more comfortable and respectable ones in the suburbs, goes without saying.

Next to this most important use of the electric railways comes their use in furnishing recreation for the masses of the people. Nothing accomplishes so much in the elevation of our population as frequent opportunity to cultivate acquaintance with nature. Optimism is the natural and healthy condition of the mind, and nothing encourages one to look on the bright side of life as does a ride or ramble through the country. The combination of fresh air and pretty scenery makes the only tonic that tones. The two necessary considerations in the accomplishment of the scheme of country air for the masses are, first, the public parks, and, second, the means of transportation to them. It is only within the past year that, in the state of Massachusetts, a State Public Park Commission has been created for the purpose of purchasing large tracts of land and opening them to the public, that they may enjoy the beauties of nature without trespassing upon private property. On a portion of the Blue Hills, only ten miles distant from the heart of the city of Boston, over 1,200 acres have been secured to be preserved forever for the benefit of the people. Also, in Arlington, a like distance in another direction, a large reservation is made; Middlesex Falls in another, and the Commission is now turning its attention to the shores of Revere Beach, immediately north of the city, one of the grandest beaches of this continent. It is needless to add that the street railway companies are doing their share in the matter of providing the necessary transportation. While their motives are not purely philanthropic, the results accomplished are of almost as substantial benefit as though the people only were considered. While this fact is very greatly appreciated, there seems to exist a growing feeling, on the part of some, that the street railway companies get everything and give nothing. Certainly the very evident benefits the people have secured, coupled with the fact that few companies have earned more than moderate dividends, and many none, should be enough to convince the most skeptical that the stockholder's experience is not always a profitable one.

However, I presume that it was not expected of me to devote this paper to a demonstration of the advantages accruing from the existence of electric railways, but rather to consider the question of the operation of roads, and the projection and construction of new lines. It seems almost useless for me to tell you, who know, certainly as well as, if not better than, I, how to operate existing roads, and how to determine what lines will pay, and under what conditions of fares and traffic. When I say, hereinafter, that such a thing should be so, even though it be without modification, you must understand that I offer such only as my opinion, formed from my own experience, and not necessarily as an established fact.

As a road is projected, and studied from a financial point of view, first, then constructed, and then operated, it may be well to consider these topics in this same order. The first point, covering the work preliminary to the construction, admits of nothing but rather general discussion. As it is not the purpose of this paper to consider roads built to yield their dividends in benefits to allied interests, as in developing real estate, it may be taken for granted that the question of primal importance, in the consideration of a proposed line, is its probable earning capacity. The stimulation to the growth of the country crossed may be considered, only in the reflex effect that such growth may have upon the business of the road. A line to pay should be one that makes itself a necessity to the people, in offering them the best facilities for transportation in the particular direction. Competing lines should be avoided, excepting where the volume of business is large enough to support both. Besides the assurance that the line is necessary to the people accommodated, it must be ascertained that the number of the latter is large enough to support the road on a paying basis, not only the first year, when the repairs are slight, but later, when reconstruction becomes necessary. I consider that there are very few cases where a company is warranted in investing its money in a line, on the strength alone of the future that may be expected from it. A road should be, at least, capable of earning its operating expenses from the start, and the evidence of a more prosperous time, later on, should be very strong, before it is constructed without immediate promise of good dividends. It is sometimes necessary for an established company to build on a location, merely to keep out competition. The only thing that warrants this is the knowledge that the opportunity exists for the proposed competing company to be self-supporting from the start, and ultimately a serious rival. Otherwise, it is economy to allow it to build the road, and buy it out at the foreclosure sale.

Track construction is a subject that has been so thoroughly discussed in all its details, that I shall not attempt to do more than express my opinion, in a general way, as to what forms are best suited for the various demands of the suburban roads. The kind of construction most desirable for a certain location depends, of course, entirely upon the particular conditions. For roads connecting towns, I think that it is often possible to secure an independent right of way for a very slight cost per mile, and very often for nothing; this might require special legislation. Progressive land owners realize that the one way to enhance the value of their real estate, is to put it within means of easy communication with the surrounding neighborhood, and especially the principal town. For this reason they are often willing to give the necessary land for an electric railway—without any undesirable conditions or restrictions—and oftentimes to contribute something toward the grading. If, in this way, the right of way can be obtained that is desirable as to route and grade, it offers many advantages that cannot be had on public highways. For such a right of way, the regular steam road form of construction would be employed. About a sixty pound T rail, 6 × 7 in. oak or chestnut ties, laid two feet centers, needle switches with lever throw, etc., would give a track that would allow a speed of forty miles an hour, making it necessary to slacken speed only for curves, and as much for switches as the overhead construction demanded, the track switches requiring no reduction of speed. Curves, in such a road, should be few, and of the longest possible radii.

Where it is decided to build on country roads, a location at the side of the road is, of course, preferable. Here T rail may be laid, and the track filled with gravel, covering the ties and leaving the heads of the rails entirely exposed.

In the streets of smaller towns, where permission can be obtained, it is also desirable to lay T rail, although there is always more or less trouble maintaining the paved brow that is usually required, and consequent difficulty in plowing snow from the track, due to the shears and diggers of the plow striking the partially displaced blocks.

In city streets, and others that are paved, the girder rail seems to be the only one suitable. In order to obtain the necessary depth for paving, this rail should be nine inches deep, and should weigh about ninety pounds per yard. This makes very expensive construction, but the expense is justifiable, when the conditions are considered. While such construction is necessary, where laid in streets paved from curb to curb, it is an open question in my mind as to what is best in macadam streets. There are many lines that are operated on fifteen or thirty minutes, or even on hourly intervals, where the business is hardly such as to warrant the use of track construction, costing from $20,000 to $30,000 per mile. The frequency of the service is an important factor in determining the most economical construction for use under particular conditions, and I think that the nine inch girder rail ceases to become a necessity, and becomes a luxury, when the number of cars run over it daily is reduced below a certain figure. Further, there are positive objections to the use of such rigid construction as this in dirty streets, as in macadam streets where the top dressing contains a great deal besides stone. My experience has been that the rail becomes covered with dirt, and that the cars rattle and "chatter" badly in running over it, more than in running over a dirty rail of less rigidity. It may seem revolutionary to suggest it, but I think that, for certain places, it is at least worth while to consider relaying good tram rail, using some approved form of joint plate. I am not quite convinced in my own mind that there are conditions existing where this is warrantable, but the subject is certainly worthy of discussion and consideration.

Overhead line construction has kept pace in its improvements with those of the other branches of electric railway work, and the success that has been had with the lines built during the early periods of development, encourages one in the belief that modern lines may be depended upon to give little trouble.

Regarding equipment, my idea is that the longest car that can be operated successfully on four wheels, is the most desirable for the ordinary conditions. For long distance lines having heavy traffic, I would recommend thirty foot bodies, on double trucks, for box cars, and fifteen bench open bodies, on similar trucks. Where there is a sufficient demand, I should run a combination smoking and baggage car, as the trail car of a train of two.

In building a new road for short distance travel, I should give all curves the necessary radii for the use of seven foot wheel bases through them, and have trucks this standard. On these trucks, I should use twenty foot box cars and ten bench open cars, either class measuring about twenty-nine feet six inches over the buffers. As a supplement to the regular equipment of motor cars, I recommend trailers, and that they may be run economically, a power brake is necessary. To meet this demand, the air brake is being developed, and promises to fill the

requirements. For convenience in attaching trailers to motor cars, automatic couplers are necessary. There are several forms of latch couplings that can be made to do the work satisfactorily. An important thing in connection with the use of trailers is the adoption of, and adherence to, a standard, that all buffers and drawbars may be of one height, and other parts right for the proper operation of cars in trains.

For electrical equipment, it goes without saying that the modern multipolar, single reduction motors, with series parallel controllers, are the only ones that a road can afford to use. The performance of the various equipments, now manufactured by the different companies, has been so universally satisfactory, that I feel that a great deal has been accomplished in the past two years in the development of the car equipment.

I am a firm believer in the desirability of heating all cars in the North, thinking that it has a very important effect upon receipts. As much as I like the results obtained from electric heating, I hardly feel that we can depend upon this method. Our experience is that it takes from eight to twelve amperes to keep a twenty foot car comfortable, that is, 40 degs. above the outside temperature. This means that it requires about as much current per hour as to propel a car four miles. This would make seventy-two car miles of power per day of eighteen hours, chargeable against the heaters. When it is considered that this extra power is often demanded when power is needed for other purposes, as in snow storms, it may be seen that, aside from the question of cost of coal, the consideration of the necessary increased capacity of the power station and feeder system is an important one. Having put myself on record as opposed to electrically heated cars, it is probably expected of me that I present a method that is satisfactory. Unfortunately, though, this I am unable to do. For short trips, run from a car house, the hot water storage system may do. We still depend upon the stove, and "with all its faults we love it still," until we can find something that we consider an improvement upon it.

It is not improbable that before long a telephone will be considered a necessary part of the equipment of each car operated on suburban lines. It often happens that means of communication with the nearest car house, or with the starter, would save much delay, and even danger, in cases of cars disabled or thrown off their schedule time by other causes. Either a telephone in each car, with means of plugging in on convenient poles, or 'phones, arranged at the turn-outs, in boxes, may be used. As a substitute for this arrangement, or in connection with it, a system of signals between turn-outs may be desirable under certain conditions. By the use of lantern boxes containing incandescent lamps, and the necessary hand or automatic switches, a simple system of signals may be devised, by means of which cars running between turn-outs on single track lines will be protected from meeting other cars.

While these devices may be necessary in some cases, they will always be more or less burdens, in the complications they add. The signal system, especially, has one important objection. Regardless of the most carefully enforced rules to the contrary, men will learn to consider it as freeing them from the necessity of maintaining the same careful lookout for approaching cars, and in cases of failure of the signals accidents will be more likely to occur than they would without the signal system.

The adoption of a proper schedule of fares and transfers is a most important matter. Where lines are short enough to allow the use of one standard fare throughout, this question is a simple one, but where routes are longer, and it becomes necessary to collect higher fares, complication commences. When this latter condition is aggravated by systems of transfers, the complexity increases. My experience has been that, in general, it is best to divide such a line into sections, collecting a single fare in each, and registering all as the standard fares. These sections are arbitrary of course, but in our case are determined by town boundary lines. For instance, where we have a line running through several towns, we collect a single five cent fare in each town. In connection with this, I would say that there are instances where further restrictions need to be made. Cases have arisen where towns of large area have comparatively small centers of population, a long distance apart. Single fares have been established as being good anywhere within the limits of either town. A line is then built connecting the two towns, and instead of ten cents it is considered necessary to get fifteen cent fares. The question then arises as to how the required three sections can be arranged. According to established precedent, the five cent fare sections include each whole town, although the line in question did not exist when this understanding was originated. In this case, however, it becomes necessary to establish the third section as including that part of the line between the boundaries of the more thickly populated portions of the towns, and including the intervening open country in both towns. As an exception to this method of paying fares "on the installment plan" I would mention the case where there exists a very heavy through traffic on a line compared with which the local traffic is slight. In this case I consider it best to collect the whole fare at once, issuing to the through passengers conductors' private checks. These latter are held by the passenger as evidence that he has paid through fare, and surrendered to the conductor before the end of the trip.

The selection of the best rate of fares is a matter requiring the consideration of numerous conditions governing the particular case in question. It is safe to assume that the result to be worked for is the earning of the largest possible net revenue, considering, at the same time, the development of the business. Exactly the best way to accomplish this is the problem to solve. The expense of operating may be approximated reasonably close. It is more difficult, however, to determine the amount of traffic that different rates of fare may bring. It is well to study the classes of travel that may be expected, and fix such a basis of rates as will probably yield the largest margin of profit. After having done this, the basis thus determined may be increased by a considerable percentage, and this new basis adopted as one to use in opening the road. As every one knows, it is a simple matter to decrease fares, and, while I do not believe in starting out with high rates merely for the opportunity of obtaining the credit of cutting them at some future time, I do consider that it is necessary to have a margin of safety to avoid the possibility of being burdened with rates that are too low, and cannot possibly be raised. In this state, with the existence of a law making it illegal for railroad companies to withdraw transfer checks issued without permission from the railroad commissioners, it becomes more than ever necessary to very carefully consider all proposed changes, studying them especially as to their probable effect in the future, when the road has developed and taken in new territory. It is aggravating to see the opportunity for a new line, into a district that might naturally be expected to pay, by means of a rate of fare higher than the standard, and have the fact of a previously established rate, that can be construed over the line in question, standing in the way of the consummation of the scheme. I consider one and a fourth cents per mile a minimum rate for the basis of a system of fares, no fare to be less than five cents, and would advise the establishing of higher rates, up to two cents, as the particular conditions would seem to recommend.

In certain cases I think it advisable to sell round trip tickets. Our fare from Lynn to Boston is fifteen cents, but we sell two tickets for twenty-five cents. We think that the possession of this return ticket leads people to use our cars when they would otherwise patronize the steam roads. We have no other commutation excepting workingmen's tickets over certain routes, good only during the hours of six and seven morning and evening.

Transfers may be used within reasonable distances. The system must, of course, be carefully worked out, to avoid the possibility of abuse. In all of our efforts to be just to the public we cannot lose sight of the fact that the public is not just to us when it can avoid being, and that it behooves us to take the necessary precautions to protect ourselves, inasmuch as the popular moral code includes no provision for our protection. The existence of this unfortunate condition of affairs demands that we use care to prevent the abuse of the privilege we grant the public, the most common form of which abuse is the failure to observe the "not transferable" restriction.

Suburban roads work at a disadvantage compared with city roads, when the question of operating expense is considered. There are many reasons why a given number of cars can be operated for less money, within a small territory, than when spread over a large area. These reasons are obvious. In the former case a large number of cars may be cared for in one car house, thus allowing a minimum expense of maintenance. A small car house cannot afford the motor tables, traveling cranes, etc., that do so much to lessen the cost of motor and truck repair, nor can the work of the small house be divided among different men, giving each his specialty, as in a large house. In one of the largest car houses in the world, the Lenox Street house, of the West End Street Railway Company, of Boston, two men fill all grease cups, examine and replace brushes, and inspect other parts of the motors of from 120 to 150 cars, daily. The other work in this house is divided up among some twenty men, including carpenters and blacksmiths, so that the average is about six cars per man. This number of cars per man is often assigned, but probably the work is seldom so well done as in this house. Another important disadvantage under which the suburban road labors is that of the high cost of power. It

usually is dependent upon a number of small stations, due to the fact that it is impossible to cover the necessary territory from one station, and both the labor and coal consumption of small stations are necessarily greater per car mile than are those of large ones. The opportunities of making the expense in the first instance, that of car house work, compare favorably in the small house with the large are rather few. They lie in the dependence upon one capable man, circulating among the houses, directing the efforts of lower priced labor. Another idea that suggests itself is the equipping of one house with a complete outfit of labor saving appliances, and bringing all unusual repairs to this house. This is objectionable, however, in that it requires the moving of cars over long distances, at a time when they are least in condition; and, further, that it makes two gangs of men responsible for the care of the cars. Regarding the elimination of the difference in power costs, now existing in favor of the city road, the indications are that the time is coming when it will be no longer necessary for the country road to maintain its numerous steam plants. I refer to the probable introduction of the alternating system of long distance electrical transmission into railway work. Suppose the case where it becomes necessary to distribute power for railway purposes over large areas, as on many suburban roads where several power stations are now used. With this system, there need be but one main power station, which can be located at the point possessing the greatest advantages for cheap production of power. At various selected places rotary transformers may be placed, one for each section of road. These receive alternating current, over long distance lines, from the main station, and deliver it as direct current to the trolley wires, or possibly to such local feeders as may be necessary for the distribution throughout the particular section. These rotary transformers require only the same care as generators. Besides them, the only apparatus in the sub-station, needing attention, would be the circuit breakers. The latter would be arranged between the rotary transformers and the lines, in the same way that those in the present stations are. It will be seen, therefore, that one ordinary dynamo tender would be all the labor required in a sub-station. Further than this, the sub-station might often be in car houses, where one of the regular employes could care for the machinery, thus reducing the labor charge to a minimum. By this arrangement, power could be distributed to cars operating over areas of from twenty-five to fifty miles radius from one station, at cost slightly above that for distribution within the ordinary distances of present practice. I am told that, with such a system, using 6,000 volts, three phase currents, from a station located at the central point, we could supply power, by the use of three No. o B. & S. wires, to a road fifty miles in length, when fifty cars were being operated. The total efficiency of this transmission, neglecting the loss in the trolley wires, would be about 65 per cent. These fifty cars, on the fifty mile road, would give fifteen minutes headway, with a speed of eight miles per hour. With the higher speed, that would more probably fit the conditions of such a road, the number of cars would be reduced, allowing a proportionate decrease in the size of the wires, so long as the current allowance, twenty amperes per car, was sufficient. To accomplish these same results, with the present system of 500 volts would require 600 No. o B. & S. wires, the use of which would, of course, be impracticable.

While this system has many advantages which are sure to result in its extensive application, it has its attendant disadvantages which must be overcome. Most important of these is the difficulty of insulating the lines. Practice has been to use bare wire, simply because the covering is of no use with such voltages. The principal use of the insulation on the majority of overhead wires is a sentimental one. The public prefers the appearance of the covering to the bare wire. It is probable that it will be wise to recognize the existence of this preference, and cover the wires, merely to save comment. The most serious difficulty, however, lies in the fact that it seems to be absolutely necessary to keep the wires out of the trees. Geo. D. Johnson, superintendent of the Hartford Electric Light Company, writes that a twig short circuits their 5,700 volt mains, almost as readily as a wire.

It will be evident that the adoption of a long distance transmission system will admit of the use of any suitable water power that may be located too far away to be available under the direct method of transmission.

Although I have discussed no branch of my subject sufficiently in detail to treat it thoroughly, I feel that I have already taken more than my share of your time. In conclusion, I would say that I have very great faith in the future of the electric railway. It has demonstrated its ability to live through periods of adversity. The lesson in economy that the country in general has had has taught us a great deal with the rest. Roads that have paid expenses, during the past two years, will have nice margins of profits left from the receipts of the years to come, and those that have paid their dividends will pay larger ones, and add to their sinking funds. While a considerable part of the curtailment, made necessary by reduced receipts, has been in the line of the sacrifice of repairs that should be made in prosperous times, there have been many unnecessary expenses brought to light and cut off. Things which we thought necessities proved to have been luxuries, when we learned how well we could do without them. I am a firm believer in the policy of putting everything into the best of condition and keeping it so, as being the one that yields the largest net revenue, present and future, but I realize now, better than I did two years ago, that in our zeal to have the best of everything, kept in the best of condition, we allow extravagances to creep in, with the necessary expenditures. The education in economy that we have gained will help us wonderfully in the future, and the combination of increased earnings and reduced expenditures will give an increase in the net revenue that will be substantial.

Report of the Committee on "Transfers on Street Railways."

By J. N. Beckley—Committee.

The carrying of a passenger from any part of a city, reached by the lines of a street railway, to any other part of such city, reached by the lines of the same railway, for a single fare, is, speaking broadly, a new thing in street railway operation. Ten years, even five years, ago the manager who had the temerity to advise his board of directors to establish a liberal transfer system would have, probably, been regarded as unfit for his position. To-day, the most successful companies have come to realize that in this matter of transfers, as well as in other matters, it pays to treat the riding public liberally.

One of the most important things to do, and to do promptly, is to educate the average man and woman to ride. That this is largely a matter of education every street railway manager knows. When a new line is opened, even through a thickly settled district, the people for some time continue to walk. Bad weather, the neeessity of haste or some other thing induces a person to ride once. The next time he rides with less inducement, especially if the cars are clean, the service prompt, and if he does not have to pay more than five cents to get to his destination. So the habit grows, and soon the rule is to ride, when, before, it was the exception. A liberal transfer system, properly guarded to prevent fraud, pays. This is, I think, now generally recognized. Local conditions and arrangements of lines must be considered in determining the regulations to be adopted. The rules intended to safeguard the company are important. Perhaps equally important is the making of rules broad enough to encourage riding.

If a transfer system is adopted, it is best not to hedge it in too much by narrow restrictions or to so complicate its details, as to involve labor and expend money unnecessarily. It is expedient also to appear to be making most liberal concessions to the public—especially as such concessions—presumptive or real—conduce to our own benefit. The punching "to and from"—the limit of privilege to use at absolute junctions as fixed spots—different forms, and even different colors for different issuing lines, may in most cases be avoided. If we secure a proper form of ticket, we can be protected in less complicated ways, and it is usually possible with careful arrangement to cover all requirements in one form. If series and consecutive numbers be employed, we can easily trace all issues by them instead of by old methods. If we use the series and consecutive numbers, we allot a certain quantity of tickets to each conductor and follow him by them, and should avoid minor details that interfere with or complicate the more important ones.

The ticket should be of liberal size to permit legible type and prevent crowded matter.

It should be bound in pads of 100, and the pad be so exactly arranged as to permit punching ten or more in one action of the punch. This feature permits canceling the month and day, and often the time, ten or more at once and accurately, and frequently several of the same destination. It is of great advantage to secure full "month," "days" and "time" space on each ticket—that can be accurately and quickly punched, and it forestalls the waste, expense and detail consequent upon daily dated tickets, while it gives equal protection without delay anywhere.

The subject matter ingeniously arranged can and should comprehend in one form all needed rules. "Good for this current trip—at point of change—on next car after time canceled—to destination

punched," illustrates this. "Subject to rules of company," covers several dozen words of the old form with equal rigidity. Special conditions may vary this, but in most cases it is restriction enough.

"A series number"—"conductor's number"—"run," of "car" number, or some such designation on each ticket will identify the issuer perfectly, and the consecutive number will trace the issue, hold it to sequence in use, and prevent tampering and fraud. We have some 200 conductors. Each has a stock of 25,000 tickets to begin with, renewed as used. One transfer department has 250 compartments on the wall of the room to hold these tickets (thus providing for increase in conductors), each of 25,000 capacity, so they are all systematically arranged in simple order, one compartment for the tickets of each conductor. The conductor turns in his unused transfers at the end of the day's work, and they are put in his compartment, and given out again to him on beginning work next day. A simple record book keeps this account; one double page for each conductor covers his transactions for the whole year, and shows at a glance each individual transfer account, for comparison or aggregating statistics.

Forenoon and afternoon are distinguished by light and black print in the destination blocks, and by the system we use we get month and day *one* punching each (but always preliminary, the conductor keeping these punched ahead in readiness), and *one* punch for time (even hour or ten minute interval) and *one* for destination. I need not explain that such a ticket supplants the expensive duplex form—for it is equally protective—nor enter upon any argument in favor of the absolute need of a short time limit. The day limit, A. M. or P. M. limit, or even the hour limit is of a by-gone day, too leaky to be considered, and very few companies now use it.

It is important, in my judgment, to arrange the form clearly, each section; name, rules, time, days, months, destination, series and consecutive number, to have a distinct and spacious position and be clearly defined by itself, not scattered about. It is also very important, in order to foster accuracy with rapidity, to so arrange the reading matter that the ticket shall be punched and read as punched, all one way, being held by thumb and finger of the left hand and punched with the right. Inverting and twisting the ticket not only takes time, delaying traffic, but increases inaccuracy. The ticket should be arranged in every detail so as to be within the mental grasp of the average conductor, and so as to make it easier for him to go right than to go wrong, easier to be quick than compelled to be slow. Regular horizontal and vertical lines soon fix themselves on the dullest intellect, but scattered details, hopping about a ticket, often puzzle the brighter ones.

In order that all punching may be done before tearing off the ticket from the stub, and that all possible advantage of the pad form and multiple punching can be secured, all sections to be punched should be arranged on the lower side and right hand end if possible.

The pad form saves counting the 100s, while the consecutive number counts the broken pads. The pad form is most convenient in handling in the office or on the cars, and saves time wherever used in giving out, in issuing or receiving or in taking stock. The use of the months is not important. If there be room for them there is no objection, as with the pad form they are no obstacle to quick service, as they can be punched in advance of use. Many companies omit them as the other restrictions practically give little opportunity for fraudulent use after thirty days. By beginning the consecutive number of each pad at 0, 100, 200, etc., we save complication in subtracting, as then the consecutive number on the upper remaining ticket instantly shows how many tickets have been removed.

The consecutive number is not only useful in counting, but compels proper use of the tickets. In conjunction with the timetable each ticket must show when turned in that it was issued in sequence of number and in sequence of time. No. 6,230, say, is issued at 9.30 A. M. Nos. 6,231 and 6,232 may not be returned at all, but if they are they must show issue in direct sequence of time. If not so, the series number tells us instantly who issued the ticket, and the man is spotted and the wrong exposed, for tickets cannot be abstracted and punched for future use as they will not fall within proper time limit and in proper sequence. We make conductors note on the daily car report the consecutive number of the transfer with which the day's work begins and the consecutive number with which it ends. At the close of each trip each conductor turns in the transfers taken in on such trip in a special trip envelope, dropping them in a box prepared for that peculiar purpose. This box is placed at our grand junction which all cars pass, but a number of such boxes could be used where different conditions obtain. We know at once who wrongly issued a transfer, and who received it and when it was done. A notice in our cars requires the passenger to ask for a transfer when fare is paid. This rule enables the conductor to issue transfers at his convenience, and distributes the labor of so doing instead of massing it at certain junctions, with confusion and delay.

Nor is it necessary to resort to tickets on a roll or in metal clasps or such devices for protection. The roll method necessitates single issues, singly punched, and loses the advantage of multiple punching, while it delays traffic and increases chances of error. The metal bound tickets add expense, but do not increase protection. Tickets may be just as easily abstracted in advance of proper use as in the pad form—so they may in the roll, for that matter. Real protection lies only in the system, not in the binding. Conductors cannot sell, trade or exchange transfers with series, consecutive numbers and timetable, without detection, and if the transfers be turned in on every trip detection is a very simple process, requiring no elaborate and costly inspection.

A special register for transfers, and so eliminating their cash value, doesn't help us. It confuses the conductor and paralyzes the spotter, and without a protected form of ticket, conductors can collect fares and ring them up on the register, and turn in each other's transfers to balance the account.

By putting the transfer business into the hands of the conductors, we cater to the convenience of passengers, and we obviate delays in traffic, consequent upon stopping cars to transfer. We save the large expense of transfer agents, and, in my judgment, do not increase leakage, for it is as easy for transfer agents to stand in with conductors to defraud the company, as it is for conductors to combine with each other. The numerous and continual frauds perpetrated upon transfer agents, by people who get transfers without having paid any fare, is too well understood to require discussion.

We have adopted a system of "faces identification" for moral effect, and especially for use at the noon hour, when abuse in transfers is most frequent. As soon as we have converted our stock of tickets to the new form, we shall put them into effect. They are, I understand, now in use in Minneapolis, St. Paul, New Haven, Binghamton and Scranton.

In conclusion, I need only add that our liberal system of transfer has proved a good investment, and that our form of ticket is efficient and protective. Simple, convenient and safe, yet systematic, distinct and business-like, it protects our interests, while it saves us all former waste and a vast amount of useless labor.

Report of the Committee on "Can the T Rail Be Satisfactorily Used on Paved Streets?"

BY STRATHEARN HENDRIE—Committee.

For reasons unnecessary to mention, your committee's report has been prepared with more haste than the subject deserves, and you will undoubtedly find it incomplete in many details. A vivid recollection, however, of the disappointment of your members at previous meetings, when papers have failed to materialize, has emboldened us to present this report in its incomplete state, as better than no report at all, and as continuing the discussion of a subject, in which so much interest was expressed at the last convention.

We would preface our report by the explanation that we have considered the word "satisfactorily," as applying to the point of view of the city and the driving public, as well as that of the company; and we will endeavor to show that the T rail is not only satisfactorily used in paved streets, but that it is the best rail for the purpose.

The tendency of the larger cities in this country—in fact we might say in all the cities of this country—during the past ten or twelve years has been towards smoother and better paved streets, and the general public, watching the progress of its city officials, has become in many places impatient of the action of the street railway people in maintaining the old forms of rail, which make a ridge on the smooth surface of a first class modern street in an American city. Our travelers have come home from England and the Continent extolling the grooved rail, and our city officials have in many cases forced either the English grooved rail or its American modification upon the railway companies. No street railway man hankers after the grooved head before he gets it, or enjoys it after he has put it in, and he therefore fights its introduction, demanding to be left alone, as he was, with his center bearing or five inch tram head. What we would show him—and through and beyond him his public—is that he can progress in the direction of their desires for a smooth street, and can give them something even more satisfactory to them than their favorite grooved rail.

For the street railway man, questions of price, joints, quick deliv-

T RAIL IN PAVED STREETS.

Place.	Company.	Rail in Paved Streets. Miles T.	Other rail.	Weight.	Height.	Construction.	Pavement. Inside.	Outside.	Filling.	Remarks.
Augusta, Ga.	Augusta Ry. Co.	.5	3.5	56 lb.	3½"	Ties 3 ft. centers, steel chairs	Brick	3 in. brick, then asphalt	None	Public and officials think it better than girder
Bay City, Mich.	Bay Cities Con. Ry. Co.	8	11	60 lb.	6"				Oak strip, gravel, etc.	City Engineer and B. of P. W. think it the only rail
Boston, Mass.	West End St. Ry. Co	24	215	35 to 100 lb.	1½" to 9"	Largely 6 ft. rail on stringers and 9 in. on ties with tie plate	Granite block	Same		City officials and the public are not in favor of it
Columbus, O.	Columbus St. Ry. Co.	.5	54.5	60 lb.	6"	Ties 2 ft. centers, broken stone ballast	Brick	Same	Hardwood covered with coal tar	No complaint; more will be laid
Denver, Colo.	Denver City Cable Ry. Co.	6			4"	Cable; yokes 4 ft. apart	Asphalt with stone toothing	Same	None	Makes good street
Denver, Colo.	Denver Cons. Tramway Co.	6.75		48 to 72 lb.	3⅞" & 6"	6 in. concrete under ties; concrete between ties	Stone blocks, next rail, then asph.	Stone block	Oak strip beveled to fit	
Des Moines, Ia.	Des Moines City Ry. Co.	2	15.23	60 lb.	6"	Spiked to ties	Brick			Public and city officials like it
Duluth, Minn.	Duluth St. Ry. Co.	16	10		5¾"	Ties 2 ft. centers, oak stringers	Cedar block	Same	Block cut or notched	All like it
Ft. Wayne, Ind.	Ft. Wayne Elec. Ry. Co.	8	7	60 lb.	6"	Ties 2 ft.; tie rods 10 ft.	Brick block, cobblestone			Company now reconstructing entirely with "T" rail
Houston, Tex.	Houston City St. Ry. Co.	9	1	45 lb.	4¾"	Ties and chairs and stringers	Brick, gravel, cypress bois d'arc, rock	Same	Concrete	Gives satisfaction
Lincoln, Neb.	Lincoln St. Ry. Co.	15			5¼"	Ties, 2 ft. centers	Brick, cedar	Same	Sand with brick	Have only two curves now, but intend to lay track
London, Ont.	The London St. Ry. Co.	1	11.5	56 lb.	4"	Cedar ties, gravel and ballast	Gravel	Macadam		Not favored. (Note—Pavement is not good)
Marinette, Wis.	Marinette Gas, E. Light & St. Ry. Co.	4		40 & 60 lb.	3½" & 6"		Wood block	Same	Wooden strip to fit	All well pleased now
Minneapolis, Minn.	Twin City Rapid Transit Co.	5	35	60 lb.	5¾"		Cedar or granite	Same	Pine or oak strip	City engineers approve
New Haven, Conn.	Winchester Ave. R. R. Co.	14		52 to 72 lb.	4¼" & 4¾"	On chairs and on ties	Half block, half cobble	Same		Common Council will have nothing else
Norwalk, Conn.	The Norwalk St. Ry. Co.	3		60 lb.	6"	Three brace chairs to each rail	Blocks and cobbles	Blocks and macadam		Gives satisfaction
Norwich, Conn.	Norwich St. Ry. Co.	1.2		48 lb.	4"	Chairs and stringers			Gravel	Not favored much
Port Huron, Mich.	The City Electric Ry. Co.	5		45 lb.		Cedar ties, pine stringers	Cedar block	Same	Oak strip inside, pine strip outside	Gives satisfaction
Racine, Wis.	Belle City St. Ry. Co.	.227	2.773		4⅜"		Brick			Public and officials like it
Salt Lake City, U. T.	Salt Lake City R. R. Co.	3		72 lb.	6"		Sandstone block	Same	Sand	Public and city officials well satisfied
Savannah, Ga.	City & Suburban Ry Co.	1	7			Chairs or stringers				Not favored
Springfield, Ill.	Springfield Cons. Ry. Co.	22		40 & 60 lb.			Beveled brick or block			Gives satisfaction. Authorized by City Council
Springfield, Mass.	Springfield St. Ry. Co.	15		56 lb.	4" & 4½"	On stringers and on ties and chairs	Granite and cobble	Granite and macadam	Asphalt & brick	No complaint; evidently satisfactory
Waterbury, Conn.	Waterbury Traction Co.	8			6" & 7"	Spiked; ties 2 ft.	Belgian block for 7 in. rail; cobble for 6 in.	Belgian block	None	None better, when properly laid and paved to
Windsor, Ont.	Sandwich, Windsor & Amherstburg Ry.	3	1	56 lb.	4¼"	Steel chairs; ties bedded in gravel, then inch board and block paving	Cedar block	Same	None	Preferred to girder rail
Wyandotte, Mich.	Wyandotte & Detroit River Ry	2		56 lb.	4¾"	On broken stone	Macadam	Same	None	No objections

ery, competition, coal pile, and construction combine to recommend the T rail. The old argument for the tram head—that the steel paving for the three inches is the cheapest in the end—no longer holds good in these days of good street pavements and rapid transit. Wagon traffic goes where it belongs—on the sides of the street. To those who can still use the clean headed, old center bearing rail, we can only say, "You lucky dogs;" to most of us it is lost forever. As a substitute for this, where old grants are being renewed or new ones made, the grooved headed rail has been in many places hastily, and, we believe, unadvisedly, required. While the suggestion of a T rail, for use in paved streets in cities, is startling to the average citizen, alderman or city engineer, and is in most cases impatiently rejected by them, yet we must recollect that the mention of a rail, such as steam róads use, calls up in their minds, the idea of four or five inches of steel standing up above the street and of dilapidated plank crossings with half drawn spikes, and we should go patiently to work to teach them, that as there is more than one way to supply motive power to a car, so there is more than one way of putting a rail in the street.

To aid you in this, we have prepared a list of twenty-six cities in which the T rail is used, with remarks thereon (to be found at the end of the table), kindly furnished this committee, by the railway companies, in answer to a list of questions sent out; and we might also say that there are over fifty other members of this Association, whose roads are reported in the railway publications, as being partly or wholly constructed of T rail, who declined or neglected to answer the inquiries of your committee. The general consensus of opinion of the twenty-six roads referred to, and of the officials of the cities in which they run, is that if you can once get down a hundred yards of T rail and make a decent job of the paving, neither the officials nor the citizens will permit you to use anything else in the future. The main thing is to make your paving job a neat and good one. In three of the other cities, where there is at present no T rail, but which are blessed with enlightened city officials, the T rail is about to be made a requirement on the companies.

Modern street railway construction and street paving imply a broken stone, concrete or other solid foundation, a high girder or T rail and a brick, asphalt or granite surface to the street in the larger cities, or cedar block, cobble or macadam in the smaller ones.

Asphalt or macadam can be paved as easily to a T rail as to any other. They should be laid flush, and room should be made for the flange by running a railroad freight car, or other car having a larger flange than the street car, over the track before it is opened for traffic. Bricks are now moulded by many paving brick manufacturers to fit girder and T rails, those for the latter allowing a space for the flange of the car wheel. Whether it is more expensive to chip the corners of granite or Medina blocks or to leave them intact a short distance from the head of the rail and fill the space thus made with asphalt, creosoted wood or concrete, is open to question, but, in either case a first class job can be made. The writer is familiar with two excellent pieces of fifty-six pound T rail construction on chairs, in one of which the pavement consists of six-inch cedar blocks, and in the other of small three or four inch cobble stones, both paved close to the rail with no filling.

It may be useful in your arguments with city officials in favor of a T rail as against a grooved girder, to insist that a T rail is a girder rail with a head differing less from that of the grooved girder than this does from the tram or center bearing head. Also the substitution, in this country, of the steel base and upright member of the girder for the wooden stringer, took place before the introduction of the grooved rail, and was due to entirely different causes, and certainly has not been brought about by any demand for smooth streets originating with the cities or citizens. Such substitution is equiva-

lent to that of steel for wood in buildings. The girder is an established fact; its grooved head, we hope, is merely a passing fancy. The grooved rail might easily be a big headed T out of which a piece corresponding to the groove has been planed. This can easily be shown by reference to cross sections. And we should bear in mind that if we hope to peacefully and with good feeling avoid the use of the grooved rail we must do so, not by objecting obstinately to what we know in our inmost minds to be reasonably objectionable, to be bad practice, to be obsolete, but by presenting to the public, and educating it up to it, a rail which shall, from its point of view, be as far ahead of the grooved rail as that is ahead of the tram or center bearing rail. And we should also bear in mind that the public will demand, and in the long run will secure, streets satisfactory to itself.

Your committee has not gone more fully into the details of construction from a street railway point of view because these must necessarily vary in different localities, but it suggests that the progress which has been made in girder rail construction in the past two or three years should not be lost sight of when we secure the T. Have it big enough and heavy enough.

As it may be of use to the members of the Association, your committee has attached to this report, in the form of an appendix, a list of some of the railways which have answered its queries, together with a synopsis of the answers, regretting that out of 178 letters sent out with stamped envelopes for reply, it received but eighty responses, and, as above stated, of the ninety-eight who failed to come to time more than fifty are using the T rail, but whether in paved streets or not is not known.

Special Paper on "Power Brakes vs. Hand Brakes."

BY E. J. WESSELS.

Hand brakes and friction brakes have not materially changed since the day they were first put in service. It is obvious that a brake only powerful enough to stop a small, slow moving, light weight car has outlived its usefulness when applied to cars weighing seven tons or more, propelled by an unseen force which has driven live stock from the field.

The modern brake, when placed alongside of the old time brake, bears the same relation to it that an arc light does to a kerosene lamp. Brakes of all kinds are useful, but the brake installed to-day should answer all the requirements of modern practice. By common consent, the two things regarded as most important in steam railroading are the wheel flange and brake. None of us would like to travel on the State Express if we had to depend upon hand brakes instead of the well known air brake.

It is not strange that car builders have not kept pace with present requirements in their braking apparatus. They have done well for the street railway fraternity, but heads and hands have been occupied in developing trucks, wheels and car bodies, and builders have not been able to do justice to the brake. The radical changes in car building, brought about by cable and motor cars, have kept builders busy. They could not devote their entire attention to improved brakes. We have no controversy with car builders on this question, and wish to suggest rather than criticise. If buyers demanded improved brakes, builders would conform. As such demand has not been made, the brake of to-day remains in appearance substantially what it was twenty years ago.

The evolution of the electric motor has been rapid and astonishing. Motor builders have had great odds to contend with, but have overcome them, and the leading types of machines combine efficiency with low cost and economy of operation. Motors have been standardized.

It will not be denied that hand brakes are inadequate. If power brakes could be furnished at the same first cost as hand brakes they would be universally adopted. The day is approaching when brakes will be considered as separate equipments, and will not be quoted in the lump sum named per car. There is no more reason for including brakes in the estimates than for including motors.

On roads free from grades, there is obviously not such imperative necessity for reliable brakes as there is on roads which have grades of from 5 to 14 per cent., or where travel is congested, and especially on suburban roads operated at high speeds.

Railway men are seeking the most improved appliances of all kinds. They have found it profitable to include many things in their rolling stock which formerly were not used. Thus, elegant cars have come into use, equipped with vestibules, plate glass, stained glass, Pintsch gas, upholstered seats, electric heaters, fine headlights and even call bells. These are radical departures from the old time cheerless cars which were generally not heated, and had smoking oil lamps, and floors littered with straw. Improvements pay. If they did not they would not be made. Formerly, it was difficult to work one's way to the door of a car, and when one got there, it was, at times, hard to get out. To-day, with improved facilities for ingress and egress, crowds are comfortably carried. This change in car construction involves additional expense. It is paid, without complaint, because the outlay is found to more than pay for itself in increased business. Then, too, the public demands improvements, and there is more disposition on the part of managers to give the public what it demands, if practicable.

It will not be maintained that the improvements are absolute necessities, nor can it be shown that they are in any sense "life saving." Ocean flyers in service have $20,000 oil paintings, ministering to the æsthetic taste of tourists, in their saloons. In the hour of collision it is far more important that passengers have a properly constructed life boat at their disposal than any creation of the painter's art. Each has its sphere, but the more important thing is the life boat. It is so in street railway practice. Cars should be artistic, but they should be equipped with brakes that will do their work quickly when danger impends.

On steam roads, hand brakes proved utterly inadequate. They were tested and found wanting. When the first air brake made its appearance it encountered great opposition. Where would steam railway practice be to-day if air brakes were eliminated? The battle of power brakes *vs.* hand brakes on steam roads was fought years ago, and air brakes remained in possession of the field. It is questionable if the need for power brakes is as great on steam roads as it is on surface roads, especially when trailers are run. Steam road stations are miles apart. It was comparatively easy for an engineer to whistle "down brakes," to cut off steam, and bring his train up standing. The inertia to be overcome was greater, but he had not the grades to contend with that exist on surface roads.

Electric cars in even out-of-the-way places ascend grades that no mogul engine has to confront. Of course, there is a corresponding down grade, and it is here that the difficulty arises, for surface cars ought to stop for passengers no matter how steep the grade or high the speed may be. Otherwise earnings decrease.

The braking power on an electric or cable car should be so positive as to permit of stopping in less than the car's length, if necessary. One has only to watch the men braking cars going down such grades as exist in Albany and Jamestown, N. Y., Easton and Allentown, Pa., and scores of places, to have a full appreciation of this point.

Recognizing the inadequacy of a single hand brake on grades, many roads have provided a duplicate inside equipment. This extra equipment is additionally expensive, not only in first cost, but especially in maintenance.

A motorman realizes how difficult it is to keep his car under control, hence he sets one brake before car starts down grade. He then depends upon his other brake. Manifestly, when one brake is set from start to finish, it means wear and tear of apparatus and short life for the shoes. Moreover, the speed of car is needlessly retarded and fewer car miles per day can be run, than would be made if he had a positive braking outfit at command.

In a good air brake the brake cylinder is constructed of iron, and contains a piston and piston rod, which is attached to brake levers under the car. The rear end of the brake cylinder is made airtight, and connected with the train pipe, so that when air is applied from the reservoir it forces out the piston in the cylinder and sets the brakes.

The power of the brake cylinder can be easily calculated, and is equal to the square inch area of the piston multiplied by the air pressure carried in the reservoir, hence—

Brake cylinder six inches in diameter and thirty pounds pressure gives 848 lbs. power at the brake cylinder.

Brake cylinder seven inches in diameter and thirty pounds pressure gives 1,154 lbs. power at the brake cylinder.

Brake cylinder seven inches diameter and thirty-two pounds pressure gives 1,231 lbs. power at the brake cylinder.

Brake cylinder eight inches diameter and thirty-five pounds pressure gives 1,759 lbs. power at the brake cylinder.

This may be increased by using larger diameters, or higher pressure, and by arrangement of brake levers any additional power may be obtained; at the same time it may be graded suitably to the weight and speed of car.

Friction (or continuous) brakes operated from the axle have been

used for years on cable systems, and the jar from them has caused constant complaint. On electric cars friction brakes, of course, can not be used. The braking force requisite to bring a car or train to a stop, should never exceed the weight of load resting upon the wheels to which brakes are applied. Any power applied in excess of this is wasteful and dangerous. The full power of a friction brake depends upon the load carried on axle, to which friction disks are attached. For example, with a grip car and passengers weighing 8,000 lbs., the weight being equally divided between two axles, leaves 4,000 lbs. carried by the axle with friction disks. With a car wheel of two and one-half times the diameter of friction drum, we gain that much leverage, which multiplied by 4,000 lbs. gives the direct pull power of friction brake of 10,000 lbs.

Nor is this all. The brake levers of street cars are, as a rule, adjusted to about four and one-half times leverage. If, then, we multiply the 10,000 lbs. pull of friction brake by this leverage, we have a strain of 45,000 lbs. upon brake beam and shoes. This is vastly more power than is ever required. When two or more cars are coupled together, it is impossible to regulate brake chains and brake gear, so that every shoe will press with equal force against the wheel. When, therefore, a gripman applies his friction brake, the entire 45,000 lbs. is carried by the beam and shoe that are adjusted nearest the wheels, and the remaining wheels revolve without noticeable check.

In a train of three four-wheeled cars with passengers, weighing 36,000 lbs., resting on twelve wheels, a brake power of, say, 2,900 lbs. applied to each wheel would make the most perfect stop. If the entire 45,000 lbs. power of friction brakes is applied to only two wheels of such train, there will be 38,000 lbs. more power exerted than necessary to stop wheels from revolving, and at the same time only one-sixth effectual braking power is obtained, as compared with a braking pressure distributed against every wheel under the train. Such harsh, rigid, excessive power of the friction brake, applied quickly by the momentum of the whole train, will wear out any kind of brake gear, no matter how good or how strongly made, and the constant jar adversely affects the life of cars. In cold, wet and stormy weather (with slippery tracks), when grip car is abandoned except by the gripman, the pull power of friction drum is greatly reduced, just at the time it is most needed to set brakes on trailers, which are always overcrowded at such time.

A twenty-eight foot closed electric car, weighing without passengers 20,000 lbs., and running at ten miles per hour, has over six times the energy to overcome when brakes are applied, that a horse car has, weighing one-fourth as much and traveling at less than one-half the speed. Moreover, when horses were employed there were ten feet extra length in which to stop car. This extra length is no longer available, since the advent of electric cars. Unless cars have proper brakes, high speeds are most dangerous.

Without entering the humane feature of braking, it cannot be denied that at best hand braking is a great task for even strong men. They report fresh in the morning and for a time muscles stand the strain; but after a few hours' handling of grip lever or controller handle, they find their strength decreasing. Realizing this, for the rest of the day they slow up earlier than strictly necessary, or (as often happens) they do not stop at all and let cars run past crossings, missing passengers, who do not always wait for the next car, but walk instead.

If, however, the men have ready for instant use an ally in the shape of power requiring but the touch of a handle to become available, they are placed in the best possible position to make as many stops in as short a distance as is necessary. Not being fagged out, they are better able to do their company more justice, and are more on the alert to prevent accidents.

In the distressing accident which occurred seven weeks ago in New Jersey, this point was particularly emphasized. We quote from the *New York Herald* of August 27, after having ascertained from the officials that the report is accurate. "When the crowded car began to go down the incline, the brakes would not respond promptly to the demand of motorman Gormley. Tight as he could wind up the chain he felt it slip repeatedly. He knew what this meant, and, with full strength, he set the brake as hard as he could. But his efforts were in vain, and the car gained greater headway every instant. It was beyond his control, and he realized that in a few seconds the car would strike the sharp "crab tree" curve. As it dashed down the steep mountain side tracks he turned and shouted to Conductor Bagley to put on the rear brake chain. Bagley was inside the car, and at Gorman's call every one suddenly realized the danger. The conductor was wedged between the passengers, but he fought his way to the rear platform and wound up the remaining chain of the single brake system from there. In an instant he saw that it, too, was of no use in the emergency, and turning he shouted, 'Jump for your lives! The car is running away and will strike a curve.' The car was rushing on to that fateful curve. Like a shot propelled by some awful power it went. Then it struck that curve. A section of one of the wheel flanges snapped off, and in an instant later the car left the rails. It ploughed its way across the track with scarcely any perceptible diminution of speed, was jerked sharply to the right, when the wheels struck the opposite rail and then capsized, landing squarely on its side with a crash which was heard a quarter of a mile away."

We need not pursue the account further, except to say that eighteen people were hurt, many of them badly, and one boy's arm had to be amputated. A $35,000 damage suit is pending against the Accident Insurance Company which wrote the risk on that road, and the same company has settled a number of cases out of court.

It is only fair to state that had that entire system been equipped with power brakes equal to such emergency, the chances are the car could have been stopped long before the danger point was reached without injury to limb or property.

It is not the purpose of this paper to make capital from such a sad occurrence; we are opposed to sensationalism, but it is proper to call attention to such calamity as a warning. What happened on that road has happened on others, and will again occur so long as implicit reliance is placed upon hand brakes, which cannot possibly do the work required of them at such a crisis. The first cost of equipping the entire line with power brakes would have been but a fraction of what the damages will cost.

It is unnecessary to multiply instances where hand brakes have shown radical defects. That practical men have been apt to think too lightly of the question of improved brakes is explainable by their having so many other important things to oversee. Then, too, the aim of a railway man is to incur as few obligations as possible and to operate with the utmost economy and earn dividends. But often seemingly cheap apparatus proves dearest in the end.

Probably 75 per cent. of the recorded accidents is chargeable to inefficient brakes. Statistics of this sort are hard to tabulate, and some records show even a higher percentage. While hand brakes often stop cars quickly, they do so by consuming excessive energy. This means waste and increased maintenance account. Then, too, it is impossible for a motorman to maintain his maximum strength for a long time. In active service he has to apply brakes between 250 and 400 times daily. He can only exert his maximum strength spasmodically and temporarily even when aided by the weight of his body. "A chain is no stronger than its weakest link."

The day is past when railway employes are considered merely automata. Not all men make good motormen or gripmen. These positions, like that of conductor, are ones of trust. The men, as a rule, are intelligent, and, during the recent financial depression, many recruits have been made who formerly filled much higher spheres. The strain of a day's work on these men is very severe.

When we consider how many chances people take in crossing tracks in front of moving cars, or in jumping on or off, despite printed warnings, this strain becomes more apparent. No matter how fast or slow cars go, people are always dodging them, with reckless disregard of danger. A motorman is not allowed to shout. He is required to keep silent. In the presence of danger he can only rely upon his gong or whistle and his arms. These alone are not adequate when drunken or deaf men are on the tracks.

The most painful thing which comes under a street railway man's notice is the killing or maiming, especially of children. When a little child, ignorant of danger, toddles to the track, and sees the car coming, it generally stops, hesitates, starts off and usually rushes in front of the car. The motorman, who has to depend upon a hand brake at such a time, seldom succeeds in stopping his car. It is not an unusual sight to see a little child taken from under the wheels.

Touching the legal aspect of the brake question, while it often happens that plaintiffs are non-suited on the ground of contributory negligence, to the railway man this frequently means outlay for legal talent. Even though his company or the underwriters are not called upon to pay damages in such cases, it is surely better to prevent accidents than to defend law suits, especially as prevention is cheaper.

It is a menace to life and property to have a high speed motor at work, without having suitable power to control it. Thus far, "reversing" has not proved a success, and, while theoretically one motor acts as a generator to drive the other (if there be two, which is not always the case), in practice this has proved a failure. The danger of relying

upon the same current which propels a car to stop it too, is only too apparent. If the current fails to work in one case, how can it be expected to work in another? The trolley may run off, or there may be a break in the line when current is needed for braking a car plunging down grade. "It's the unexpected that happens."

Hand brakes have no emergency stops. Air brakes have, and, if necessary, stops can be made so quickly as to apply brake shoes instantly to every wheel on one car or a train of cars in the most effectual manner. No hand brake can do this.

When hand brakes are used, it is necessary to have a separate brakeman for each trailer. When an air brake is used, these extra men are entirely dispensed with. On a train of a motor car and two trailers, if air brakes are used, only one motorman and one conductor are necessary. If hand brakes are used to control the same train, four men, instead of two, are necessary. This means a saving in wages of at least $21 a week, and will soon pay for an air brake equipment.

Moreover, when air brakes are used, there is no shuttle movement, jerking or bumping, and the shoes are applied evenly to all the wheels; whereas, in hand braking, it is impossible for different men on different cars to brake in harmony. One car will be braked hard, and another not so hard. Of course, no good results from such ununiform braking.

Air brakes are provided with reserve power stored in reservoirs, and, by having large enough capacity, the air pressure required for braking becomes practically inexhaustible. The air pump of a thoroughly good air brake is most economical in operation. It requires no power when the car is starting or when it climbs grades. As it takes ten times the power to start a car that it takes to keep it going, the advantage of this is obvious. A good air brake is so compact that very little room is required for it under the car body. It has no cumbersome or complicated machinery to get out of order. It works automatically. It needs much less attention than an electric motor gets. It is only necessary to keep the mechanism clean and in order, and to lubricate the pump regularly. No hinges or springs annoy inspectors or employes. A good air brake pump, the moment it has compressed sufficient air, cuts out and runs in free air with the axle. A good air brake entirely replaces a hand brake. The hand brake may be left on the car, and the air brake can be so attached as to leave the hand brake available should it be required. A good air brake requires no expert to operate it. It is so simple that a child can work it. This being so, a railway manager is not restricted to hiring men of a certain height or weight, for when work is done by compressed air instead of muscular strength, no Samson is required to work the handle.

In steam practice trunk lines maintain schools of instruction in which men are taught to handle air brakes, and only qualified engineers are trusted to operate them. A good air brake for surface roads is so constructed that, when used by men not schooled in its use, it does not get out of order. It is capable of being misused without proving defective. The physical labor involved in working the ordinary hand brake causes the other good qualities of the gripman or motorman to suffer. This has a direct bearing on accident account, wear and tear and repair accounts. The application is obvious. "A stitch in time saves nine."

A good air brake enables a man to make the best possible stops without noise, jar or injury to the apparatus. In hand braking much excess force is used. This means that rods and bars are strained when stopping the car, ane often the brake gear is in such shape that, when a quick stop is required, some part is sure to collapse.

One type of air brake equipment in service enables a gripman with but a small handle to work grip and brake either simultaneously or independently. When this type brake is used on the car, grip and brake levers are entirely removed, giving more space for passengers on platforms. Through its use, what formerly involved painfully hard work, is now accomplished with ease. This device is in successful operation on car 421 on the Third Avenue Railroad, New York.

We believe it is better to keep the motor controller and the brake handle separate, but if railway men demand a single handle to operate both it can be supplied just as was done in the air brake on Third Avenue, New York, car 421, which works grip and brake. We doubt, however, if a real necessity for a single handle exists.

Recently a new form of power brake has been announced, in which electricity is relied upon. The electric brake, while undoubtedly possessing some valuable features, has some which are a decided disadvantage. It is, of course, in its infancy, and its future will be watched with interest. We saw the paper read by Mr. Sperry on the 19th of last September before the American Institute of Electrical Engineers entitled "The Electric Brake in Practice." Mr. Sperry, unknown to himself, quotes our language verbatim, which was used as an editorial by one of the dailies and subsequently copied in the journals. It is to be regretted that, when using a part of our matter, the able electrician did not use other parts also.

He says that a locomotive engineer has his pressure gauges, which allow him to adjust the brake application to a nicety. A good air brake for surface roads is also supplied with a pressure gauge, but in practice no Westinghouse air brake engineer looks at a gauge, and they are more ornamental than necessary. He states that "with an electric brake the brake shoes are entirely dispensed with." Do the street railway men intend to to abolish brake shoes? Suppose, as may happen, the electric brake fails to work, what will become of the car or train? There is an apparent contradiction in the article on this point. In one place it states that the electric brake does away with brake shoes, and in another place it admits that it will be necessary to resort to hand brakes. How can hand brakes be used without shoes, and now can a car be held by an electric brake after the residual magnetism or (Foucault current) is dissipated? He says that the one grave fault of an air brake in railway service is that the maximum brake application does not exist as it should at the higher speeds. This is an error. The immense advantage of an air brake over an electric brake is the fact that power can be applied in varying degrees; great power, when needed, and almost imperceptible power, if only very slight retardation is wanted.

An air brake holds the wheels and keeps doing so. An electric brake, after first stop, depends wholly upon residual magnetism. This at its best is an uncertain factor. As we understand the paper, the residual magnetism in the electric brake is only available for something less than one-half minute after car has stopped. When this magnetism is consumed the electric brake possesses no more braking power whatever, until the car is again in motion. It is right here that the air brake shows its immense superiority, for it has the air reservoirs to draw upon when car has stopped, and, therefore, ample power is available for immediate and constant use. This failure in source of supply is a tremendously weak point in an electric brake. The paper states that "the current flowing after motion ceases, though small (mark this admission), is found exceedingly useful in holding the car from starting itself, even on quite a heavy grade, as only a small quantity of energy, added to the already great friction of quiescence, will prevent the car from starting." We fear that at such times the advocate of electric brakes would need something more reliable and constant to lean upon. The paper says "when an electric brake is used, it seems as though the car was running into an air cushion." This pays a well merited compliment to air brakes, for by them an air cushion stop is made possible. The paper adds "operating the brake in this manner, it will at once be seen that the system is one of the utmost certainty of operation, surer even than the hand brake, air or other power brakes." If the speaker had not been for some years in the electric motor business, he might not take such decided exception to this claim as he does, but since working with air pressures he has found them much more reliable and safer than electricity. The inventor referred to, makes fourteen claims of the advantages of his brake over other brake systems. As this paper is not written for advertising effects, we purposely refrain from naming any special make of air brake in contrasting the air brake with the electric.

1st. He speaks of the certainty of an electric brake in operating.

So is a good air brake certain in operation.

2d. "The enormous power and under perfect control."

A good air brake has much more power, more constant power and is under better control. It will be noticed that the inventor omits all reference to electric brake power being constant. This lack of constant braking power is the objectionable and fatal defect of the electric brake. It will not be noticeable on a level, but it will be only too apparent on a grade. At the Institute meeting, before which the paper on electric brakes was read, one of the members stated he had been on a train in Connecticut, where two motor cars and three trailers were ascending a 9 per cent. grade. While doing so a fuse on the second motor car blew out, throwing all the work on the first motor car. This it was unable to do and hand brakes had to be immediately applied to prevent train from running away. The author of the paper was asked "what would you do at such a time with your electric brakes?" Mr. Sperry, in reply to the question said, that a case of this kind was rather unusual, but that he would have applied the electric brakes, which would have brought the train to a standstill, and by that time the hand brakes could be applied to prevent the car from running backward down the grade. How then can he claim that the brake dispenses with brake shoes, and if the electric brake had been used on the train in question to the exclusion of hand brakes and brake shoes, what would have become of the train and passengers?"

3d. "The absence of all power absorption at moneyed cost from the central station."

This may be true if brake shoes are not used, but remains to be proved in daily service. Shoes probably will continue to be used. A good air brake consumes very little power. You can test how little by watching the readings on a car operated at this time with an air brake, on the Atlanta Consolidated road.

4th. "Its high efficiency, being far superior to compressed air; amply proven in numberless instances where electricity has replaced air. (The air requires a direct application of energy, amounting to an immense aggregate power absorption during the day from the central station; the working parts of the air machinery are attached to the car axles and require a large quantity of energy, not only while compressing, but at other times as well)."

We are unaware of a single case where electricity has replaced air. We are informed on high authority that air compressors for driving rock drills and coal cutters so greatly outnumber electrical machinery for such purposes, that hundreds of air compressors are sold for every drill or cutter sold. The statement that an air brake requires a large quantity of energy, not only while compressing, but at other times as well, is wholly inaccurate and entirely incapable of proof. A good air pump requires no perceptible power after it cuts out.

5th. "Its extreme simplicity."

So is a good air brake very simple.

6th. "Observe saving in wheels, two or three fold."

A good air brake properly applied saves the wheels.

7th. "Saving of brake shoes."

We believe brake shoes will be retained, and would not care to ride on a car without them. Under certain conditions the paper admits hand brakes will be needed. How can hand brakes be applied without shoes?"

8th. "Very little wear of either wheel or magnet."

There is little wear to a good air brake, and lightning plays no pranks with an air brake, but is likely to do so with an electric brake.

9th. "No hissing to frighten horses on streets."

We have yet to hear of a case where a horse was frightened by an air brake.

10th. "The low E. M. F. at which it operates."

This is true of a good air brake. It is easy to test power consumption with a wattmeter, by running car with air pump, and then running car (under exactly similar conditions) with air pump detached; the slight power consumed will then appear.

11th. "The ease of its application and control."

Nothing surpasses a good air brake in these respects.

12th. "Conserving strength, prolonging the usefulness and life of the motormen."

This is open to question when one sees the despair of motormen when fuses melt and switches burn out. Gripman Williams on air brake car No. 421, of the Third Avenue Road, New York, (where 120 equipments are in daily operation) told the speaker, "This job is so soft, I expect some of you Wall Street fellows will come here to run cars since times are hard."

13th. "The smoothness of its operation."

Nothing can surpass the air-cushioning effect of a good air brake.

14th. "Cannot cause flat wheels."

A good air brake properly applied also prevents flattening of wheels.

We had no intention to refer at length to electric brakes, but have felt constrained to do so because the statements we have replied to appear in the printed Transactions of the American Institute of Electrical Engineers, and should not remain uncontradicted.

Lastly, it must be remembered that the magnetic clutch of this electric brake has to bear on the surface of a flat disk cast upon the car wheel. This can hardly be called "ease of application," for the brake can not be applied to the ordinary type of street car wheel. It requires a special casting to be made on one wheel on each axle. This, on a large system, means an additional outlay for wheels, as "extras are charged for."

We have purposely avoided tabulating the fatal accidents of the last twelve months, directly due to inadequate braking facilities. It, however, is timely to call attention to the charge of Judge Lippincott to the Grand Jury of Hudson County, N. J., last month. He devotes special attention to the subject of "killing by the trolley," which he characterized as being sometimes manslaughter. He said: "Deaths by accident have become very frequent. Personal injury, not resulting in death by accident, has become frequent. Now, from mere unavoidable accident, resulting in death or personal injury, no liability whatever arises, but the general rule of law is that where death or other personal injury results by reason of the omission on the part of another to discharge a legal duty there a criminal liability arises for manslaughter in the case of death, or for an assault and battery where death does not ensue. If neglect of a legal duty is the cause of death, the person guilty of such neglect is chargeable with manslaughter. If death does not result, but only other personal injury, then he is chargeable with assault and battery. The law imposes upon every one reasonable care in his acts toward another. There is a legal duty owing from one to the other, and a negligent omission of the performance of that duty, resulting in death or other bodily injury, is indictible." He proceeds: "There are many familiar illustrations of these principles of law; a motorman running his electric car along the streets carelessly, negligently, runs over another and kills him, it is manslaughter, although it was not his intention to injure him. A motorman running his car at a dangerous rate of speed along the streets, running over another by reason of his dangerous rate of speed, the death arising from this omission of duty to run at a reasonable rate of speed, he becomes guilty of manslaughter. If persons in charge of the running of steamboats, railroad trains, electric trolley cars, horse cars or other public conveyances, neglect the duty of using reasonable care, and death results therefrom, they are answerable for manslaughter, whether it be in the erection of buildings, the running of machinery, or any other employment."

It will be seen that the judge's charge covers the operating of motors. A jury will certainly class an air brake as being more than a reasonably safe appliance. It is certain that a plaintiff's attorney, in prosecuting a suit for damages, will call attention to the fact that it was possible for a company to have availed itself of an air brake which would have been reliable.

Recently, two verdicts were given against one traction company in New Jersey, one for $3,000, the other for $5,000, and there are other suits pending for over $500,000 damages in that place alone, on account of trolley car accidents. Thirty-eight deaths to date are charged against that one road since it adopted electricity.

On September 21, Motorman Michael Lewis was convicted of manslaughter in the Court of Special Sessions, at Newark, N. J. Lewis ran the motor car which killed four year old Martha Henry on August 4. On September 25, Judge Kirkpatrick sentenced Lewis for one year in the county penitentiary. The judge lectured him severely for carelessness, and said he felt it his duty to make an example of him. Lewis was crushed by the unexpected sentence. He expected only to be fined, and that his company would help him. On the same day Motorman Desmond was arrested in Brooklyn for nearly killing a six year old girl. His car cut off her right foot. He claimed he did not see her until she was directly in front of the car, and that it was impossible to stop it in time.

In Alliance, O., it is recorded that "the motorman, when he found his car going down hill at too great speed, immediately lost his nerve, and deserted his post." That car was equipped with a presumably good hand brake. This would not have occurred had a good air brake been available.

More than one motorman has lost his reason as the result of a fatal accident. Recently, a motorman committed suicide, owing to remorse for having run over a child. It may be said this was not his company's affair, but had this unfortunate man had a power brake at hand, he would not have killed the child and taken his own life. In a sense, we are our brothers' keepers. Would it not be well to place in every motorman's hands, apparatus which would render indictment by a grand jury out of the question?

There are some railway men who complacently tell us they have no accidents on their road. It may be that such fortunate individuals exist, but we have not found them. It is somewhat curious that after men made this statement, there were bad accidents on their roads.

The newspapers have been hounding the fraternity so much in Brooklyn and elsewhere, that trolley accidents have become household words, or a subject for jest.

There is no part of electric or cable railroading so important, as the ability to stop cars quickly and to keep them stopped. This is specially true where electric or cable cars cross steam roads at grade. At such times hand brakes show their inherent inadequacy.

We do not advocate the adoption of a scientific toy, but submit for your consideration the fact that you can procure at comparatively low cost, air brakes which are positive, simple, economical and highly efficient, and which have been tested in the crucible of daily operation.

In urging the adoption of air brakes, we are often told by railway men, "We haven't time for experiments. Let somebody else do the

experimenting, and then we will look into the thing." Had this position been taken by progressive men, would there be a single commercial electric motor in existence?

The experimental stage was passed long ago, and with 350,000 air brakes on locomotives, passenger and freight cars, it is untimely to talk about experimenting, for steam roads and surface roads have much in common. If a freight car loaded with pig iron needs an air brake, how much more is one needed to brake a car carrying living beings?

There are air brakes and air brakes. Of the merits of the different ones, buyers will do well to satisfy themselves before contracting.

The all important question is whether the first cost of a good air brake is too high, or not, in proportion to the advantages gained. No accountant can figure accurately how many dollars of damage claims will be avoided; nor how much revenue will be increased by the quicker schedules made possible with air brakes (for even seconds count); nor what the gain in labor account will be by not being restricted to hiring any particular height or weight of man; nor how much the life of the car body, truck and motor will be prolonged. There is a decided gain from whatever point we view the air brake, and with an air brake, an employe is armed at all points.

Will it not be worth your while to give this braking matter earnest attention? If but a few of this audience will determine to investigate the advantages of the air brake over all other forms of brakes, this paper will not have been prepared in vain. It was written, to suggest the value of good power brakes over hand brakes, in minutes snatched from busy days.

Report of the Committee on "Mail, Express and Freight Service on Street Railway Cars."

BY RICHARD MCCULLOCH—Committee.

In beginning a discussion of this service, it seems necessary to explain that the first word of the subject is spelled with an *i*, because a gentleman from the rural districts of Wisconsin proudly wrote, in answer to a circular asking for information regarding the carrying of mails, that "His road sometimes carried females too." He desired, however, that all information given should be regarded as confidential, so the name of this most fortunate road is withheld. That the street railroads of this country operate a heavy freight business has long been the opinion of the itinerant tinware peddler, the "umbrellas to mend men," the lady who takes in washing, and all the merchant princes of the tribes of Israel, notwithstanding the fact that a generation of sweet tempered conductors have talked themselves hoarse in endeavoring to explain matters differently.

The first feature, which strikes one in endeavoring to study a subject such as this, is the great difference existing between what are known as street railroads. We have city roads and suburban roads; we have summer resort roads; we have belt roads operated by different motive powers, some of them almost approaching steam railroads. There are large city systems, operating over many miles of track and running hundreds of cars, and there is one road down in North Carolina, from which the statement was received that: "This here road is owned, directed, managed, superintended and driven by Yours Truly." All these railroads haul different classes of passengers, bent on different errands, and are operated under different conditions. It is manifestly impossible, therefore, to lay down any fixed rule for mail, express or freight service—to say that it should be put into practice on street railroads, or that it should not be put into practice. This is a problem which must be solved for each railroad individually. In this paper it is intended merely to give a general discussion of the question without attempting to solve it.

In order to ascertain, as well as possible, how much has already been done, a circular asking for information in regard to mail, express and freight service was sent to every street railroad company in North America. 978 letters were sent out and 413 replies were received. These replies are tabulated below. As a great many railroads were not heard from, it cannot be assumed that the table is absolutely correct, but it is probable that most of the railroads having such a service answered the circular. Roads which are enumerated, as having express or freight services, are only those which have this service fully developed. The carrying of packages by conductors of passenger cars was not called express service, but is enumerated in a separate column. From some of the states, notably Pennsylvania, Rhode Island and Massachusetts, it was reported that the transportation of express and freight by street railroads was prohibited by state law, and many of the roads answered that their franchises allowed only the transportation of passengers.

The rate charged on express matter was usually five or ten cents per package, while the freight rates vary from four to ten cents per 100 lbs. The mail is usually carried either under a direct contract with the Government or under a sub-contract with a mail contractor. The income from the transportation of the mails varies according to the amount of mail, the number of trips per day, and the length of the haul, from $100 to $1,000 per annum.

TABLE OF MAIL, EXPRESS AND FREIGHT SERVICES IN NORTH AMERICA.

	Any Form of Such Service.	Under Contract with Express Co. or U. S. Government.	Haul Steam R. R. Freight Cars Over Street R. R. Tracks.	Operate Special Cars for this Service.	Carry Small Bundles on Passenger Cars for Pay.	Contemplate Such Service.	Distribute Matter Beyond Station.	Use Combination Express and Passenger Car.
Mail	62	58	.....	5	.....	10	.....	.....
Express	35	8	.....	9	31	7	2	8
Freight	55	.....	6	37	.....	12	2	.....

MAIL SERVICE.

That the street railroads of this country are already alive to the possibilities of the mail service is shown by the table. Sixty-two street railroads are now carrying Uncle Sam's mail, while fifty-eight have Government contracts. Most of these railways are suburban roads or roads joining towns; but the postal authorities realizing the advantage of quick delivery, and collection, are now beginning to make arrangements with the large city systems for transportation of the mails from main post offices to branches and for distribution and collection throughout the city.

Various methods of utilizing street railways for this purpose have been proposed by different local post office authorities. In one large Western city, in which all the roads are controlled by one company, it was proposed to equip one car of each line with a mail receptacle. At stated times, the carriers along the route were to meet this car and drop into the receptacle all the mail collected by them, which was in turn to be taken from the receptacle as the car passed the main post-office. This plan, however, did not meet with the approval of the great fathers at Washington, and in consequence was abandoned by the local authorities. Any system of this kind would greatly expedite the collection of mails, but the weak point seems to be that no provision is made for their distribution.

The only method of handling a large mail service, in which it is necessary to collect and distribute along the route, and handle it satisfactorily both to the patrons of the road and the post office department, seems to be in the use of a separate car—an independent mail car in charge of a railway mail clerk. This system is already in use on street railroads in St. Louis, Brooklyn and several other places, and so far as we can learn is giving excellent satisfaction, both to the railway companies and post office authorities. The mail is quickly and promptly handled; the service is regular and certain; great and small quantities of mail may be collected and distributed with equal facility, the residents along the line are greatly accommodated, and no interruption or inconvenience to the passenger traffic need result.

As an example of such a service, it would probably be interesting to describe the operation of a United States mail car, which has been run by a street railway in St. Louis for some time. The St. Louis & Suburban Railway begins in the business part of the city and runs through the choicest residence and suburban settlements of the town of Florrissant, sixteen miles from the center of the city. After leaving the city limits, the line penetrates the beautiful Florrissant Valley, thickly dotted with pleasure resorts, country clubs, summer homes and suburban villas. The downtown portion of the road was formerly a cable, and the suburban part a narrow gauge steam line, but with the onward march of progress, the grip and the locomotive have gone to join the mule car, and the road is now electric throughout its entire length. The mail car makes three trips each day, two through to Florrissant and one as far as the city limits. The railroad company furnishes a conductor and motorman, while the post office department supplies the mail clerks. The car, which was built especially for this purpose, is equipped with its own motors, and is furnished with the necessary desks, cases, racks for mail bags, etc. At a schedule time it is run up in front of the post office and receives the mail put up in

pouches from a wagon there to meet it. The mail clerk receives a bag for each station outside the city limits, and for each carrier along the route a bag designated by his number. He also receives all mail which has come in too late for assortment, which is distributed on the car to the proper bags before reaching the first station. Letters are received, canceled and distributed on this car, just as in the ordinary steam railway mail car. The first stop is at a point about one and a half miles from the post office. At this point six carriers meet the car and each carrier receives from the mail clerk the pouch bearing his number. Another stop is made about two miles out, another two and a half, another three, and another four miles from the post office. Any mail for the suburbs is handed to the mail clerk by the carriers and dropped into the proper bag by him. After the city limits are passed, bags are exchanged at each station just as on a steam railroad. On the return trip the same system is followed until the city limits are reached. Within the city, the post office department has placed letter boxes at the principal corners along the line. Each carrier brings the mail collected in his district to the nearest box on the line of the railroad. Stops being made at each box, the mail clerk removes the mail, and assorts it before arriving at the next station. The letters thus canceled and assorted are delivered at the main post office, tied up in bundles ready for shipment. The mail car makes no stop for passengers, and for this reason can easily keep out of the way of the passenger cars. A light freight business is also done on the car. Provisions, light furniture, milk, trunks, etc., are carried and the charges collected by the conductor. The mail service has now been in operation three years. New features are constantly being added to it, and aside from the accommodation afforded the residents of the territory through which the road runs, it is a source of profit to the railroad company.

The system just described seems the best that has yet been devised for the handling of a large mail business. Where the mere carriage of the mails in pouches from the main post office to branches, or from depots to post offices, is undertaken and there is no attempt made at collection or distribution along the route, there can be no objection to carrying the mail sacks on the front platform, if their number is not too great; but passenger cars should not be stopped and held for mail collections, nor should valuable space within a passenger car be taken up with mail sacks.

The question as to whether or not mail service is called for depends almost entirely upon local conditions—the length of the road, the territory through which it runs, the proximity of depots and post offices to the line of the road, and many others. An advantage in estimating the advisability of inaugurating a mail service is that a certain fixed income may be assumed, which is not the case with any other service. It is usual in Government contracts to pay a a certain sum per 100 lbs. per mile, the weight being determined at stated intervals by weighing the mail. For this reason a certain fixed income is assured during the interval. A number of cases may be cited in which it would be well for the managers to look into the profits which might accrue from a mail service. Large city systems, covering various parts of the city and passing close to post offices and public buildings would afford great advantages in distributing and collecting the mails. Suburban roads, roads connecting towns, and roads running to depots in the outskirts of the city are other instances of openings for mail service.

An advantage, independent of any financial return, and one which is regarded by many as the one reason for street railways embarking in this service, lies in the prestige of Uncle Sam's name. This point was never so thoroughly illustrated as in the late labor troubles in Chicago. Rioters have no fear of the city police or of the state militia, both of whom are often in sympathy with them, but they regard with the greatest awe a company of regulars armed with Springfield rifles. Uncle Sam will tolerate no interference with the distribution of the mails, and no other point has been so thoroughly impressed upon the dangerous element in our communities during the last year. Some railway managers, on securing mail contracts, have proposed to paint upon each car "U. S. Mail," as an official announcement that their roads are under the protection of the U. S. Government. How effective will be the protection against blockades and riots, and how great a moral influence this will exert to prevent strikes and other stoppages, remains to be seen.

EXPRESS AND FREIGHT SERVICE.

The answers to the circulars showed that thirty-five roads are now engaged in the express business, while fifty-five are hauling freight. As a matter of fact, however, few roads through the country are doing a regular freight business, most of the so-called freight services partaking more of the nature of express. As operated upon street railways, the distinction between express and light freight service is so ill-defined that it is deemed best to consider both subjects together.

There are many points in the street railroad as now conducted, which make it almost an ideal agent for the transportation of packages and light freight. The great number of points reached by the cars, the absolute certainty with which they run, the thousand and one precautions taken against any stoppage of however short a duration, the rapidity with which distant points are reached, and many other causes combine to make the street railroad of to-day a common carrier of exceptional advantages, when only short distances are considered. Many conditions will suggest themselves to railway managers, in which an express or freight service may be made a paying institution. In the case of a town, in which the railway station is some distance from the business part of the town, there can be no quicker, safer and better plan of conveying express and freight to some distributing point in the heart of the town, than by the street railroad. Whether or not this will pay depends upon the amount of material, the competition, the distance, and the scope of the street railway franchise. A case often met with through the country is that of two towns connected by an electric railroad, one of which, having no steam railroad, is obliged to get all its supplies through the other town. The installation of a freight service of some kind would at once suggest itself in this case, and the profits would depend upon the size of the towns, the character and occupations of the inhabitants, the distance between the towns, etc.

The operation of an express service on large city systems has not been attempted to any great extent, but it has been contended by some enthusiasts on the subject, that a street car express service will eventually take the place of the many city deliveries and city express wagons now in use. As an example of a city road operating an express and freight service, involving collection and a house to house delivery, it would be interesting to cite the case of the Southern Railway, of St. Louis, which has been operating an express service on this plan for almost two years. The Southern Electric Railway begins in the heart of the city, and runs in a southerly direction for seven miles, following the general direction of the river, to Carondelet. The territory penetrated is thickly settled for almost the entire distance, and in no essential does the road differ from the ordinary city street railway. Three trips per day are made upon schedule time by the express car, which is entirely independent, being mounted upon motors of its own. At the downtown end is a receiving station where a clerk receives all express consigned to the company, and keeps all the books pertaining to the service. The especial feature of this service, however, is the collection and delivery. This is effected by means of wagons, two of which are kept at the downtown end of the road, and three of which meet the car on all trips at certain points along the line. On receiving notice by mail, telephone or otherwise, a wagon calls for a package, delivers it at the car, from which it is handed to the proper wagon, and delivered to the address marked on the package. A charge of ten cents per package is made for this delivery, and trunks are taken from houses to the Union Depot, checked, and the checks returned, for the sum of fifty cents. A corresponding charge, according to size, is made for the delivery of large boxes and bundles. A compliment to the efficiency of the service is paid by the large dry goods and clothing houses, who have ceased to run their delivery wagons into this part of the city, and now consign all of their bundles to the railroad company. Where formerly one delivery daily was made by the wagons, three are now made by the railway. An interesting feature of the service is that several large factories located in the southern part of the city consign all their freight to the electric express. The goods are put on the car, taken to the proper railroad stations, shipped, and the bill of lading returned to the consignor. Packages are received by the express car C. O. D., the charges collected, credited to the proper account, and settlements made at the end of each month. The railway company assumes all the responsibilities of a common carrier, holding itself liable for all loss and damages. This, however, is a contingency which seldom occurs. The service has now been in operation for about two years. It is well patronized both by the residents along the line and the large retail stores in the center of the city. It does not interfere with the regular running of the cars, and since its inauguration has never failed to pay.

Up to this point we have considered an express and freight service merely as a paying or non-paying institution, to be adopted in the one case and to be rejected in the other. There is another view which may be taken of the case, however, which is in many instances the most proper solution of the problem. This is to regard the establishment of this service merely as an auxiliary to the passenger traffic, to be operated whether or not it pays in order to gain increased passenger travel. The most notable instances of this sort are the roads which run from the hearts of our large cities out into the suburbs. It is manifestly to the interest of these roads to promote building and settle-

ment along their lines, and how can they better attract builders than by giving their patrons all the advantages of city life, not only in furnishing them with rapid transportation to and from the city, but in aiding them in receiving their provisions and supplies. This calls for some form of express service, and although the receipts from this source may not equal the expenses, the increased passenger receipts and the advertisement given the road must also be taken into account.

In all street railroad practice, the cardinal point of any service, whether mail, freight or express, must be that it does not interfere in the least with the passenger travel, and this point should always be kept in view in the arrangement of such a service. For this reason we would strongly advocate the use of separate cars, operated by separate motive power and by separate men. In roads between towns, or suburban roads operated on the same plan as a steam railroad, where stops are made only at certain stations, a combination car or a trailer might be used ; but in city roads the system of piling trunks and boxes in the passenger cars and on the front platform, and stopping for these to be put on and taken off, is not of the era of the electric railway. Another system more fitted to the mule and the bobtail is the custom, yet in vogue in some places, of receiving small packages for transportation and allowing the conductor to deliver them along the route, stopping the car and forcing the passengers to wait. If the addition of a package service renders necessary such a reduction in the efficiency of the passenger service, it is difficult to perceive the gain in accommodation. A passenger car should carry passengers. It should stop and start for passengers alone, and it should reach the end of the road in the shortest possible time.

If mail bags may be thrown on the front platform of a car, carried to their destination and delivered without causing any long stops, this is perhaps the best way of solving a mail service on a small scale; but in a freight or express service it is better that the work should be done with cars especially devoted to such service and by men especially trained for it. A single box car equipped with motors of its own will handle the light freight and express of quite a territory without any interference with the regular running of cars. A twenty-five foot car, equipped with double trucks, supplied with the most approved form of motors and controllers, and fitted up either as a mail car, express car or combination car, can now be obtained for $2,000 to $2,500. A smaller car, mounted on a single truck, can be obtained for less money. If heavy freight is to be hauled, it should be carried in motor and trailer cars built especially for this purpose.

If it is proposed to establish a freight or express service, estimates should be made of the amount of business which could be procured, of its reliability, and of the rates which could be charged, taking into account the existing competition. On the other side, the cost of operating such a service should be estimated, allowing liberally for the time the investment is in idleness on account of nothing to do. If a reasonable assurance cannot be obtained of a steady and regular traffic, it is best not to venture into it, for an unreliable trade is liable soon to develop into a losing one. There are cases, however, as has already been pointed out, when it would be good policy to operate such a service at a loss, merely to give accommodation to patrons; and it is possible that such a service, started for this purpose alone, might, in a growing community, develop into a paying one.

Before leaving the subject of express service, it might not be out of place to give a brief description of a novel form, soon to be introduced upon the Union Depot Railroad, of St. Louis, in which the freight is to consist of members of the genus *homo*, in a more or less disjointed state. This great railroad system, in its ramification, extends to almost all parts of the city, passing nearly all of the city institutions, including the Dispensary, the City Hospital, and several of the other hospitals, and at the desire of the city authorities it is now having built a hospital car. As designed, it is a twenty foot body, double truck car, having a double floor filled with asbestos to deaden sound. It is proposed to utilize it primarily in conveying patients from the Dispensary to the City and other hospitals. It can also be used in case of a great fire or calamity where there are many injured, and where the horse ambulances are not capable of handling the work. It is expected that other uses will develop for it after being put into service. The car is to be equipped with stretchers, folding chairs, a tank of water, apparatus for heating water by electricity, an emergency drug store, dressings, instruments, earth closets, and all necessary apparatus for taking care of the sick and injured. A surgeon is to be in charge of the car, and will accompany it on all its trips. The car is now being built, and the innovation will, no doubt, be watched with a great deal of interest. It is intended by the city authorities to make arrangements to run the car over all the electric tracks in the city, and this will enable them to reach almost any point within the city limits.

Information received from several of the states, as before stated, shows that in some places the transportation of freight or express over street railroad tracks is prohibited by state law or municipal ordinance, and it has been suggested that associations of managers of street railroads in those states be formed, for the purpose of securing favorable legislation. The enactment of these laws may be due to hostile steam railroad influence, or it may be due to a misconception of the nature of the services which street railroads would put in operation. Surely, a smooth running electric car, moving swiftly onward, would not prove such a nuisance as the great lumbering wagons which block the streets of our large cities. Where a freight or express service is needed, the accommodation to the public would be so great that many citizens might be enlisted on the side of the railroads to secure the proper legislation.

In closing, it would perhaps be well to note some of the principal points which it is hoped, have been brought out in this paper:

1. That a mail service involving collection and distribution is best handled on a separate car, operated on the same plan as a United States railway mail car.

2. That it is supposed that a great advantage, arising from the transportation of the mails, comes from the fact that the road is under the protection of the Government, and is thus secure from riots, strikes and blockades.

3. That the most promising opening for an express or freight service is a road running between two towns, or a city road running through well populated suburbs.

4. That the question whether or not such a service will pay is entirely a local question, and must be estimated for each road separately under existing conditions.

5. That there are cases when it would be advisable to operate such a service, independent of the profits, independent of the profits, in order to accommodate the patrons of the road and to induce building along the line of the road.

6. That such a service operated upon the ordinary street railroad must not be allowed to interfere in the least with the passenger traffic.

7. That in states having laws prohibiting this service, associations of railway managers should be formed to secure favorable legislation.

Five years ago such an institution as mail, freight or express service on street railroads would not have been thought possible. Such a service has always been considered as a prerogative of the steam railroad, and the fact that some street railroads have already gone into this business and that many others are engaging in investigating its merits, goes to show how eagerly the street railroad is encroaching on the domains of its elder brother. And it is not only in this respect that the electric railway is pushing the steam railroad. Belt lines, suburban lines, dummy lines, summer resort roads, mining roads and many others are rapidly being converted to the electric system. Everywhere we see instances of the screech of the locomotive being hushed by the busy hum of the trolley. We peer into the darkness of the future and we see great systems of railroads operated by power houses located in the neighboring coal fields; we see the great cities connected by electric lines, operated at marvelous speed, and perhaps at no distant date will some new "Empire State Express" or "999 Limited" be pointed out as the development of the electric street railroad.

Special Paper on "Brake Shoes."

BY POWELL EVANS.

The street railway is quite as old in this country and abroad as the steam railway proper. Owing to the immensely greater size of the latter, however, early in its existence the importance of even insignificant items of cost in construction and maintenance was made clear. As the various original steam roads became consolidated into the present great systems, economy required on every hand the adoption of standards wherever possible for each system. This principle then extended to the adoption of standards, applying not only internally to each system, but externally to all systems.

The necessity for effecting standards was the prime cause of existence of the Master Car Builders' Association, which includes representatives from about every steam railway company in the United States. This Association has collected most facts relating to the operation of all lines, and gradually reduced the greater number of details to standards. Among other net results at the present time are—the standard track gauge, coupler, wheel, and all such parts as

must necessarily be similar to permit cars from any one line to be operated on any other.

If standards have proven simpler and more economical in every way for steam roads, the fact should apply with equal force to street railway operation. Up to 1886, when electricity began its revolution of the latter industry, the horse railways were often conducted in a rather careless manner, without due regard for petty economies. Until the last year or two, since the introduction of electric motive power, the enormous change and growth of the business has taxed its managers to the uttermost to care for the vital necessities for keeping their respective roads in operation. Now, however, when the power station, track, overhead line, car and motors are quite as perfect as similar parts of the steam railway, it is full time that this Association should proceed to the adoption of standards for details.

Much has been done in this direction, but there is more still before you. We do not yet require the absolute steam railway standards, due to the interchange of cars over the various lines, but, with the growth of our suburban roads, it is not too much of a prophecy to predict this necessity in the near future.

It is not, and probably never will be, possible for all managers to agree on all points; but why should there be a difference of height of car floor above track, or diameter of wheel, on any two new or remodeled street railway lines? For our city and suburban service practically similar conditions exist all over the country, and like the steam railways we should have universal standards.

I believe in standards throughout; but now wish to call your special attention to the subject of the "shape" and "material" for brake shoes. Brakes are applied to the track as well as the wheel; but as the latter practice, with few exceptions, is the rule, what follows has special reference to it.

An extract from a letter by W. W. Whitcomb, president of the Composite Brake Shoe Company, of Boston, in the Street Railway Journal, of September, 1893, aptly emphasizes the need of reformation in this matter. He says:

"Giving attention more particularly to rolling stock, I have been struck by the fact that there is a great lack of uniformity or standard in the numerous repair parts, a state of affairs which the manager knows only too well. Take, for instance, brake shoes and their connection with the brake mechanism, a subject which has been for a long time under discussion among the master car builders of steam railways, and one which is now beginning to prove of equal interest to the managers of street railways. Having occasion some time ago to visit a large and widely known truck manufacturing concern, I was shown nearly one hundred different styles of brake shoes, many of them differing only in some small detail, yet enough to unfit them for any truck except the one for which they were designed; and the end is not yet with them. At another truck company's works the managers failed to recognize a drawing of one of their own shoes made some years before. These may be exceptional cases, yet are examples of this widely existing evil. Roads which use altogether but one style of truck are very few, and consequently for each individual style and make there has to be on hand a supply of shoes made expressly for it and fitting no other, thus multiplying styles at increased expense. This condition of things, annoying in the extreme to the buyer, ought not to exist, and a remedy for it should be adopted. That such a remedy can be found only in the adoption of some standard, suitable alike to all makes of trucks and their brake mechanism, will be readily admitted." His logic seems perfectly sound.

The steam railways have reduced the parts of their brake gear to a standard of shape—the beam, link, release spring, hanger, clevis and shoe. They have found designs good enough for all to use, and so good that no one road seems able to improve upon them.

Having decided upon these standards, they specify them when buying rolling stock, get them, and use them. Why should not our various truck manufacturing companies use a standard brake attachment; and if they can, why do we not decide upon one, and insist upon its use? As was stated above, the steam-railways some time ago settled the matter of "shapes," so this point does not appear in their recent discussions on brake shoes.

As regards "material" they are still undecided; but are unanimous on one fact, viz.; that the best thing for one road is best for all. Is this not true also among our roads? I will assume here that it is.

The Master Car Builders' Association has spent much time on this matter, and I will now read you in condensed form their last report of 1893.

After an introduction, Mr. Cloud, secretary of the association, goes on to say:

"In order to give some idea of the importance of this question from the standpoint of metal actually used in brake shoes per year, and entirely aside from the relative value of one metal or another in the service performed, some statistics have been collected from the various roads to show the annual consumption of metal for brake shoes on cars and engine tenders. While these statistics are not entirely accurate, they are nearly enough so for the present purpose. Some roads have reported the actual pounds of brake shoes procured in the calendar year 1892, while others have reported the number of shoes; by taking the average weight per shoe as 21 pounds and reducing all to weight, we find that roads which were represented in the association in 1892 owning 320,000 cars, procured in the year 1892, approximately, 32,000,000 lbs. of brake shoes for use on cars and engine tenders, or an average of 100 lbs. per eight wheel car represented per year.

If we extend this ratio to all the cars represented in the Association, or in round numbers to 1,100,000 cars, we will find that the annual requirements for brake shoes for cars and engine tenders owned by roads represented in the Association by representative members, is 55,000 tons. It may be said that approximately two-thirds of this metal is worn out in service and that the other one-third is returned as scrap, although this estimate of the average scrap weight is an estimate based on general knowledge, and not on any absolute statistics.

To show that the roads reporting are representative roads throughout the country, it may be said that the 320,000 cars reported on are owned by such roads as the Union Pacific, C. & N. W., C., B. & Q., Penna. Co., Penna. R. R., L. S. & M. S., B. & O. R. R., E. T. V. & G., N. & W., O. & M., Wil. & Weldon. N. Y., O. & W., and a number of smaller lines throughout the country.

It may also be added that of the total amount, 32,000,000 lbs. reported by the roads reporting, five-sixths of the total used was reported as cast iron, while approximately one-sixth was reported as Congdon, and a small number of the shoes of some different manufacture and under special names.

Most of the roads reporting as above also reported their consumption of driver brake shoes for the year, which were of different kinds, but which aggregated a total of 41,000 brake shoes, which average in weight about fifty pounds each, which would make 1,025 tons of driver brake shoes used by roads owing about one-fourth the cars represented in the Association.

Referring to the shop test made by the Chicago, Burlington & Quincy Railroad Company, and reported in the proceedings of 1891, it seems hardly desirable to repeat here the results of these tests, for while they had their particular value at the time, the report of 1892 says that "investigations have convinced the committee that accurate conclusions from the shop tests would not be warranted without road tests," and as the shop tests have been reported in detail and the principal conclusions can be had by reference to the report of 1891, these tests will not be further considered at the present time.

It is perhaps correct to state, that notwithstanding the use of wooden brake shoes in England until a comparatively recent date, the earliest valuable results of experiments on friction of metal brake shoes were presented by Capt. Douglas Galton to the Institution of Mechanical Engineers of Great Britain some fifteen years ago. The experiments were made with steel tired wheels, and the results showed very clearly the intricate character of the question of brake shoe friction under variable conditions of service in railroad trains. In support of this statement, the following table of co-efficients of friction at varying speeds with the cast iron brake blocks on steel tires is given from a paper read by Captain Galton before the Institution of Mechanical Engineers of Great Britain in April; 1879:

Number of Experiments from which the Mean is taken.	VELOCITY.		CO-EFFICIENT OF FRICTION.		
			Extremes Observed.		Means.
	Miles per hour.	Feet per second.	Maximum.	Minimum.	
12	60	88	.123	.058	.074
67	55	81	.136	.060	.111
55	50	73	.154	.050	.116
77	45	66	.179	.083	.127
70	40	59	.194	.088	.140
80	35	51	.197	.087	.142
94	30	44	.196	.098	.164
70	25	36½	.205	.108	.166
69	20	29	.240	.133	.192
78	15	22	.280	.131	.223
54	10	14½	.281	.161	.242
28	7½	11	.325	.123	.244
20	Under 5	Under 7	.340	.156	.273
.....	Just moving.	Just moving.	.....	.....	.330

It will be seen that the co-efficient of the friction is not only variable through a large range under the same speed, but that it varies very greatly with the speed under these conditions, increasing as the speed decreases.

It was also found that the co-efficient of friction decreased rapidly with the increase of time that the shoes were in action upon steel tired wheels when there was no reduction in the speed, as shown in the following table of co-efficients of friction as affected by time, also reported by Captain Galton from a smaller number of experiments:

SPEED. Miles per Hour.	Commencement of Experiment	CO-EFFICIENT OF FRICTION. After 5 Seconds.	After 10 Seconds.	After 15 Seconds.	After 20 Seconds.
20	.182	.152	.133	.116	099
27	.171	.130	.119	.081	.072
37	.152	.096	.0 3	.069	....
47	.132	.080	.070	.....	.....
60	.072	.063	.058	.....	.....

It must be remembered that all the experiments above reported by Captain Galton were made with cast iron brake blocks, on steel

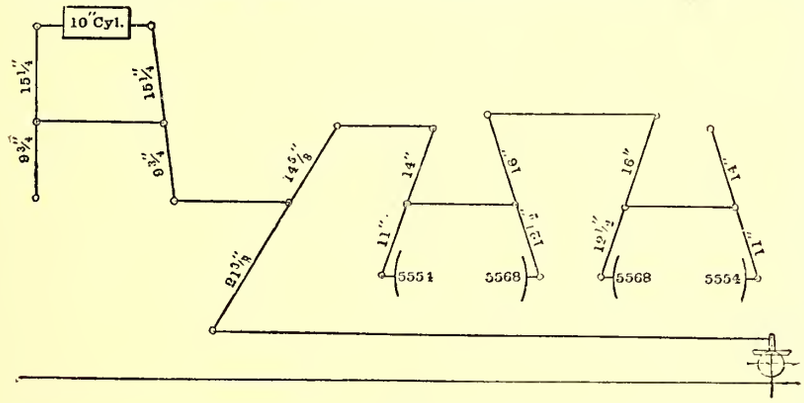


FIG. 1.

tired wheels, which is not a condition prevailing generally in the practice of this country, except on many passenger trains, but it becomes an important question to know whether similar variations are had with iron shoes on chilled cast iron wheels, especially as our service is such that shoes of the same kind are frequently used indiscriminately on both chilled and steel tired wheels.

The most reliable results obtained experimentally by the use of different shoes on chilled wheels and with different brake arrangements at the present time in hand, are those obtained by the Pennsylvania Railroad Company (which furnishes the information) in various tests conducted during the past two years, which tests had different objects in view, as follows :

First.—A comparison of retarding power with one brake shoe per wheel and with two shoes per wheel with the same aggregate pressure applied to the wheel in each case.

Second.—A comparison of retarding power with long and short shoes with one brake shoe per wheel in each case.

Third.—A comparison of retarding power with uniform pressures by the use of cast iron, composite and three different grades of cast steel shoes.

Fourth.—A comparison of the durability of these cast iron, composite and steel shoes in continued service ; also, incidentally, the relative wear of the wheels under these different shoes.

Considering these in the order above mentioned :

First.—Figs. 1 and 2 show the brake rigging on one four wheel truck in these tests, Fig. 2 showing the ordinary method used with one brake shoe per wheel, and Fig. 1 showing two brake shoes per wheel, which is standard on the car used for these tests.

The tests were made on a uniform grade of about eighty feet per mile, with three cars, two of which were passenger cars and the other a dynamometer car placed between the two. The three cars together weighed about 130,000 lbs. The run was made by gravity, and the start by releasing the hand brakes on the forward passenger car and on which alone the air brake was used to stop the three cars by opening the conductor's valve. The train of three cars was allowed to run a distance of one mile by gravity with the brakes released, and the time was taken by stop watches at the start and at the end of one mile to check the uniformity of the speed attained in the different tests. On passing the one mile post the air brakes were applied, as already explained, to the forward car only, with the other two cars pushing, and the time and distance required to make the stop were taken and the speed was recorded by the dynamometer car. The sliding of the wheels was noted by an observer at each end of the car which was braked. The condition of the rails was dry during the trials, but the wind, which was light, was in different directions and of different velocities on different days.

Statement No. 1 gives the details of the trials made to compare the use of one brake shoe per wheel with two brake shoes per wheel, all using long shoes. The sliding of the wheels was somewhat more with two shoes per wheel, but it was mostly on the last pair of wheels. It will be noted that there is practically the same efficiency in these two methods of braking.

Second.—The experiments as between long and short shoes were made in the same manner as described above, and the shoes of different lengths show about the same results, as per statement No. 2.

In the two sets of tests (given in the report) it was noticed that the riding of the cars during the stop was much better with two brake shoes per wheel than with one brake shoe per wheel, due apparently to the fact that the application of the second brake beam to each pair of wheels partly counteracted the tilting of the trucks caused by the outside suspended beams when only one pair of shoes is used per wheel in this manner.

Third.—The experiments on retarding power with uniform pressures by the use of cast iron, steel and composite shoes with one brake shoe per wheel were made in the same manner as described above, for the first tests, and the details of the various runs in these experiments are given in tables 1, 2, 3, 4 and 5 herewith, in which three different grades of steel shoes were tried, and in which the different grades are designated by the letters " D," " M " and " Z."

The composite shoes consisted of cast iron with a small percentage of wrought iron in the rubbing surfaces extending through the shoes, the percentage of wrought iron being somewhat less than 7 per cent. of the whole surface.

For a more accurate comparison, each of the runs included in tables 1, 2, 3, 4 and 5 has been reduced to actual retardation in pounds by the brakes during the stop, and the results are given in table "A" in the original report.

I omit statements 1 and 2 in the report, as they give in too much detail, relating purely to the high speeds and pressures of steam railway practice, the results broadly summed up just above. Tables 1 to 5

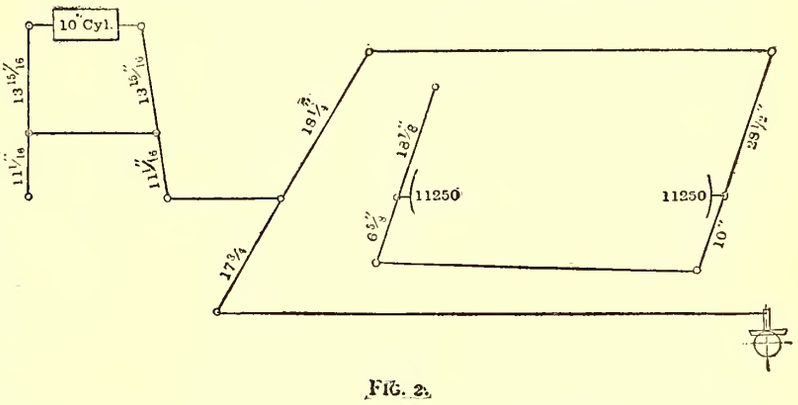


FIG. 2.

of the report are also omitted, as they are summed up later on ; and table A, as it is included in table B immediately following.

In calculating this retardation the weight of the train and the weight of the wheels, together with the speed, having been taken into consideration, and the total energy of motion calculated by adding the rotative energy of the wheels to the energy of the train as a whole, and after allowing for the effect of the grade and the effect of the ordinary resistance of the train without the brakes applied, the actual figures of the retardation of the brake shoe against the wheels as an average during the whole distance of the stop have been calculated and presented in table "A." (Included in table B.)

Table "B" presents selected runs for the purpose of making comparisons between runs in which the pressure in the brake cylinder varies between close limits of $39\frac{5}{8}$ minimum and 42 lbs. per square inch maximum. In this table "B" the figures have all been reduced on theoretical basis to 40 lbs. pressure to the square inch, thus giving a

number of cases which can be very accurately compared with one another. At the bottom of the table the averages are given with each kind of shoe, and the percentage for comparisons.

TABLE "B."

BRAKE RESISTANCES.

No. of Run.	Cast Iron Shoes. Pounds of Resistance.	No. of Run.	Composite Shoes. Pounds of Resistance.	No. of Run.	Steel Shoes "Z." Pounds of Resistance.	No. of Run.	Steel Shoes "M." Pounds of Resistance.	No. of Run.	Steel Shoes "D." Pounds of Resistance.
121	2308.40	71	2212.80	99	1698.00	18	2059.60	150	1946.80
122	2334 80	73	2236.00	96	1721.20	15	2059 60	156	1977.60
124	2403.20	75	2307.60	100	1738.40	17	2079 60	155	2008.00
123	2412.80	74	2310.00	97	1743.60	16	2108.80	149	2012 80
128	2454 40	185	2322.40	48	1767.60	.....	.....	158	2020.00
127	2462.40	187	2349 60	50	1810.40	.....	.....	35	2045.20
8	2470.80	189	2350.40	51	1836.40	.....	.....	159	2092.80
125	2479 60	184	2362.80	95	1867.20	.....	.....	34	2095.20
126	2489.60	188	2364.00	.....	.....	.....	.....	30	2135.60
9	2577.60	193	2370.40	.....	.....	.....	.....	29	2159.60
.....	.....	191	2372 80	.....	.....	.....	.....	.....	.....
.....	.....	186	2405.20	.....	.....	.....	.....	.....	.....
.....	.....	192	2410 40	.....	.....	.....	.....	.....	.....
.....	.....	182	2414.40	.....	.....	.....	.....	.....	.....
.....	.....	190	2449.20	.....	.....	.....	.....	.....	.....
.....	.....	183	2453.20	.....	.....	.....	.....	.....	.....
	Average.		Average		Average		Average		Average
	2439.36		2355.70		1772 85		2076.90		2049.36
	Per Cent		Per Cent		Per Cent		Per Cent		Per Cent
	100		96.58		72 68		85.15		84.02

Table " C" presents a comparison of the actual distances for four tests with each kind of shoe, in which the air pressure and the speeds were almost exactly alike. It also includes a percentage comparison of the average of the four runs with each kind of shoe.

TABLE "C."

COMPARISON OF FOUR RUNS UNDER THE SAME CONDITIONS.

DISTANCE RUN AFTER BRAKING.

No. of Run.	Cast-Iron Shoe Feet Run	No. of Run.	Composite Shoe Feet Run.	No. of Run.	Steel Shoe "Z." Feet Run	No. of Run	Steel Shoe "M" Feet Run	No. of Run.	Steel Shoe "D" Feet Run
8	1806	192	1887	49	3087	15	2471	157	2162
7	1893	184	1927	50	3904	17	2575	150	2866
9	1805	68	1941	51	3829	16	2708	29	2307
6	1834	65	1865	101	3425	18	2720	34	2594
	Average, 1834		Average, 1905		Average, 3561		Average, 2618		Average, 2482
	Per Ct. Av 100.00		Per Ct. Av. 103.87		Per Ct. Av 194.16		Per Ct. Av 142 69		Per Ct. Av 135.33

Two tests were made to compare the durability of the cast iron, composite and the three different grades of steel shoes in continued service, and incidentally the wear of the wheels was also noted.

The car on which the tests were made required sixteen shoes, which were made up as follows in the first test :

4 Cast iron shoes.
4 Composite shoes.
4 Steel shoes "Z."
2 " " "D."
2 " " "M."

Grouping the two grades of steel "M" and "D" together as from one foundry, the total wear of the four shoes of each manufacture was as follows, while the car ran :

KIND OF SHOES.	WEAR.	
	Actual Pounds.	Percentage Comparison.
4 Cast-Iron	23.530	100
4 Composite	11.394	48.4
4 "Z" Steel	2.337	9.9
2 "D" " 2 "M" "	1.680	7.1

A second test was made to determine the durability of the shoes, and, if possible, to get a better record as to the relative wear of the wheels, and the following table gives the results, including also a statement of the relative distances run after the application of the brakes, taken from the former tests reported.

Three sets of cast iron shoes were practically worn out during these tests, and one set of composite shoes, while the steel shoes were not much worn. So far as the wear of the wheels is concerned, the results were somewhat contradictory, and inasmuch as a large portion of the wear of the wheels is from the rail, it would be unsafe to ascribe all the difference to the shoes.

COMPARATIVE WEAR OF CAST IRON, COMPOSITE AND STEEL BRAKE SHOES.

KIND OF SHOE.	WEAR OF				Relative Distance Run after Application of Brakes. Taken from other tests.	REMARKS.
	SHOES.		WHEELS.			
	Pounds	Per Cent.	Reduction in Circumference in Inches.	Per Cent.		
Cast Iron.....	94.690	100.00	2.812	100.00	100.00	12 Shoes worn out.
Composite.....	37.635	39.75	2.343	103.87	103.87	4 Shoes worn out.
Steel "D"	5.708	12.06	1.156	135.33	135.33	2 Shoes slightly worn.
Steel "M and D"	10.220	10.79	2.437	139.04	139.04	4 Shoes slightly worn.
Steel "M".....	4.532	9.57	2.281	142.69	142.69	2 Shoes slightly worn.
Steel "Z".....	8.194	8.65	2.969	194.16	194.16	4 Shoes slightly worn."

A discussion follows which Mr. Rhodes initiates by saying:

" The report says that the composite shoe consisted of cast iron with a small percentage of wrought iron in the rubbing surfaces extending through the shoes, the percentage of wrought iron being somewhat less than 7 per cent. of the whole surface. On our line we use a composite shoe, and have for a number of years, on account of the saving which we find by using that shoe, but it has in the neighborhood of 40 per cent. of wrought iron. I can readily see that a test made of a shoe with only 7 per cent. of wrought iron might give entirely different results.

Mr. Marden: We have made, on our road, quite a number of experiments as to different metals for brake shoes, and we find that on steel tired wheels we cannot run with as good results with the same kind of metal as we can on chilled wheels. In fact, we are using, today, nothing but chilled brake shoes on steel tired wheels. On cast iron wheels we are using a composite shoe, and we are also using what is known as a Congdon shoe.

Mr. Lewis: One table states that the consumption of cast iron shoes is 22,530 lbs., while that of steel shoes is from 1,680 to 2,337 lbs. In other words, you have used nearly twenty times as much cast iron in the same service as you have of steel. It is assumed, of course, while the mileage is not given, that the mileage given by the different kinds of shoes mentioned in the report was the same. Now, the difference in the cost between the steel, composite or cast iron is not above a ratio of two to three, while you notice that in the wear the ratio is as one to twenty. Now, I have never considered that a steel shoe was objectionable for a driving brake shoe, and I never have known them to injure the tires, and if they wear twenty times as long as a composite or cast iron shoe, I think it would be advantageous for us to use them.

Mr. Waitt: In connection with what Mr. Lewis has said, there is another feature that comes in for consideration—the matter of the length of time that the shoes of various manufactures will wear is offset considerably by the amount of shoe resistance or holding power of the various metals. I notice two tables which show that there is a material difference in the resistance between cast iron and steel, the steel in the tests running an average of only 2,049 as against 2,439, or only 84 per cent. of the holding power of cast iron. It seems to me that this should be taken into consideration, and that we should not base a decision as to what is the best metal for brake shoes entirely upon the wear. And then, of course, will come in the consideration as to the effect on the wheels. It has been said by some—I am not prepared to say how true it is—that there is nothing gained by changing metal for brake shoes, that just so surely as you get a brake shoe that wears longer you are taking the life out of the tire—out of the steel tire, if it is a steel tired wheel, or out of the tread of the wheel, in the same proportion, or nearly so, as what you gain in the wear of the shoe.

Mr. Sanderson: We made some trials (I think it was four years ago) with some heavy shifting engines, putting cast iron shoes on one side of the engine, and steel shoes on the other. We found that the steel shoes outwore six and one-half sets of cast iron shoes. We have been using cast steel shoes since then on the driving wheels on all our larger engines on heavy mountain service where much sand is used, and we find that the steel shoe cuts down the tires about as fast as they

wear on the rails. I was looking up the record the other day, and found there was an engine that had been on the road two years, on heavy mountain service, and did not require returning yet. That is the Ross cast steel shoe. I would like to ask, in regard to this report, whether there were any release springs on these brake beams. The power seems to be calculated on the pressure in the cylinder. Now, we made some little rough tests the other day with a hand dynamometer, and found that it took over 800 lbs., with some forms of release springs, to pull the shoe up to the wheel. We could not make any calculations as to the co-efficients of friction and resistance.

Mr. Cloud: The report did not give any information on that subject. The standard, however, uses a release spring, and I presume it was used in this car. But how much it took to overcome it, I have no idea.

Mr. Lewis: In regard to the effect of different metals on the steel tire or on the wheel, we know that the Ross-Meehan shoe is designed to wear the part of the wheel that is not in contact with the rail nearly as fast as the wheel wears where it is in contact with the rail. The fact is that we never have seen a shoe constructed in that way that has worn the wheel as fast as the rail will wear it.

Mr. Harrison: We have been conducting experiments on the Baltimore & Ohio road for some time to try to find out the most economical brake shoe for our service. We have had experience with the wooden brake shoe and the wrought iron shoe and the cast iron shoe, and when we try to take the wear of the wheel and the wear of the rail the conditions are so entirely different that it is almost impossible to get any result at all. We were changing our cars, running them first one place and then another, until the only thing that we could do was to take them on to some local train. We have not arrived at any conclusion yet as to what the best metal would be. Soft metal has given very good results, and some experiments reported were very satisfactory.

Mr. Mackensie: I move that a committee be appointed by the chair to report at our next annual convention upon the advisability of making an extensive brake shoe test. I want to say now that in order to do this it will be necessary for that committee to have different kinds of wheels under the cars and different kinds of brake beams, and I think that that should be embodied in the motion. We can make a test of a brake shoe and also of a brake beam at the same time, and I believe that there are lots of lines running through the country who would be glad to furnish cars with different kinds of wheels in order to make these tests."

This ends the report as far as concerns us. I have it here in full detail for any one wishing to see it. The following extracts from letters from two wheel manufacturers and one brake shoe manufacturer, will show their views on the question of friction between wheels and shoes.

Charles V. Slocum, of the New York Car Wheel Works, of Buffalo, N. Y., says: The best mechanics acknowledge that two metals of extreme hardness coming together with resistance, as in the case of of wheel and brake shoe, do not adhere, but will eventually heat and burn.

As you are probably aware, the treads of cast iron wheels have the hardest surface which is possible for the manufacturers to provide, and this hardness is absolutely necessary for the service required. This surface cannot be touched by a tool to any extent. It is harder than hard steel, and when brake shoes of the same material are used, or shoes of considerable hardness, friction results instead of wear, with a consequent burning of the treads of wheels, in many instances shortening the life of the latter and putting the railroad company to a great deal of expense in replacement of wheels or in having them refitted; hence it becomes a question of wheels versus brake shoes.

In other words, will railroad companies prefer to buy the harder and more expensive brake shoes for the purpose of economizing in the consumption of the same, or will they prefer to buy softer brake shoes, as, for instance, the ordinary soft casting worth from one and a quarter to two and a half cents per pound, according to the qualities purchased, with a total investment per shoe of twenty to fifty cents, or will they prefer to economize in car wheels, which cost from $3 to $65 each, according to style, size and kind?

These shoes are very readily replaced with very little expense. No car wheel can be replaced to any advantage without taking out the truck, pressing off the wheel, pressing another on, replacing it in the truck and replacing the truck under the car. The expense of replacing one wheel has been variously estimated at from $2 in steam railroad service up to $10 in street railroad service, where the motor has also to be removed and the gear taken from the axle.

This, it can be seen, is comparatively expensive and does not include the cost of the wheel itself burned by the hard brake shoe, nor the cost of the new wheel to take the place of the burned one. Including these two items, a conservative estimate of the cost of replacing a brake burned wheel under a motor car would be $20, and where a company is not well equipped with facilities for doing the work, the expense would be far greater.

The cost of replacing a brake shoe might possibly be $1, including the cost of the old and new soft casting and all the labor involved.

Street car wheels are ordinarily guaranteed ro run from 25,000 to 35,000 miles in service under ordinary conditions, and will often make double these figures in actual mileage if not actually prevented. Hence it is a question which every master mechanic must decide, as to whether the wheels shall be assisted in giving good service by the use of soft brake shoes, or whether they shall be hindered, and in many cases actually prevented from giving satisfactory results by using friction, instead of resistance, in the stoppage of cars.

The Philadelphia Car Wheel Company, of Philadelphia, Pa., writes: It is a well known fact that when two metals are very hard and are brought together, they do not adhere, but will heat and burn.

Cast iron wheels are chilled on the tread, and are made as hard as it is possible to make them, and if the brake shoe is made and chilled in the same manner, instead of adhesion and wear on the brake shoe we have friction between the two surfaces, which results in the burning of the tread of the wheel, which unfits it for future service.

The difference between replacing new wheels and new brake shoes is so very great that there is no question but that a brake shoe made softer than the wheel is far more preferable and economical than when made with a chilled face, and we, of course, would commend the use, in every case, of a brake shoe made from ordinary iron.

In this connection we would like to call your attention to the flange of motor wheels. A great deal of the wear on wheels has been on the flange, and if this is not made of sufficient thickness it will chip and break long before the chill is worn from the tread, and much of the rail now in use has been made with a groove too narrow to take in more than a seven-eighths flange, and this is entirely too small for a motor wheel.

W. W. Whitcomb, of the Composite Brake Shoe Company, states: From observation and discussion in railroad clubs by the steam railway mechanics, I have become strongly of the opinion that a chilled brake shoe should never be used in street railway service, and with but few exceptions they are being condemned and thrown out. They may give more service, but it is usually at the expense of the wheel and a constant risk of accident and disaster to the traveling public. In the electric service, for instance, where considerable speed is attained and frequent and sudden stops necessary, a chilled shoe should be prohibited, in my opinion.

In connection with the first two above citations, it is well to note that with us there is not much danger of burning the wheels, but the remarks on wear do apply, and with force. I now wish to give you some figures which will show the cost of this brake shoe business to us, and therefore its importance.

In round numbers there are on all lines of street railways in the United States 50,000 cars, including the steam and electric motors, cable grip cars, trail and horse cars. These should not properly be lumped, as they include varying factors of weight and speed, varying the brake services required—but for the result in view, using low averages, this lump figure will be sufficiently accurate.

Assuming an average mileage of seventy-five miles per day for all cars, including an allowance made for cars used in rush hours only and others under repair, the total result would be 3,750,000 car miles per day. Taking the average life of brake shoes at 5,000 car miles, and an average of five shoes per car, there is a daily consumption of 3,750 brake shoes, and an annual consumption of 1,358,750 shoes. At an average weight of twenty-one pounds each, new, the total weight is 28,745,750 lbs; at two cents per pound, amounting to $574,875. I will deduct from these amounts an average weight, per shoe, of nine pounds when worn out, amounting to 12,318,750 lbs. of scrap, at one-third cent per pound, equal to $41,062, leaving a net balance of $533,813. This represents what we pay annually for metal actually ground to dust braking our cars. To this we must add the cost of labor in changing the shoes. Allowing thirty minutes per shoe for replacement and adjustment of rods, etc., and $2 per ten hours per day for labor, this total amount charge would be $136,875. Adding this last figure to the net cost of metal gives us the total annual charge of $670,688 for brake shoes, equal to about $13.70 per average car, from which you can roughly estimate the cost of this item for your respective roads.

It is self-evident that if you select a metal which will give you a greater car mileage than 5,000 miles; or a shape which will permit you to use more of your twenty-one pounds of new shoe than twelve pounds for braking, and, therefore, less than nine pounds for scrap; or if your shape is readily adjustable on cars, and your men become familiar with their replacement and save time—if you do any one of these, a saving results, and if you do two or all, the saving is so much the more increased.

Now, the first step towards an advance in economical operation is to turn to your accounts and records and locate any leaks. Can you all do this?

I will hazard the statement that you cannot. Wm. Wharton, Jr., & Company, Incorporated, of Philadelphia, in preparing this paper, sent out 300 circular letters and sets of questions for returns—with stamped and addressed envelopes enclosed—to as many representative street railways in the United States. The questions asked are given below:

MATERIAL.

1. Do you keep records of wear of shoes and wheels?
2. What are your averages?
   (*a*) Weight of cars?
   (*b*) Mileage of wheels before worn out?
   (*c*) " " various shoes before worn out?
   (*d*) Stops?
   (*e*) Gradients?
3. What material has given you the most satisfactory results for brake shoes?
   (*a*) In braking qualities for wheels?
   (*b*) In economy of shoes themselves?
   (*c*) In " " wear on wheels?
4. What materials have you used for brake shoes, and how proportioned in amount to each other?
   (*a*) Soft iron?
   (*b*) Hard or chilled iron?
   (*c*) Wood?
   (*d*) Steel?
   (*e*) Wrought iron?
   (*f*) Combination of any of above?
   (*g*) Any other materials not above included?

SHAPE.

5. How many different styles do you use;
   (*a*) Makes of trucks?
   (*b*) Patterns of shoes with separate hangers?
   (*c*) " " " without separate hangers?
6. Would you advocate a standard shoe, without separate hanger, to fit all trucks; and do you think such a standard possible?
7. Or, would you advocate a standard shoe, interchangeable for right and left, fitting into hangers with a standard shoe face, the hangers made for special adjustment to various trucks?

No.	MATERIALS. Weight of cars.	Mileage of Wheels.	Mileage of shoes.	Stops per Mile.	Gradients.	SHAPE. No. of Truck patterns.	Shoe patterns. No hangers.	Shoe patterns. Separate hangers.	Stand. Shoe wanted.	Stand. Shoe hanger wanted.	REMARKS.
1-7	No	Re-	cords	at	all.						
8	12 to 22,000...	Abt. 225,000....	Abt. 75,000	... .	As high as 10% and plenty of them.	4 Brill.....	.....	1.....	.....	Yes.....	Shoes wear down to ¼ in. thickness or less before giving out.
9	.....	.....	.....	....	.....	.....	.....	.....	.....	Present practice.	Shoe inter. and fit stand. hanger.
10	.....	.....	.....	.....	.....	1.....	.....	.....	.....	.....	Shoes from Bemis Co. only.
11	....	.....	.....	.....	6% heaviest	1.....	.....	.....	.....	....	
12	.....	.....	.....	.....	.....	5 or 6.....	.....	.....	.....	Yes	Use shoes as made by truck manufacturers.
13	.....	.....	....	.....	.....	3.....	6.....	.....	Not pos'ble	Yes	60 per cent. chilled iron, 20 per cent. soft, Lappin.
14	Abt. 12,000 ..	25,000 to 30,000..	.....	....	.....	3.....	.....	.....	Yes	.....	Chilled iron in shoes.
15	15,000.....	35,000.....	3,000.....	.. ..	Not over 7%..	2.	.....	.....	.....	.....	Hard iron shoe to brake on tread only.
16	4 to 6½ Tons	20,000 to 60,000..	4 to 7,000	Abt. 10 per m	2½ to 5½ % ..	2.....	.....	3.....	Not pos'ble	Yes	60 per cent. soft I., C. I. with wood, also with steel plugs.
17	12,000.....	55,244.....	4,864.....	5 per m... ..	3 to 6%.....	1.....	.....	1.....	.....	.....	Medium C. I.
18	{Cab. 7,500.. {E. 14,500...	} 40,000.....	7,000.....	8 per m.....	Level...	1.....	.....	1.....	.....	Yes	Congdon shoe (cast steel plugs in C. I.).
19	6 to 8,000.....	Abt. 40,000.....	Abt. 12,000.....	.....	0 to 12%.....	2 Brill	.....	.....	.....	Yes	Soft iron and wood, "Ill-fitting hangers."
20	4 to 5 Tons..	.....	.....	.....	Highest 2%...	2.....	.....	.....	.....	Yes	Ordinary C. I. shoe.
21	Abt. 6½ Tons	30,000 to 32,000..	.....	.....	.....	2.....	.....	.....	.....	.....	Chilled iron shoes—2 patterns.
22	.....	.....	.....	Very frequent.	One of 10% ...	2.....	1.....	2.....	.....	Yes.... ...	Soft iron with wood plugs.
23	.....	.....	.....	.....	8 to 9% in places.....	2.....	.....	.....	.....	Yes.....	Soft iron shoe.
24	7 to 8 Tons...	One year	9,000.....	Very frequent.	6%.....	4.....	2.....	1.....	.....	Yes.....	Have used soft I. and hard I. and iron and wood plugs.
25	12 to 15,000...	30,000 to 40,000..	5 to 7,000.....	Not frequent	About level	6.....	3.....	3.....	.....	Yes.....	Have used soft I. and hard I. with wrought plugs, and wood.
26	5 Tons.....	Not worn out but flat in 5 years....	6,000.....	5 to mile.....	0 to 9%.....	4.....	.....	.....	.....	Most emphatically	Same as 25 above. Note letter about skidding of wheels.
27	4 to 6,000.....	One year	2 to 8,000	Every 300 ft.	0 to 6½%.....	4.....	2.....	2.....	.....	Yes.....	
28	{Cab. 7,000.. {E. 16,000...	33,000..... 27,000..... ..	....	As usual in cities.	Abt. 2½%	1 each railway....	.....	Loop hanger bolted to brake bar..	.....	Durable, but hard to keep good fit	See his note. Prefers hard iron. Thinks soft I. wears wheels faster than hard I. Impossible for one shoe to suit all railway men.
29	11,000.....	45,389.....	.....	.....	5% heaviest..	2.....	.....	1.....	.....	Yes.....	Congdon shoes.
30	20,000.....	30,000.....	4,500	.....	.....	4.....	.....	1.....	.....	Yes...	C. I. with wrot. I. plugs.
31	5½ Tons.....	20,000 to 24,000..	10 to 14,000.....	Every 500 ft.	Not over 2%..	1.....	.....	1.....	.....	Yes.....	McGuire type shoe, chilled iron wheels.
32	10,000.....	Abt. 36,000.....	1,500.....	20 per mile...	4 to 11%.....	1.....	1.....	.....	.....	Yes.....	Hard C. I.—4 steel segments, 3 in. apart.
33	{Mo. 16,000.. {Trail 6,000..	}	.....	.....	3 to 7%.....	1.....	.. ..	All.....	....	Yes.....	Soft C. I. and same with wro't plugs.
34	8 to 9 Tons	4,000 to 30,000 ..	Comp. 20,000 C. I. 8 to 10,000...	Usual in cities....	..... Max. 3%.....	2.....	1.....	1.....	.....	Yes.....	Note on wheels. Soft C. I. and comp. shoe.
35	8 Tons.....	35,000.....	4,5000.....	7 to mile.....	7%.....	3.....	.....	2.....	Yes.....	Yes.....	Soft C. I., hard C. I., C. I. with wood plugs. Wood.

Note.—The originals used in preparation of this sheet were present for reference.

REMARKS.

Of the thirty-five answering replies, seven sent no information whatever (1-7); seven stated that they had no records of shoes or wheels, but gave such information as memory supplied probably (8-14); thirteen gave records of shoes and wheels—"limited," "not accurate," etc. (15-26); two had records of wear of wheels, not of shoes (27-29), and six had records of shoes and wheels (30-35). A tabulated list of replies in the order above indicated is given on this page.

The small number of these answers, first, and the smaller number giving accurate information, second, does not speak well for the interest the members of this Association show in such matters, or the records kept by them. As a whole the replies are very contradictory.

You will note the wide difference in material in use. It is not possible that this difference can exist and all be right.

Who are in error? In my opinion a standard shape of shoe proper could be put in practical and immediate use. Out of twenty-four circular replies on this point twenty-two favored such a plan. The principal objection made to it is, that the hangers wear and will not hold shoes tightly for any length of time. Is this not largely due to faulty design, as the Master Car Builders' Association standard for some years has consisted of a separate shoe and hanger? I am using the word hanger as meaning the clevis in steady railway practice.

The Graham Equipment Company also uses this standard on its trucks, and in a recent letter on the subject states: "We have no trouble with hangers wearing out. We find they hold the shoes tight, and so far in our experience of three years we have not yet found a case of the hanger or shoe rattling loose." The Atlantic Avenue Railway Company uses the Master Car Builders' standard, varying the hanger attachment to fit their trucks. The Electric Traction Company, of Philadelphia, the Baltimore City Passenger Railway Company and many other lines using the McGuire Truck Company's shoe, or designs similar to the Master Car Builders' standard, vary the hanger to fit different trucks. You will find samples of all the above mentioned shoes among those now on exhibition here. I strongly advocate the adoption of the Master Car Builders' standard by this Association, the hangers made to fit our various trucks. In time we may hope to reach a standard hanger, when the brake beam and attachment are made from one design, which could easily be accomplished.

This standard shoe weighs less than any combined shoe and hanger, and most of the metal in it is available for actual wear—leaving the smallest possible percentage of residue for the scrap pile. You will note the great weight of useless metal required for attachment solely, which many of the combined shoes and among those exhibited contain.

This standard further requires but one pattern for right and left shoes for all trucks, and car house men become familiar with it and accustomed to its fitting.

Without further attention to shape, I will proceed to some consideration of material. From conclusions based on the foregoing Master Car Builders' report and letters immediately following it, there appear to be three main conditions involved in the "best material," viz., that it should be economical in wear itself, economical as regards wear on wheels and should have a good co-efficient of friction. Different men will vary in opinion as to the relative importance of these three conditions.

It seems to be generally conceded that neither chilled iron nor steel are advisable, as they have not a sufficiently firm hold on the wheels and wear them too much.

Soft cast iron, on the other hand, is satisfactory on both these points, but wears out too fast. Various combinations of soft and medium hard cast iron, with wrought iron, chilled iron or wooden segments inserted in the frictional face—from 20 per cent. to 40 per cent. of the face—have given the best results in all these respects in street railway service so far. The Lappin and Baltimore Car Wheel Company's shoes represent the soft and chilled segment type; the Composite Brake Shoe Company's shoe the iron and wood segment type, and the Wharton Company's shoe the wrought and cast iron type. Still another type is the Wharton wood shoe, in which the frictional surface consists of oak cut across the grain. The Pennsylvania Railway Company uses a medium hard or soft, as you please, cast iron mixture for its shoes; but it is well to remember that the pressure of the shoe against the wheel, and the circumferential velocity of the wheel, is much greater in steam railway practice than in ours, and the former could not use at all with safety material which might do our work.

A chilled iron shoe would burn their wheels, and a wooden shoe would be set on fire. Another point of difference in conditions of the two practices is the normal freedom from dirt and grit on the steam track, and the necessary presence of both on all tracks laid in city streets. The grit undoubtedly increases the frictional co-efficient between the wheel and the shoe on street cars, but also tends to increase the grinding of both.

A. Whitney & Sons, wheel manufacturers of Philadelphia, have designed a shoe having open cuts across the frictional face, to permit this grit to fall out. As the area of the frictional face must necessarily be as great as in others of continuous surface, they practically apply a number of small shoes instead of one large one, and the total amount of grit retained by the former type is probably equal to that retained by the latter, so I cannot see any actual difference in result in this respect between the two. The grit is always with us, and must be considered an ineradicable factor in our problem. In connection with the area of frictional surface, the best practice seems to be for the shoe to be not less than twelve inches long, and to rub on both the tread and flange of the wheel.

Regarding this question of material, I have collected the available information, but am free to confess my inability to suggest final conclusions. We must think and work over the matter for a time.

The object of this paper is to call your attention to the value of standard design in the practical business of squeezing dividends out of the operation of your roads; to show you that steam railways have standard shapes for brake shoes and attachments, and that we should and could have our own; to inform you that our roads, as a whole, are inconsistent in their selection of material for brake shoes; and to lay before you for further consideration the facts known regarding the merits of various materials for this purpose.

Too much stress cannot be put on the value of good records in this and other details. The results will more than repay the trouble and bookkeeping costs.

I now beg to suggest the appointment of a committee to investigate the subject during the coming year, to make experiments, if deemed advisable, and to report at the next convention. A sum of money should, in my opinion, be appropriated by the Association for their use. The Master Car Builders' Association is now having a series of experiments made at the works of the Westinghouse Air Brake Company, on brake shoe material.

Report of the Committee on "The Best Method of Treating Accidents."

BY P. M. DYER—Committee.

Among the subjects coming to the attention of the general manager none is more replete with perplexity and difficulties than the disposition of personal injury claims. Expense of operation can be approximated; cost of construction estimated by the engineer or architect, but when and where accidents will happen, and what they will cost the company, can never be predicted. By the aid of modern inventions the cost of operation has been lessened; but this gain is threatened by the additional expense incident to the increased number of accidents on street railroads operated in the crowded thoroughfares of our large cities.

It is my purpose to explain to you in what manner the North and West Chicago Street Railway Companies attend to personal injury cases, commencing with the accident and following the theme to the final disposition of the claim. These two corporations carried 167,000,000 passengers during the year ending December 31, 1893, and upon the claim department devolves the duty of investigating all accidents and the making of settlements, or preparation of the defence, in all claims that spring from this great traffic. One claim department does this work for both roads.

The working force consists of a medical staff and a sufficient number of investigators, all under the direction of the chief adjuster, who reports to the general counsel of the two companies. For the purpose of this article the work of the claim department may be divided into three periods, each separate and distinct from the others, as follows: First, investigation; second, negotiation; third, litigation.

First, as to investigation. The work of this period begins immediately after the accident and continues until there has been secured a full and accurate account of the accident, with reliable information as to the nature and extent of the injuries to person. Employes have been instructed to notify the claim department of the occurrence of an accident on car or train, giving circumstances of the same, nature of injuries to and residence of the injured, and as far as possible to secure the names of the witnesses. When this has been accomplished and the injured one has been placed in the charge of a physician or the police, the car or train may continue its journey. In the meantime a representative of the claim department will proceed with all possible dispatch to the scene of the accident. If the injured person has not yet been removed, he must see that conveyance is provided to the hospital or to the home.

These companies usually bear the expense of temporary medical care and transportation, without regard to liability, believing such attention is appreciated by the injured and the community at large. In all cases of personal injuries, it is the duty of the medical staff to secure the privilege of an examination; the physician making the same to avoid any assumption of responsibility for the treatment, but to fully ascertain the nature and extent of the injuries, and to obtain, if possible, a concurrence in his report by the attending physician.

All employes witn ssing accidents are required to make written statements of the circumstances of the same on printed forms provided for that purpose, attaching the names and places of residence of all witnesses. This report must be completed and given to the foreman before the employe finishes his day's duties. These reports are forwarded to the claim department without delay, and when received, circular letters containing printed interrogatories are sent to each witness. If the seriousness of the accident demands it, interviews are had with the witnesses. That the claim department may be kept fully advised from time to time as to the condition of persons injured on these roads, they are occasionally visited during the period of recovery by the investigators assigned to those cases. In Chicago, all hearings before the coroner are had immediately after the accident, and the verdict of the coroner's jury is usually rendered on the day following the death. It is the policy of these companies to secure the presence of their witnesses at the hearing before the coroner, and obtain stenographic minutes of the proceedings. Thus, in a comparatively short time, the claim department will have collected much information as to the condition of the injured, and the circumstances of the accident. We may now consider the work of the first period completed.

The reports relating to an accident could now be filed away, perhaps forever, if it were not for the industry of some claim lawyer or other hustler who persuades the injured to make a demand on the company for compensation. The making of a claim leads us to a consideration of the second period, that of negotiation. Demand being made for compensation, it becomes the duty of the chief adjuster to place before the general manager or general counsel all facts within his knowledge bearing on the claim, for a decision as to liability, and the naming of the maximum sum to be paid, if a settlement is deemed advisable, the claimant being promptly informed of the decision. As to the negotiations preceding a settlement, I need say but little. They are usually conducted by the chief adjuster on the part of the company. If not successful the period of negotiation will end, usually to be followed by litigation, the third and last.

After the commencement of suit all witnesses are again located by the claim department, and thereafter located at stated intervals until the time of the trial, and if possible additional witnesses are found to strengthen the defense. Success in defending suits arising from personal injuries, largely depends on the character of the work done during the period of investigation. The officers of these companies believe in the thorough investigation of all accidents, if possible the settlement on a reasonable basis of all valid claims, in vigorously contesting fraudulent demands, and that prompt settlements are for the best interests of their companies.

In conclusion, I will say that the time is at hand when all railroad corporations must be prepared to resist claims in a large percentage of their accidents. To promptly prepare to do this is the part of wisdom, when considered from a financial standpoint, usually the determining consideration in corporate management.

Report of the Committee on "The T Rail Track Construction of the Terre Haute Electric Railway."

By Russell B. Harrison.—Committee.

It gives me pleasure to respond to the request and invitation of the American Street Railway Association, extended last year at the Milwaukee convention, to make a report at the Atlanta convention, on "The T Rail Track Construction of the Terre Haute Electric Railway." This is not alone from the fact that it is very gratifying to have so influential a body as the American Street Railway Association thus recognize the pioneer and successful work of the Terre Haute road in the important field of track construction. But more especially from the standpoint that having given several years' study to street railway track construction—not following as others lead—but working on the problem with new and original ideas, I believe the presentation of the results that have been secured will not only prove of great value and interest to the members of the Association in showing how T rail track construction may be successfully laid in paved streets, with the hearty approval of the public, and will give the members a standard to follow that will enable them to save thousands of dollars in expensive experience and in costly experiments. If but a small part of my expectations in this respect shall be immediately realized, the seed will be sown and will produce a great harvest, bringing ample reward for our efforts and work on the problem.

The present standard of "all steel" T rail track construction of the Terre Haute Electric Railway, not only has no equal in this country, but is so far in advance of anything yet attempted in the way of street railway track construction, that I feel a brief outline of our work on the problem, prior to reaching the present standard, will not only not be out of place, but will prove of real interest. I am aware, gentlemen, that these are strong words to be used in connection with our present track construction, and that my opinion may not be immediately shared by many members of the Association, but I am confident that all members making an actual inspection of the track, will share my opinion as to its smoothness, solidity, durability, permanency and general merits, and the great advantages and public popularity of the smoothly finished asphalt and brick paving laid in connection with it.

Terre Haute is an anomaly among the cities of this country, on the subject of street railway track construction. It is the only city that would not permit girder or groved rail in its streets, and would make as great a fuss now on the subject, as the average city would do, if an attempt were made to lay T rail track. This will seem a strange condition, but to the company it is a very pleasant one, making its relation with the city on the subject harmonious, and permitting the road to secure, with popular approval, the best and most durable form of rail, at the least cost. This feeling—the approval by the public of a T rail did not exist at the start, but was brought about gradually, assisted by the greatest of all teachers—experience. It would not be in existence to-day if the management of the road had not at all times realized that public opinion and the approval of the public, were valuable assets to a street railway company, and worth every earnest effort to hold and maintain. Our motto has been, not how cheaply, but how well we could construct our tracks in the streets. The public have appreciated our efforts and sustained us loyally.

There has been in the past too much attention paid to motors, generators, cars, power-houses etc., and too little to the foundation for successful and economical operation—a perfect track. The development of electricity as a motive power for street railway service, was very rapid, and it is only natural that the inexperienced should be misled in their hurry to change power and have an electric road that would make them very rich in a year or two. Is it any wonder then that many roads should find after a year or two of experience that the track was too light for the cars and motors, and the cars and motors were too heavy for the track, and that both were worn out and required rebuilding, at time when the great panic had reduced traffic to its lowest point. Light and abused track and worn out cars and motors, coupled with reduced traffic, have brought to too many roads the unwelcome guest—the receiver.

It seems strange that street railway track construction should drift so far away, in theory and practice, from steam railway track construction. One had but to study the wonderful display showing the development of track construction, in the Transportation Building, at the World's Fair to acquire a liberal education on the subject. The Terre Haute road has indeed had a fortunate experience. Its management early realized, that successful track construction should approach as far as possible, and not deviate from, further than necessary, the best steam railway track construction. So to-day the Terre Haute road is an all T railroad, and every block of track in paved streets of so durable a character that it will last for years, with a minimum of repairs.

Terre Haute, although a small town at the close of the great civil war, was very enterprising and determined to have a street railway. A company was incorporated for this purpose in 1866, with ample capital, and commenced to lay track early the following year. It is an interesting fact in connection with the present low price of steel, that the side bearing, flat iron rails purchased by the company in 1867, cost $108 per ton. These rails were used about twenty years and then, thirty-eight pound girder rails were substituted. The franchise of the company does not contain any requirements as to the style, character or weight of the rails. While there has been no expression from the public on the subject, the management feared that the general and popular prejudice against the use of T rails in the streets would appear in Terre Haute. They, therefore, hesitated about so radical a change, but appreciating the good results that would come from the use of such a rail, they decided to place a trial order. No publication was made of the fact that it intended to use T rail. The first T rail laid by the company was on South 3d Street, in the fall of 1890. This rail was laid preparatory to changing the motive power from horse to electricity. The old girder rail on 3d Street was taken up, new ties distributed, and when everything was ready the T rail was distributed in a matter-of-fact way, as if it was the only rail that could be used, and a force of men put to work in laying them. The Mayor of the city came around

shortly, reports having reached him, as to the company laying a steam railway track, and when he saw the reports were true, said with some excitement, "What are you doing here, putting a steam road in our streets?" The superintendent, who was on the spot, was equal to the emergency, and replied pleasantly, but earnestly, that the track was being built for an electric railway. The mayor replied that that could not be the case, as the rails were steam road rails. The superintendent then informed him, that these T rails were the only rail adapted for the successful operation of electric railways, and while it appeared to be the steam road rail, it was in reality very much lighter (the section being forty pound T) than a steam road rail. Further explanations satisfied the Mayor, and convinced him as to the merits of the T rail. In a short time he not only became interested, but enthusiastic, and brought councilmen to see the rail, and explained to them its advantages for electric street railway service. They in turn brought prominent citizens and others to look at it, and thus by tact and good management the T rail was introduced.

A description of the laying of this first T rail track will prove of interest. It was a forty pound T rail, laid on oak ties, 5 × 7 × 7, with three feet space from center to center. The rails were laid without proper regard to having the end of the rail rest on a tie. Planks, 2× 6×12, were laid on both sides of the rail. On the inside, the planks were nailed to the ties, and on the outside blocks were nailed to the ties to raise the plank to a level with the rail, to provide vehicles an easy crossing. Ordinary flat splice bars were used with the rails. The rails were bonded with three-eighths inch, galvanized bond wire, with a single bond to the joint. They, in turn, were wired and soldered to a supplementary wire, of one-quarter inch, galvanized, stranded iron wire, each alternate joint being soldered and wired from both rails of the track. In the single track, the supplementary wire was in the center of the track, and in the double track between the tracks. The track was covered in with good gravel.

One year's experience demonstrated that planking was unnecessary; that gravel, which is found in great abundance under and about Terre Haute, made—with a little clay that is found above it—a superior substitute for the plank, and protected the rails better, in enabling vehicles to pass along, and to cross the track easily and without injury. This substitute only required occasional attention in filling up low spots to maintain a level roadway. In two years, the planks were badly decayed and warped up at the end, and as the track was thoroughly overhauled at that time, the planking was taken up, and gravel substituted.

At the end of two years' service of the track, it was found, in making repairs, that the galvanized iron, supplementary ground wire was rusted out and gone for various distances, making a return circuit an impossibility, and as we had only the rails to depend upon, which, in themselves, for this purpose, are not sufficient, this trouble not only reduced the efficiency of the circuit, but caused frequent burnouts of the armatures and fields. It grew to such an extent that it was found necessary to rebond this track, and it was decided, at the same time, to dig up and repair the entire track, and increase the number of ties by one-third, and, at the same time, give careful attention to having the ties under and properly supporting the rail joints. Tinned, No. 00 copper wire was substituted for iron as the bond and supplementary wire. Good gravel, with a little clay, was substituted for the plank along the rail, and the substitute has given very much better service than the planks have ever done. This section of the road, as rebuilt, is in daily use now, and giving good service.

The era of street paving did not set in, in Terre Haute, until 1892. This was not because Terre Haute lacked in enterprise and progressiveness, but was because the town was situated on a high bluff, fronting the Wabash River, and had, with the gravel subsoil, good drainage and good streets. When it was decided to pave Wabash Avenue and Main Street with brick for fifteen blocks, it became necessary for the company to take up its girder rail. Our experience, thus far, with T rail, had been so satisfactory that it was decided to continue its use on the following method:

Rail.—About this time the Illinois Steel Company brought out its sixty pound Shanghai T rail, and as this was five and three-quarters inches high, permitting paving without chairs and direct spiking of the rail to the ties, it was very promptly adopted and ordered.

Ties.—Carefully selected oak ties 5 × 7 × 7 were used.

Foundation.—After excavating for the track, the ground was rolled by a heavy fourteen ton steam road roller. Then six inches of broken stone was placed in position as a bed, and rolled by the fourteen ton steam road roller.

Track.—Then the ties and rails were placed in position and raised to grade by tamping screened broken stone underneath, spaces between ties were filled with broken stone and rammed to position.

Bonding.—Single bonds were used of seven-sixteenths inch, galvanized iron wire, and a supplementary wire of No. 00 tinned copper wire.

Paving.—On top of the broken stone, screened sharp sand was placed, and with one-inch hose this sand was washed into the interstices of the stone. After drying, the sand was brought up to an even surface by a fresh deposit, and it was then smoothed to even surface and the desired thickness by a mould board. Then vitrified bricks were placed in position, leaving them somewhat higher than the rail. They were driven into the cushion of sand by means of hand rammers, with a square piece of boiler plate placed on top of them, to force all to the proper level. The sand cushion permitted the bricks to crown evenly from center towards each rail to afford proper drainage. A special brick with one corner cut off with sloping angle to give space for flange of wheel to run in, was laid next to the rail. These bricks were not the shape of the special nose brick now used, and only set against the lower edge of inside of head of rail. The space between the brick and web of rail was filled with grouting. Bricks of regular size were laid between. After the bricks had been rammed and rolled to proper position, a grout of best screened sharp sand and Portland cement with water, made to such flowing consistency as to percolate all the crevices, was poured over them, and by brooms pushed into the openings. When thus wet, the bricks were solidly united and they cannot be separated, except with great difficulty. A finishing coat of sand was thrown over the entire surface, and traffic kept off for one week. After thoroughly setting, the sand was swept off and the street opened for traffic. The street between the tracks and curbstone, as well as between the tracks, is one solid mass of concrete and brick from center of street to curb, and will sustain great pressure. Since this track was laid, our experience with it has demonstrated that it could have been improved in one particular, viz., the sand and broken stone should have been united with cement into regular concrete. For we have found since the paving was completed that the use of the water on the sand did not wash it thoroughly into interstices of the broken stone. In time the sand dried and settled down into the spaces, and while the ties and the paving immediately over them have remained firm and solid, the paving between the ties has settled slightly, without breaking or disturbing the concrete holding them together. This track laid in Wabash Avenue, the principal street of the city, has had two years' severe service, and has been thoroughly tested in every particular, and thus practically demonstrated its great success and merit. Vehicles, carriages and wagons can pass along the rail, and turn in or out at will, without jar or wrenching. It can be crossed at right angles, or at any angle with equal ease and comfort. A coutinuous traffic over it has caused no perceptible wear, and the cars glide over it without oscillation, as smoothly as when first laid.

Our next experience with T rail construction was in a street paved with asphalt, where a half mile was laid in the fall of 1892, and a mile more in the spring of 1893.

While asphalt presented some new problems, the T rail, ties, joint plates, bonding and supplementary wire were the same as on Wabash Avenue, the foundation was improved by making it of concrete, six inches below the ties. This broken stone concrete was also placed between the ties, and up to a point to allow space for four inches of asphalt packed into position.

The asphalt was brought up to and in contact with the rail on the outside for the entire distance of half a mile. On the inside of the rail for the first half mile the vitrified brick used on Wabash Avenue, with corner cut off on a sloping angle, was used to give flange space, and between the two ends of the brick asphalt was used in the regular way. On the last mile the merits of the Haydenville blocks having been brought to our "attention" it was decided to use them both inside and outside of the rail, and while it makes a smoother finish to the rail than the brick or asphalt, our experience proves that these blocks do not have the wearing qualities of the brick. This track and asphalt paving are beautiful in finish, and of unusual strength and smoothness. It is a genuine pleasure for passengers to ride over this track, for there is no motion perceptible except the forward motion.

Our next experience with T rail construction was during the year 1893, in several streets paved with brick. The rail was sixty pound Shanghai, and rail plates, bond wire and supplementary wire were the same as in the street laid in asphalt. The foundation was six inches broken stone concrete below these ties, and about five and a half inches additional concrete between the ties. It also covered slightly the top of the ties. The foundation for this brick track was further improved by

pouring a thin wash of sand and cement over the top of the foundation before placing the sand cushion thereon. This gave the foundation, track, ties and concrete a solid union. The brick paving was laid in a manner similar to that on Main Street. Instead of angle cut brick for flange space Haydenville blocks were placed on the inside of the rails, one and a half inches distance therefrom. The lower part of the space between the Haydenville block and rail was filled with sand concrete, rammed down tight. On top of this an inch of tar was placed. The hollow spaces in the Haydenville Block were filled with sand concrete before placing in position, and the space in the center of the track between blocks was laid with vitrified brick in the regular way. This track is perfect in strength, smoothness and durability. A year's experience with the Haydenville blocks on these business streets show that the glazed upper service wears too rapidly, and their use has been entirely discontinued.

While this track, just described, was in every way superior, I gave further study to where additional improvements could be made, causing the following changes: 1st, to use a heavier rail with wider head; 2d, to substitute metal ties for wood; 3d, to secure greater rigidity and evenness in rail ends; 4th, a firm and permanent hold on the rails without the use of nuts and bolts; 5th, in paving, a better brick and of such shape as would provide better flange room and contact with the web of the rail. These changes brought us to an all steel T rail track.

Rail.—When the Illinois Steel Company, brought out the seventy-two pound Shanghai T rail which was an improvement both in weight, strength and in the width of the head of the rail over sixty Shanghai T of same make it was immediately adopted as the Company's standard and was used in our latest and best T rail track construction. The Shanghai rails of this company's make are so well know that a description is hardly necessary, but as this paper will be read by some who have not seen sections of them, I will give the dimensions of the seventy-two pound rail. The rail is six inches high, the base is five inches wide, the top or head is two and three eighths inches in width. The web from where the turns begin is three and one half inches. The long web permits the rail to rest on the ties and brings the top of rail to proper level for paving with brick, asphalt or granite blocks. In this track the rails are laid broken jointed. The seventy-two pound rail has a wider head which gives better contact, and wider bearing service for the wheels. The edges of the wheels do not nick or chip out as with the lighter rails with narrower heads.

Experience with the narrow head rails demonstrates that by wear an outer flange is formed on the wheel and that this outer flange is very destructive to the life of special work and the wheel. The wider rail head is also better for gravel or macadamized streets as it gives no opportunity for the stones lying adjacent to the rail to nick the outer edge of the tread of the wheel.

Foundation.—The foundation of a track is to a larger degree than any other part responsible for its wearing qualities, and this fact has not been lost sight of in our work. Good rails, ties and joints cannot alone make a track or properly sustain it so as to keep it level and give good wearing qualities; therefore under the all steel track it was determined to place a heavy foundation of the best material. After the necessary excavation the ground was rolled with a heavy fourteen ton steam road roller. Then eight inches of broken stone concrete was placed in position and allowed to set. Then the rails, ties and joints were distributed and connected together and when the track is completed it is brought to the required grade or level by putting blocks under the rails at intervals to bring track to proper grade. Then four inches of broken stone concrete is tamped under the ties and under the rails, after the tamping process is completed the inequalities of the surface are filed with concrete and the whole leveled up with concrete over the top of the ties and pounded to a level surface with a wooden rammer and allowed to set.

Ties.—The ties are steel and double corrugated and heavily coated with tar while hot, and being made, and are two inches high, seven inches wide and seven feet long for straight line work, and were laid fifteen inches between centers. For special work the ties vary in length as the necessities require, up to twenty feet or more. The metal of the tie is one-half inch thick. These ties were manufactured by the Daniels Steel Tie Company, of Youngstown, O. The rails rest on and are fastened to the ties by clamps with off-sets to fit the base of rail. These clamps are secured and adjusted to the top of the tie by special made bolts with oval shoulder and is inserted from bottom of tie with the head below and the nut on top, which permits a powerful box wrench being used to draw the nuts on bolts to a permanent position.

In using these steel ties in connection with the Wheeler rail joint a mechanical difficulty arose, but was overcome in the following way, after some study: The Wheeler joint has a thickness of three inches below the rail base, and in laying track with broken rail joints a straight tie would not answer. At first we thought it would be necessary to use a wooden tie under rail joints, but by devising a special tie, we were able to have them all of metal. The special steel tie for use under joints was adjusted to the necessary levels, by bending it down in the center three inches by an easy off-set. In laying the track these special ties were easily placed in position and gave perfect satisfaction. The clamps and bolts were the same as on straight line work.

Joints.—A great deal of attention was given to the subject of securing a good rail joint for this all steel track, and after examining many devices selected the Wheeler rail joint made at Marion, Ind., as it did away with the bolts and nuts, and embodied the best of all mechanical principles—that of the wedge. These joints at that time had not been made for Shanghai rails or for steel ties, but I overcame these difficulties by designing a new joint to be used with these rails and ties, and secured in this new pattern more bearing surface on the tie, by having the bottom of the joint made to fit the corrugations of the tie. The joint consists of two parts, one of which is keyed on to the other. The larger or heavier part used on the outside of rail has two lugs, that fit in the angle joint holes nearest the ends of rails. After it is placed in position, the lighter part is keyed on with a large maul and it holds the rails rigid. Then the tie is placed under joint and is fastened to it in the regular way, with the exception that the clamps have longer off-sets, the holes in the ties for the bolts are also wider apart, on account of the width of the base of the joint. The joint has corrugations on each side at right angles to the rail, which gives it great strength. The joint is made of the best malleable iron and weighs thirty-two pounds complete.

Bond and Supplementary Wire.—Iron wire, having proved unserviceable and unsatisfactory, the heaviest copper wire was used in connection with this steel track. Double bonds of No. 0000 copper wire were used at each rail joint, one in the upper and one in the lower part of the web of rail. These bonds were soldered and connected to the No. 00 tinned copper supplementary wire, that has been adopted as standard.

Paving.—When the foundation is completed and the track set in it, as just described, nothing remains but the paving to complete the track and street for use. The all steel track was laid on 9th Street, a business street leading from Wabash Avenue or Main Street to the Union Depot, and brick was, therefore, selected for the paving material. This brick pavement was laid as previously described, and needs no further description.

As the use of Haydenville block has been abandoned and the angle, nose-cut brick did not touch the web of the rail, I designed a special shaped brick that has many advantages, combined with the same wearing qualities as the brick on each side of the tracks, as sample pattern of brick which I have with me will give a clear understanding as to its shape.

Drainage.—In the earlier laid track in paved streets, rapid and proper drainage of the tracks was not provided for. The paving was crowned to the center of the track and followed the slope of the streets, but when the lowest point in the street was reached, no provision was made to carry the water quickly to the sewer. In this new track, proper provision is made to get rid of the water from rain, snow and street sprinkling, quickly and effectively. In the center of each track, at the lowest point in the grade of each street, an eight-inch sewer pipe was laid to the sewer. Over the top or opening of this pipe, in the center of the street, is placed a small catch basin surmounted by a special made iron grating. The water flowing down the track and along the side of the rails, is thus rapidly removed and a simple and effective drainage secured.

Injury to track by vehicles and heavy teaming.—On our track, which is standard gauge, four feet eight and a half inches wide, heavily loaded vehicles cannot drive along it and get the benefit of the smooth metallic surface as in the case with girder rails. This condition is a great improvement, and makes a saving in many ways.

First. It saves an immense amount of money in repairing the injury and wrenching to track, and rapid wear and tear thereto caused by vehicles, and particularly heavily loaded wagons turning in and out and driving along the track.

Second. It permits a quicker and more frequent car service—which all street railway men know means time and money by giving the cars a clear track.

These are great advantages and will be best appreciated by the

managers of the lines in large cities. They can also bear testimony to the large savings effected in the wear and tear.

To further prevent heavy teaming along the flange spaces of our track, and at the same time make the wear and tear on the street paving, which we are required to maintain, a minimum, the following ordinance was passed by our City Council, October 4, 1892:

"An Ordinance Regulating Heavy Hauling Over and Through the Improved Streets of the City of Terre Haute.

"Be it ordained by the Common Council of the City of Terre Haute, that it shall be unlawful for any person to drive or cause to be driven or permit his or her servant to drive upon any street or alley paved with wood, stone, brick or asphalt, any wagon or other vehicle having upon it weight which, together with the weight of the wagon or vehicle, shall exceed four thousand pounds (4,000) and less than seven thousand pounds (7,000) unless the tires upon such wagon or vehicle shall be at least three inches in width; nor shall any such wagon or vehicle having upon it a weight which, together with the weight of the wagon or vehicle, shall exceed seven thousand pounds (7,000) be so driven in or upon any such paved street or alley, unless the tires on such wagon or vehicle shall be at least three and one-half inches (3 1-2) in width.

"Section 2. Any person who shall violate any of the provisions of this ordinance shall, upon conviction therefor be fined, and forfeit and pay not less than five dollars ($5.00), nor more than fifty dollars ($50.00).

"Section 3. This ordinance shall take effect and be in full force and effect on and after December 1, 1892."

Before tests were made, the trackway was carefully calibrated as regards time for traveler to go from top to bottom and the intermediate points, resulting in knowing the time to one-hundredth of a second. The tests were conducted across the bus bars of the switchboard of the Camden Horse Railroad Company, Camden, N. J. Average voltage, 515 volts.

Before throwing a fuse in circuit, a water rheostat was set, using a Weston ammeter for this purpose, so that the current desired would flow through the fuse, when the circuit was completed by the traveler on the trackway.

The different size fuse wires were subject to the following limitations: The time of the traveler running full length on the trackway 1.5 seconds; the current ranging from 20 to 130 amperes in ten ampere steps.

The smaller fuse wires would fuse with the minimum current of twenty amperes, and in all instances inside of the 1.5 second limit. Consequently, the curves show a wide range, but in the larger size wires, a greater current was required to fuse the wires in the 1.5 second limitation; consequently, the curves given for the larger fuse wires show less and less range as the fuse wires increase in size.

In order to strike an average, the tests were repeated, under similar conditions as regards current and gauge wire, with a three inch horizontal fuse, a six inch vertical fuse, both of which were connected to a standard form of fuse block, also a four and a half inch fuse, the average in length of the three inch and the six inch, was employed connected in a specially constructed fuse block which absolutely pre-

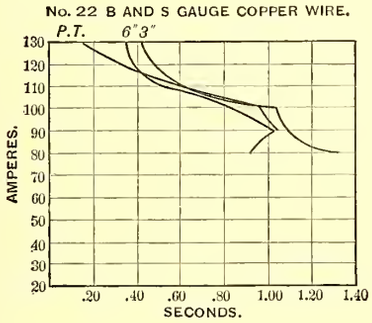


FIG. 1.

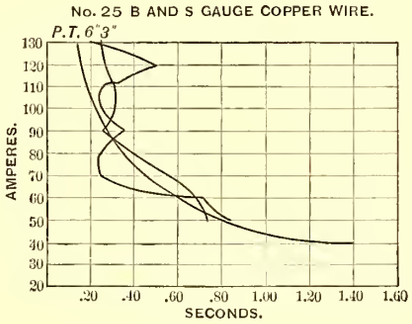


FIG. 2.

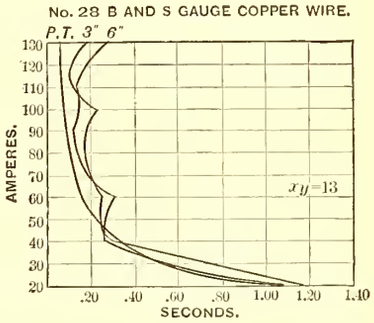


FIG. 3.

In closing this report, gentlemen, I wish to thank you for your attention, and at the same time express the hope that it will prove, as it was intended, a good guide to you in securing that very necessary condition for successful and economical operation—*perfect track*.

Before closing I wish to call your attention to the fact that through the kindness of The Paige Iron Works Company, I am enabled to show you in the Exhibition Hall a sample of our special track work made of seventy-two pound Shanghai steel rail and laid on the Daniels steel ties, as we lay it, also samples of Wheeler rail joints, attached and unattached to rails. Also a crude sample of our brick paving. This sample is not as correctly or as smoothly laid as we lay it in Terre Haute, but as I did not reach Atlanta in time to supervise the laying, it would be unreasonable to expect unskilled hands, without guidance, to lay it as our experienced employes do.

Special Paper on "Destructive Arcing of 500 Volt Fuses."

BY W. E. HARRINGTON.

The destructive effects of the arc accompanying the opening of 500 volt circuits with switches, lightning arresters and fuses, has led the writer to inquire into this phenomenon, particularly in reference to fuse practice. A series of carefully conducted tests were made to find the relation between the fusing currents of different size copper wires, ranging from No. 30 to No. 21, B. & S. gauge, the time required to open the circuit, and to what extent the arc contributed to the time required.

An inclined trackway was constructed, having two copper tracks upon which a traveler, consisting of a block of hard wood having copper plates in contact with the tracks, could run, the circuit from rail to rail of the track being completed through an electro-magnet on top of the traveler. Parallel with, and alongside of, the track was a raised board, on which a paper was attached. An impress was made on paper by a lever on the traveler, when released by electro-magnet, owing to stoppage of current.

vented any arcing of the terminals. In other words, the fusing of the fuse wire could not burn the terminals to which it was attached.

The results with a few of the fuse wires are recorded graphically in the accompanying charts and give, therefore, the time required in fractions of a second for the circuit to be opened under identically similar conditions as regards current and gauge of wire for a three inch, a six inch unprotected and a four and a half inch protected terminal fuse.

The curves as given in chart No. 3 for No. 28 B. & S. copper wire, illustrates excellently the erratic character of the fusing of wires under conditions as observed in the practice of to-day.

The time required to open a protected terminal fuse wire becomes less and less as current increases and grows less regularly, showing that a regular law is followed. The curve is an hyperbola having its asymptotes for its axes, and the equation for it is $xy=13$ for No. 28 copper. Whereas, the two unprotected terminal fuses are uncertain and show in a very pronounced manner wherein the terminals contribute to this end, the conclusion one is forced to draw is that a fuse wire in practice, when it fuses, does not do as it was intended to, open the circuit, but establishes a condition, though the time may be limited, wherein the terminals act as a magazine to furnish the gas through which the circuit is continued. The curves throughout do not show any superiority of the six inch fuse over the three inch. Looking at the results in comparison, as given by the Board of Fire Underwriters, which is attached to this paper, the very point they should have observed, to wit, the continuance of the arc through but a short period of time, at the expense of the terminals, and the possibility of the vicious gas thus generated, coming in contact with other circuits and establishing other and more serious conditions, such as short circuits and possible fires.

Not to be misunderstood, while the tests as are herein recorded show no superiority of the six inch unprotected terminal fuse wire over the three inch unprotected terminal fuse wire, the six inch fuse wire is unquestionably safer when conditions are more extreme, such as, for instance, when a short circuit occurs.

The determining factor in this matter of fuses is: What are the conditions required to protect against absolute short circuits across the bus bars of a large power station, 500 volt switchboard? Tests are

conducted showing how fuses act under conditions that are predetermined, certain currents which are made to flow, etc., but you never see anything published or advice given in this matter of fuses for the condition which really occurs the most frequently, that is, absolute short circuits. The Board of Fire Underwriters' report, herewith attached, give the different length fuse blocks required for 10 amperes, 20, 30, 40, and so on.

Now the requirements and limitations as prescribed in the Board of Fire Underwriters' report are true and perfectly safe when the fuse "blows" under the conditions as outlined in the tests, as made by the committee appointed to make such tests.

But on an absolute short circuit across bus bars, as above stated, a 10 ampere fuse block constructed as specified, will, instead of protecting one when most in need of such protection, burn up in the most vicious way, and will open magnetic cut-outs in a power station requiring currents up to a 1,000 amperes, to open. Understand, the fuse does not itself do this, but the arc established at the expense of the terminals is the immediate and sole cause, and the circuit must be opened elsewhere. As stated, the magnetic cut-outs, above referred to, open the circuit.

This matter of arbitrarily adopting a series of fixed dimensions and connections, under which fuses are to be used, is absurd.

The conclusions one is forced to draw from the above tests and the general literature upon the subject of fuses, are as follows:

First. The proper and only fuse block to be used is one having protected terminals.

Second. That fuse blocks should be furnished so that the terminals would not be burned under conditions approaching an absolute short circuit across the bus bars of a 500 volt power station.

Third. That magnetic cut-outs are immeasurably preferable under all circumstances.

APPENDIX.

REPORT OF UNDERWRITERS' INTERNATIONAL ELECTRIC ASSOCIATION.

The following data give the maximum length between terminals at which arcing occurs, the minimum lengths at which no arcing was observed and the safe lengths on 500-volt circuits for fuses, whose melting points are identical with the various current strengths designated.

Amperes.	Maximum length at which arcing occurred.	Maximum length at which no arc was observed.	Safe lengths.
10	1/4 inch	1/2 inch	1 inch
20	1/2 "	3/4 "	2 "
30	2 "	2 "	2 3/4 "
40	2 "	2 1/4 "	3 3/8 "
50	2 1/4 "	2 1/2 "	3 1/2 "
60	3 "	3 1/4 "	3 3/4 "
70	3 "	3 1/4 "	4 "
80	3 1/4 "	3 1/2 "	4 1/8 "
90	3 1/2 "	3 3/8 "	4 3/8 "
100	3 3/4 "	4 "	4 1/2 "

Special Paper on "The Use of the Booster on Electric Railway Circuits."

By J. H. Vail and S. H. Wynkoop.

The question of investment in copper is one which has always been a bugbear to the street railway manager, and is to-day the most serious problem confronting the operating company, inasmuch as it tends to restrict the extension of long distance lines for serving suburban traffic. Since the cost of copper for a given service increases directly as the square of the distance, the necessary investment becomes prohibitory when the line extends more than three or four miles from the station.

Railway generators and motors are becoming more satisfactory; we are still allowed, in the absence of a conduit system inspiring confidence, to suspend our trolley wires overhead; and in some cities the authorities will look the other way while we string cables as large as hawsers from pole to pole, in pairs, in dozens, and—if poles could be found to stand the strain—probably in scores.

Even then we are not happy. The power house site is usually chosen, so far as circumstances will permit, with reference to convenient coal delivery and the distribution of traffic. In the heart of the city crowded streets render slow speed imperative; in the suburbs, where a clear track invites to rapid transit, the pressure is low—usually abominably so. In fact, the writers have in mind a city not far from the metropolis, where two motor cars are run upon a single car's time; and they have witnessed the *fading out* of the electric headlights as the two cars started out together. The reduced voltage was in this case self-evident; and the net horse power secured to move the cars was *probably less than half the proportionate amount originally generated* in the station. The loss in transmission does not require further demonstration.

Accurate tests show that the commercial efficiency of the street railway motor at normal voltage is 78 per cent., while at two-thirds of the normal it is only fifty-two per cent. We all undoubtedly recognize the fact that the resultant effects of too little copper show up to the non expert traveling public in slow speed and dimming of lamps; but to the railway company the results *are actual losses*—decreased traffic and increased coal bill; which is the direct opposite of what we desire. In other words, instead of aiming at the greatest receipts for the least expenditure, we are actually getting least receipts for greatest expenditure.

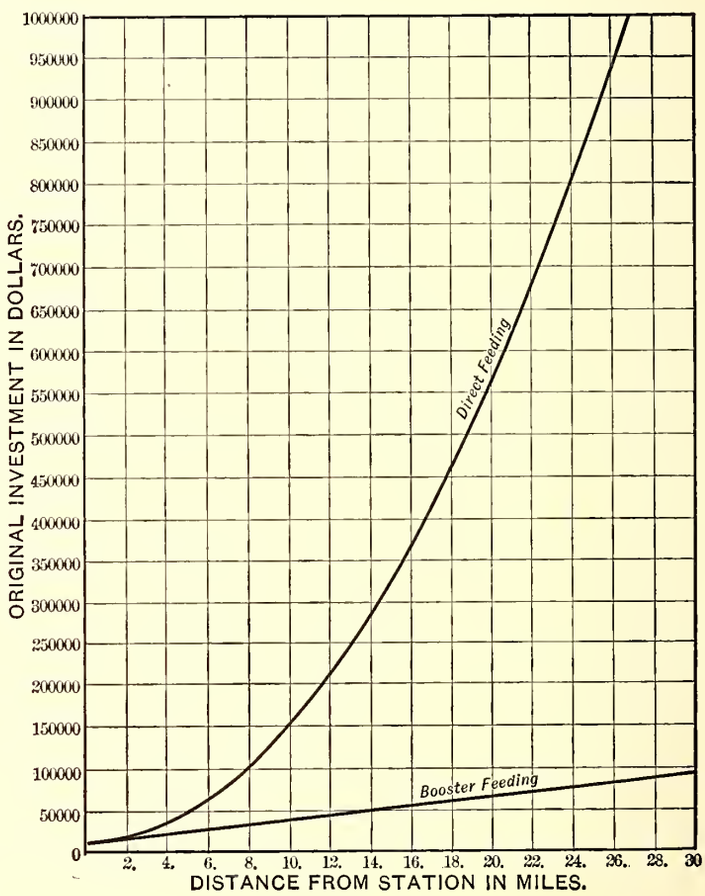


DIAGRAM I.

INITIAL COST OF STEAM AND GENERATING PLANT, COPPER AND SPECIAL APPARATUS FOR DELIVERING 200 AMPERES AT 500 VOLTS.

The usual remedy suggested is: Use more copper. Very good. But if the owners of the road are already groaning under the weight of the copper mine that has been saddled upon them, together with the cash invested therein; if they live in constant fear that they will be forced to place all feed wires in large cities underground, what then?

Leaving out of this discussion improvement in generating station, car equipment and track, we must look for higher economy to the alteration of our methods of electrical distribution, adopting such as will prove, after careful comparison, to be of least first cost, of reasonably high commercial efficiency, of interchangeability on different divisions of the system, and of practically automatic action.

We are in need of a marked advance over present practice in this direction, and must devise some method of distribution that shall give better and more economical service over a large area, and which shall at the same time enable us to reach out from the power station to distances at present inaccessible.

The alternating current system, which has done so much to develop the distribution of electricity for lighting by incandescence, has not yet reached that stage of eminent perfection in motive power service which will warrant us in admitting its value for railway work at the present time.

Another method which might be suggested is one which contemplates the use of motor generators located at intervals along the line and actuated by high tension currents. Such a system must be automatic under all conditions of load and short circuits, working with cool bearings and not requiring careful attendance. This scheme also requires practical development.

The well known booster system, invented by Mr. W. S. Barstow, and applied by him with great success to the feeders of constant potential electric lighting plants covering large areas, is worthy of our careful investigation, as it promises to offer a practical aid to the economic solution of what may be called the medium long distance electric railway problem.

With direct feeding we can overcome the loss in transmitting energy only by incurring the heavy cost of copper as a first investment. With the booster system, we overcome the loss in transmission by incurring the cost of operation of a machine which shall automatically raise the initial voltage above that of the bus bars by an amount which may exactly equal the drop in potential on the feeder at that instant.

When using this machine, we calculate our feeder for ampere capacity only, and constantly maintain the pressure at the service end of the feeder equal to the pressure at the bus bars, irrespective of the length of the feeder or the load.

In any given instance, the cost of a direct feeder increases as the square of the distance, while the cost of the booster feeder is directly proportional to the number of miles. These characteristics of the latter system result in a reduction of first cost of from 25 to 75 per cent., as compared with the first cost of the ordinary direct feeding methods of our present practice; and it thereby becomes possible for numerous electric street railway companies to extend their lines into suburban localities, from ten to twenty miles distant from the power station, at the same time retaining the investment within reasonable limits.

In order to present these in a manner easily comprehensible, we can readily establish equations for the two systems to be compared; and then, by assuming certain accepted values, plot the results. Let

C_1 = Current delivered to trolley wire.
V = Voltage at generator.
V_1 = Voltage at trolley wire.
V_2 = Voltage of booster.
Eg = Efficiency of generating apparatus.
Eb = Efficiency of booster.
E' = Operating expenses for direct feeding—coal, oil, water, waste, engineers, firemen, and interest on so much of the steam generating and transmission plant as is due to the feeder under consideration.
E'' = Operating expenses for booster feeding—details as before.
M = Length of feeder in miles.
m = Circular millage of feeder.
\$ = Initial cost of as much of the steam generating and transmission plant, as is due to the feeder under consideration.
I = Per cent. interest on investment.
D = Per cent. depreciation on investment.
s = Cost of steam plant per H. P.
g = Cost of generating plant per K. W.
b = Cost of booster per K. W. output.
k = Cost of insulated wire per pound.
p = Cost of placing 544 ft. No. 0000 wire, including insulators, pins, cross arms, sundry hardware and labor—5 per cent. allowance for sag.
z = Cost of supplying one horse power per year, in quanties of over 100 H. P.

Then for direct feeding

$$\$ = \frac{\frac{C_1 V_1}{746} + \frac{C_1 (V-V_1)}{746}}{Eg} s + \left\{ \frac{C_1 V_1}{1000} + \frac{C_1 (V-V_1)}{1000} \right\} g + \frac{2315.488\ M^2\ C_1}{V-V_1} k + \frac{.5664\ M^2\ C_1}{V-V_1} p \qquad (I.)$$

And for booster feeding

$$\$ = \frac{\frac{C_1 V_1}{746} + \frac{C_1 (V-V_1)}{746} + \frac{\frac{C_1 V_2}{746}}{Eb}}{Eg} s + \left\{ \frac{C_1 V_1}{1000} + \frac{C_1 (V-V_1)}{1000} + \frac{\frac{C_1 V_2}{1000}}{Eb} \right\} g + \frac{C_1 V_2}{1000} b + .019318\ m\ M\ k + \frac{m\ M}{211600} p \qquad (II.)$$

Substitute the following values in Eq. I.:

C = 200
V = 500
V = 550
S = 45
Eg = .95
g = 25
K = .13
p = 75

We have

$$\$ = 9735 + 1374\ M^2 \qquad (III.)$$

Substitute the same values in Eq. II assuming 211600 as the value of m, taking Eb—.90, and finding an expression for V2 in terms of M, we get

$$\$ = 8732 + 2857\ M \qquad (IV.)$$

In order to graphically represent the relation between initial investments in the two methods of feeding under discussion, Eq. I. and II. have been solved for varying values of M from 1 to 30, and the results plotted on Diagram I. An inspection of this diagram shows at once the immense superiority of the booster system over the direct feeding in cases where the first cost is the essential feature. It will be noted that the curves have been carried out for the entire thirty miles,

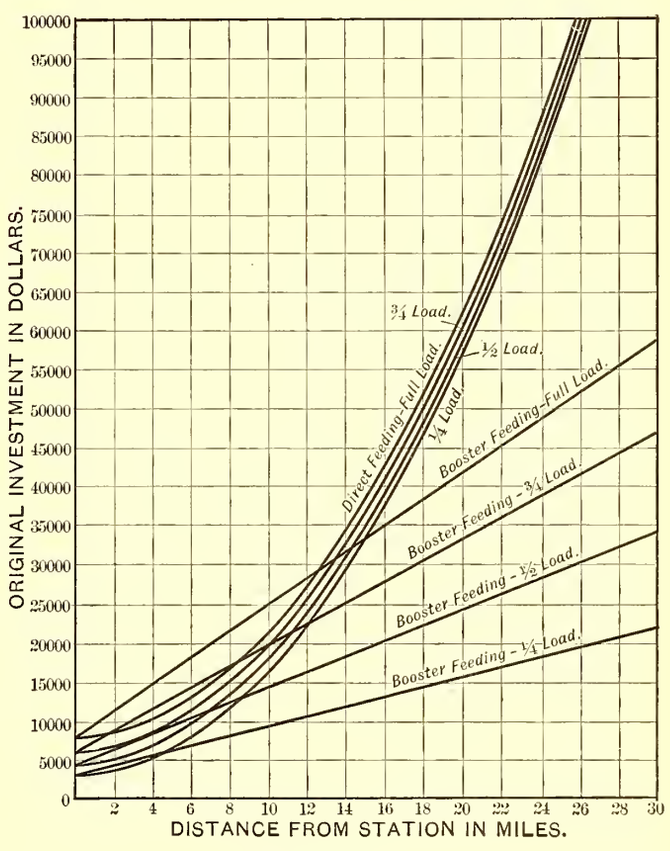


DIAGRAM II.

OPERATING EXPENSES OF PLANT DELIVERING 200 AMPERES AT 500 VOLTS, INCLUDING COAL, OIL, WASTE, WATER, LABOR; AND INTEREST AND DEPRECIATION ON THE INVESTMENT.

without regard to the practical voltage limit in direct current machines, or the point at which the cost of operating an independent station becomes less than operating from the main station.

Diagram I. shows that for distances greater than one and one half miles it will cost less to instal a booster system than to place copper and machinery in the usual manner for feeding direct. In cases where the motive power is water, costing little or nothing per horse power, these curves give at once the relative economy of the two methods; but ordinarily on the account of the consumption of coal, the loss in the line (represented in the new method by the power required to

operate the booster) becomes an important factor in the discussion; and it is necessary to establish equations for the operating expenses, taking into account the fixed charges of interest and depreciations on the investment, as well as the cost of furnishing the required power.

The following equations will enable us to determine these values for different distances:

Direct feeding:

$$E' = \frac{\frac{C_1 V_1}{746} + \frac{C_1 (V - V_1)}{746}}{Eg} z + \$ (I + D) \qquad (V.)$$

$$E'' = \frac{\frac{C_1 V_1}{746} + \frac{C_1 (V - V_1)}{746} + \frac{\frac{C_1 V_2}{746}}{Eb}}{Eg} z + \$ (I + D) \qquad (VI.)$$

Making the same substitutions in Eq. V and VI as were made in I and II, placing $(I + D) = .10$, and remembering that $ varies according to the method and distance under discussion, we get

$$E' = 155\, z + \frac{\$}{10} \qquad (VII.)$$

$$E'' = (139 + 36\, M)\, z + \frac{\$}{10} \qquad (VIII.)$$

Diagram II. represents these equations plotted for varying values of M, being taken at 40.

The intersection of the upper curve with the upper straight line is the point at which the booster system costs as much to operate as does the direct system. This distance we find to be twelve and one-half miles. For shorter distances, direct feeding is more economical, while for longer distances the booster system has an absolute advantage. Now, the assumption upon which Eq. V. and VI. were solved, is a feeder constantly loaded to its maximum capacity. The absurdity of this assumption is apparent when one considers the actual conditions which obtain in railway work; the average load on the feeder during the entire year will be more nearly one-third or one-quarter of the maximum. We have therefore established and plotted equations similar to V. and VI., for ¾, ½ and ¼ load, and the resultant curves are shown on Diagram II., in order to afford ready means of comparison.

A careful study of these diagrams demonstrates in what the economy of the booster system consists. While the method we have outlined may seem like robbing Peter to pay Paul, it must be remembered that in direct feeding there is a large amount of capital invested in the pole line, accruing interest day and night, in storm and sunshine, irrespective of the traffic on the line; while with booster feeding, the interest on copper investment is nominal, the power required to drive the booster itself being proportional to the load on the line. Thus we can readily understand why, under the conditions given, with an average load of one-quarter the maximum, the booster system is absolutely more economical than the direct feeding system for distances over four and one-half miles.

The equations here laid down will serve to answer any questions that may arise as to relative first cost or operating expense. It has been impossible to represent results derived under varying conditions without multiplying the diagrams indefinitely. All calculations have been based upon the most recent methods of rail bonding and track feeding; and the assumption that the resistance of the return circuit is equal to that of the outgoing circuit is therefore perfectly safe.

It may occur to some that the installation of a special high voltage generator to supply the feeder in question would be a simpler method of reducing the copper; but a cognizance of the enormous variations in drop under extreme changes in load, on a long feeder calculated for ampere capacity only, leads at once to the discarding of such a scheme until such time as manufacturers can furnish efficient generators over-compounded from 50 to 150 per cent.

The adaptability of the booster to railway work of all kinds is wonderful. A few specific instances are noted, in the confident belief that the suggestions thus thrown out will impel each and every electric railway manager to personally investigate this system, with a view to ascertaining exactly how far it would prove of advantage when applied to his particular road.

Ordinarily in calculating copper for distribution, we are obliged to allow for special features influencing traffic, such as ball grounds, race tracks, picnic groves, etc. As there is seldom any necessity for bunching cars at all these points simultaneously, and as the various features are usually scattered, it follows that at all times one or more of the feeders is lying comparatively idle. Under the plan suggested, the copper is figured for average conditions, and a booster, placed in the station, is arranged to be thrown immedately upon any feeder which may become burdened with an excessive load.

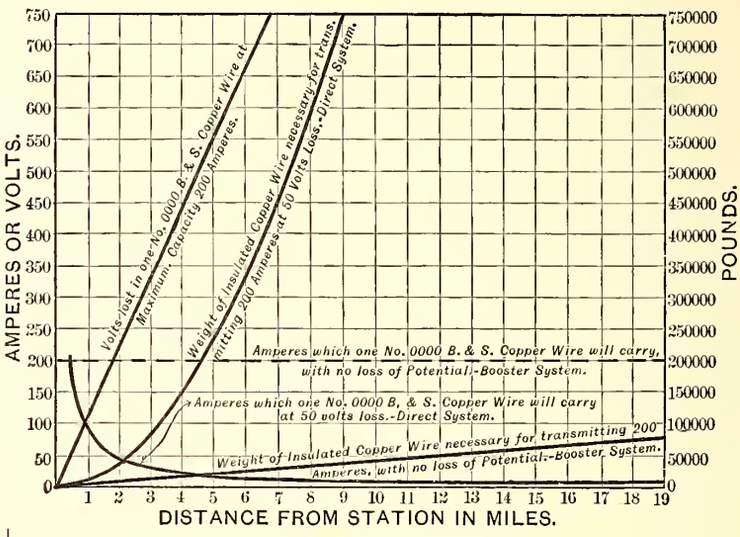


DIAGRAM III.

COMPARISON BETWEEN DIRECT AND BOOSTER FEEDING FOR RAILWAYS. RESISTANCE OF RETURN CIRCUIT (RAILS) = RESISTANCE OF FEEDER. ALLOWANCE FOR WEIGHT OF INSULATION = 15%. ALLOWANCE FOR SAG = 5%. SHOWING THE INVESTMENT SAVED IN WEIGHT OF COPPER BY MEANS OF THE BOOSTER SYSTEM.

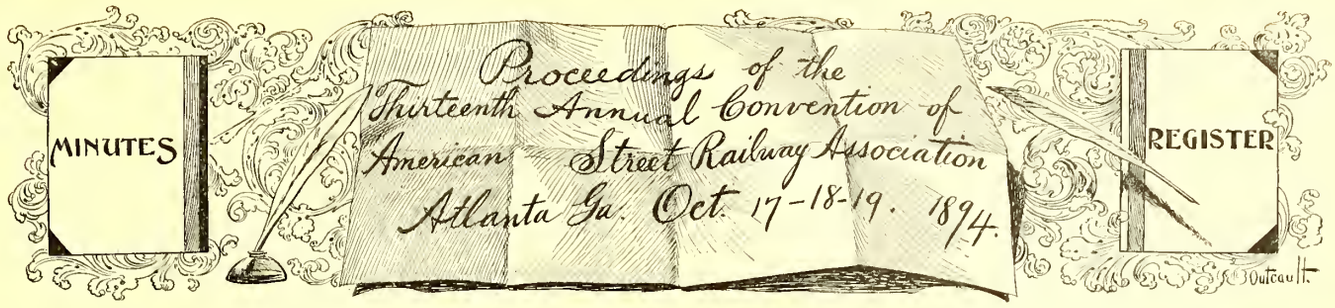
Another feature of this system, which makes for economy, becomes prominent on long suburban lines forced to run an infrequent schedule late at night. On such a road the booster may be shut down and cut out of circuit entirely when the load on the long distance feeder drops to, say, one-quarter of the maximum, depending upon the amount of copper in the line.

If this suburban line extends to a park or pavilion which is open only during the summer months, the advantage of the booster over direct feeding is enormous, since the investment on a booster lying idle is a small fractional part of the interest on the idle copper of a direct feeder.

On many roads already in operation the copper in the line has proven entirely insufficient, and the erection of additional feeders is contemplated. Would it not be worth while to consider the installation of a booster at one-tenth the cost of the extra copper, provided calculations showed the economy of operating the two systems to be equal?

In the progress of electric railways, as in the growth of cities, development frequently fails to follow the lines predicted for it. It therefore, happens that many a road to-day is worrying along, the victim of misplaced judgment—and copper. In many instances the adoption of a booster and a redistribution of the present copper, will remedy the evil in the most economical manner.

In large cities such as Boston, Brooklyn and Philadelphia the tons of copper could in this way be largely reduced, with a gain at the same time in uniformity of pressure.



The Thirteenth Annual Meeting of the American Street Railway Association was held in Machinery Hall, Piedmont Park, Atlanta, Ga., Oct. 17–19, 1894.

President Henry C. Payne, of Milwaukee, Wis., called the meeting to order and introduced Hon. W J. Northen, Governor of Georgia, who said :

"*Mr. President and Gentlemen of the Convention.*—Just before I retired last night, I was caught over the telephone by the president of the Atlanta Street Railway, who requested me to meet you at this hour and speak some words of welcome for the state to the officers and members of this Convention. I attempted to excuse myself by saying that much important business in my office demanded my attention, and I could not spare the time. He replied that no business in my office could be more important to this state than the organization you represent and I must lay aside all business and come. I reminded him that I had only ten more days of service and I could not do less than utilize every moment if I cleared my table for the incoming of my successor. He replied that the state could wait in its minor interests while it gave due consideration to the higher claims of this Convention upon its general interests and future development. It did not avail with him that I had already anticipated his interest and written you words of welcome, now being circulated through the Convention. He insisted that I must give personal recognition of your presence and your work.

I am here, therefore, more, it would seem, by the command than the invitation of the president of the Atlanta Street Railway Company to bid you welcome to the state and to the South. The people of Atlanta have learned that when Joel Hurt touches the button " we must do the rest." (Applause.)

Now that I am here, Mr. President, speaking for my state and my section, I give you glad greeting. I apprehend that many of you have never before visited the state and possibly not the South. We are glad to have you here, that you may know for yourselves the attractive advantages of the South.

This ideal, balmy day is fully representative of our delightful, health giving climate. Many of you, I dare say, expected to find us living in the tropics It may surprise you to know that the hottest day I have experienced in five years, I found last June in Toronto, Can., and the next highest temperature, last August in Nebraska. I had the honor, upon that last occasion, to make an address to a large assemblage of people, with the thermometer 107 degs. on the outside, and 205 degs. under my vest, when the temperature for my estate, on that day, was only 90 degs. In colder climates than ours, this is nature's compensation for the growth and development of crops. The heat, in short summers, must be intensified; whereas, with us it is greatly diminished because of greater length of time for utilization.

We are glad to have you, personally, know about the variety, abundance and richness of our agricultural products, our mineral, timber and industrial resources.

We give you especial welcome upon these special grounds so that, impressed, as you will necessarily be, by the preparations in progress for the coming Cotton States & International Exposition, you will not only advertise abroad its possibilities and its attractions, but you will return next year and bring with you your friends to look upon its splendid magnificence and share the benefits to come from its exhibits.

We receive you gladly into our state because we want you to know our people better—warm hearted, hospitable, genial, cultured, progressive and true, the equals of any among the civilized nations of the earth.

Again, we are glad to have you visit us that you may know the financial and business conditions of the South. Did you know that, during the recent financial distress that came upon our common country, we had fewer bank and business failures at the South than in any other section of the Union? Did you know that the South owes less money than any other division of states? The average land mortgage indebtedness for fourteen states at the South is only $33,000,000, while the same indebtedness for fourteen states at the North amounts to $334,000,000. The average annual interest for these states at the South on this mortgage indebtedness is $2,600,000; for the corresponding states at the North is $21,900,000. The average per capita of this indebtedness for the South is $25, while for the North it is $129. I do not desire to make odious comparisons, but it is due us of the South to say that the State of Kansas has under mortgage 26,000,000 acres of land—more than the five Southern states counted together, Alabama, Arkansas, Georgia, Kentucky and North Carolina.

Knowing these conditions, we are glad to have you visit our section, with a view to the further development of your interests at the South. Electric street railways have made wonderful progress in this section. We now have at the South 1,611 miles completed and projected, calling for an investment of $71,080,000 to equip them. This has all been done, too, within the last six years.

We welcome you because you are an organization of thorough business men, come to consider the business conditions about you for the advancement of the common good.

More than all, we give you greeting because we believe you to be the strongest factor for the advancement of the business interest and the civilization of the times that has given spirit to our progress for the last quarter of a century.

Standing, then, in this distinguished presence, in view of the conditions you find here, and the intelligence and purposes you bring with you, speaking for Georgia and the entire South, I give you most cordial greeting and glad welcome to our state and among our people. (Prolonged applause.)

President Payne responded to the governor's greeting as follows:

Speaking for myself, and feeling that I voice the sentiments of every member of the Association, I beg to return cordial thanks to the Governor of Georgia for the hospitable manner in which he has welcomed us to this fair city of the South.

I am sure that we shall all carry away with us warmest feelings of friendliness for the city of Atlanta. We have all anticipated our visit to this city with genuine pleasure, and I am sure that we will look back upon our Convention here as one of the most pleasant we have ever held or could ever hope to hold. Atlanta is a proverbially hospitable city. We already feel the generous greeting in every handshake. We are glad to be here.

The street railway business is so closely identified with the best interests of every city, that it is no wonder that a body like this is made to feel at home in the active, thriving cities of the land. Once more I voice the sentiments of every man here, and return thanks to the Governor of Georgia for his friendly greeting here to-day. (Applause.)

Letters of regret at their inability to be present were read from past presidents, Chas. B. Holmes, and Henry M. Watson.

The first order of business was the reading of the minutes, and on motion they were approved as printed.

The president read his address as follows.

Address of the President.

Gentlemen of the Association:—For your partiality in electing me to the office of president of the Association, I desire to return my most heartfelt thanks.

It is hardly necessary for me to say that, since our last meeting, the street railway business has suffered, in common with all other enterprises, owing to the financial stringency and business depression which has prevailed in all parts of the country. These conditions, however, have not been without lasting benefit to the interests which we represent; I think we have all studied more thoroughly to bring about economies in operation, to limit the construction of new lines into unproductive territory, and in every way to bring our business to a more healthy basis; so that, from that point of view, there is compensation for the depression through which we have passed. I presume it is the common experience of all that we are on the up grade, and I confidently anticipate a slow, but gradual, return to normal business conditions. The resources and characteristics of the American people are such that they cannot long continue in a state of either mental or financial depression.

During the transition period from animal to electric power on the tramways of our country, it was but natural that the proceedings of the annual meetings of the Association should be largely taken up with the consideration of the application of electricity to transportation purposes Now that we may fairly consider such application as an accomplished fact, I think our attention should to a greater degree be turned to a

comparison of views regarding the practical operation of our several roads. The substitution of electricity for animal power has elevated the business to a higher plane. Street railways have become as essential to the prosperity of our metropolitan cities as the steam railways to the country at large.

Having had practical experience in the management of both these methods of transportation, I can fairly say that the duties of the manager of a street railway equipped for rapid transit are more vexatious than and require quite as much ability, intelligence and application as those of one in charge of a steam railway. The steam railway manager makes his time tables, publishes them, and the people are expected to, and do suit their convenience to the same. Not so with us. We are expected to make our time tables to conform to the convenience of each individual separate passenger who desires to be transported, and a car is expected to be at each and every corner at the identical moment when the passenger is ready to be carried.

Again, the steam railway manager has to encounter legislatures and legislation but once in two years, or at the most once in each year, and that during a short period in the winter only; while the life of the street railway manager is made unhappy, to say the least, by the legislative bodies in cities, which are practically in continuous session.

The American capitalist is quick to discover promising fields for the investment of capital, and I think it is sate to say that never in the history of our country has there been a more rapid development than has come from the application of electricity to transportation purposes. In the anxiety to secure franchises and to reconstruct street railways, very excessive valuations have been placed upon, and paid for the right to operate by electricity in our large cities. This has led the representatives of the people to believe that there is a present value attached to franchises far beyond that which the facts will sustain. Consequently, these conditions have led to a fruitful field for the legislator, as well as for the assessor, from whose tender solicitude for the welfare of the people, the street railways, whose prosperity contributes so much to the general good, have suffered. The interest, as well as the inclination of most managers tends toward giving as liberal and good a service to the public as the patronage will justify.

Transfers and to what extent they should be granted, commutation and its effect upon earnings, and the relative earnings of cars operated on long and short headway. furnish fruitful topics for discussion and comparison of views, These, and many other practical subjects which will occur to you, I think should receive our attention, and I believe their consideration will be not only of great interest, but of material advantage to us all.

Your Executive Committee have set apart one morning for executive session, at which time I trust we shall have full and free exchange of views bearing upon matters to which I have referred, and many others affecting the practical operation of our roads.

The question of insurance has become a perplexing one. In many instances the larger systems find it very difficult to obtain insurance in sufficient amounts to cover their risks, and I think the common experience is that rates have increased to such an extent as to be so burdensome as to justify us in considering the propriety of organizing a mutual insurance association.

I cannot close without referring to the great loss which we have suffered from the removal by death since our last meeting of two of our most prominent and active members.

Mr. William Richardson, of Brooklyn, N. Y., had been identified with the Association since its organization. All will recall the great interest which he took in our deliberations, and I am sure that we all feel a sense of personal sorrow that we shall no more have his wise counsel. His life's work, so far as business activities were concerned, was completed, and he was looking forward to that quiet and peaceful ending of his days to which a long and active life had entitled him.

Mr. William J. Stephenson, of Washington, D. C., first vice-president of the Association, was, to my mind, an almost perfect type of an aggressive, forcible, intelligent business man. He had been for a considerable time engaged in maturing plans for the introduction of the underground trolley system upon his road. To this end he had succeeded in obtaining the necessary legislation from Congress, and his plans were very far matured toward the actual commencement of the work of reconstruction. We cannot but regret that he has not lived to consummate the plans which he had so ably matured. Mr. Stephenson was looking forward with the greatest interest to this meeting, and I am sure that I reflect the sentiment of every member in expressing my sorrow and regret at his untimely taking off.

The report of the Executive Committee was read as follows:

Report of the Executive Committee.

Atlanta, Ga., October 17, 1894.

To the American Street Railway Association:

Gentlemen.—Your Executive Committee respectfully submits the following report:

MEMBERSHIP.

The hard times affect the street railway business as surely as they do any other. The fare is so small—only a nickel—that one of the unthinking public is surprised when he learns for the first time that business depression affects the receipts of a street railway company The fact is, there is no more accurate test or measure of the state of the business of the country than the varying income of a street railway company, showing with absolute accuracy the state of business activity or depression in the community. Business in general during the last year has been bad, and the street railway business in particular has suffered, several of the member companies having gone into receivers' hands, while consolidation still continues to be the trend of the times.

While the year has been a hard one, the business outlook is encouraging, and we look forward with confidence to a successful year's business.

At the opening of the meeting in the City of Milwaukee, there were 197 member companies.

At that meeting, and during the year, the following companies have joined:

Camden, N. J.—Camden, Gloucester & Woodbury Railway Co.
Charleston, S. C.—Enterprise Railroad Co.
Columbia, S. C.—Columbia Elec. St. Ry., Light & Power Co.
Helena, Mont.—Helena Rapid Transit Railroad.
Macon, Ga.—Macon & Indian Spring Electric Street Railway Co.
Mobile, Ala.—Mobile Electric Light & Railway Co.
Nashville, Tenn.—Nashville Traction Co.
New Britain, Conn.—Central Railway & Electric Co.
Newburgh, N. Y.—Newburgh Electric Railway Co.
New Orleans, La.—New Orleans Traction Co., Limited.
Paterson, N. J.—Paterson, Passaic & Rutherford Electric Railway Co.
Poughkeepsie, N. Y.—Poughkeepsie City & Wappinger's Falls Electric Railway Co.
Rockland, Me.—Rockland, Thomaston & Camden St. Railroad Co.
Tampa, Fla.—Tampa Electric Light & Street Railroad Co.

The following changes in the names of members have taken place:

Brooklyn, N. Y.—Brooklyn, Queens County & Suburban Railroad Co., in place of Broadway Railroad Co.
Carbondale, Pa.—Lackawanna Valley Rapid Transit Co., in place of Carbondale Traction Co.
Kansas City, Mo.—Kansas City Cable Railway Co., Consolidated, in place of Kansas City Cable Railway Co.
Nashville, Tenn.—Nashville St. Ry., in place of United Electric Ry.
New York, N. Y.—Metropolitan Street Railway Co., in place of Houston, West Street & Pavonia Ferry Railroad Co.
Norwalk, Conn.—Norwalk Street Railway Co., in place of Norwalk Horse Railroad Co.
Washington, D. C.—Belt Railway Co., in place of Capitol, North O Street & South Washington Railway Co.

The following changes of names of companies, by substitution and consolidation, the new companies succeding the old, having taken place:

Jersey City, N. J.—Consolidated Traction Co., in place of the Jersey City & Bergen Railroad Co , and the New Jersey Traction Co., of Newark, N. J.
Lawrence, Mass.—Lowell, Lawrence & Haverhill Street Railway Co., in place of Haverhill & Groveland Street Railway Co., and Merrimack Valley Street Railway Co., of Lawrence, Mass.
San Francisco, Cal.—Market Street Railway Co., in place of City Railroad Co., and Ferries & Cliff House Railway Co.
St. Louis, Mo.—Union Depot Railroad Co., in place of the Benton-Bellefontaine Railway Co.

The following companies have withdrawn ; several of them having gone into the hands of receivers, or leased to other companies, and nearly all of them being very weak financially :

Alexandria, Va.—Washington, Alexandria & Mt. Vernon Railway Co.
Amsterdam, N. Y.—Amsterdam Street Railway Co.
Birmingham, Conn.—Derby Street Railway Co.
Cincinnati, O.—Mt. Auburn Cable Railway Co.
Dover, N. H.—Consolidated Light & Power Co,
Erie, N. Y.—Erie Electric Motor Co.
Findlay, O.—Findlay Street Railway Co.
Lancaster, Pa.—Lancaster Street Railway Co.
Lyons, Ia.—Clinton & Lyons Horse Railroad Co.
Nashua, N. H.—Nashua Street Railway Co.
New York, N. Y.—North & East River Railroad Co.
Peoria, Ill.—Fort Clark Horse Railway Co.
Raleigh, N. C.—Raleigh Street Railway Co.
Yonkers, N. Y.—Yonkers Railroad Co.

As a result of the foregoing changes, the membership now numbers 187 companies.

Your Executive Committee held a meeting in Atlanta, January 24, 1894, and the minutes tell their own story, as follows :

MINUTES OF SPECIAL MEETING OF THE EXECUTIVE COMMITTEE:

Minutes of special meeting of the Executive Committee, held in room 108 of the Kimball House, Atlanta, Ga., Wednesday, January 24, 1894, at 3 o'clock, P. M. There were present the president, Mr. Henry C. Payne, and Messrs. William J. Stephenson, Lewis Perrine, Jr., Thomas H. McLean, W. Y. Soper, E. S. Goodrich and the secretary, Mr. W. J. Richardson. Letters from Messrs. D. F. Longstreet, James R. Chapman and Edward Whittaker were read, stating their inability to be present, and regretting their absence.

The minutes of the special meeting, held October 20, 1895, were read and approved.

The secretary announced the fact that the special report, which was to have been presented at the Milwaukee meeting on "A Standard Form of Street Railway Accounts," would be prepared by H. I. Bettis, of Atlanta. Letters in reply to a circular letter sent December 1, 1893, to all the member companies requesting suggestions as to subjects on which reports might be prepared, were read.

On motion of Mr. Stephenson the following subject was selected: " The Best Method of Treating Accidents and Complaints."

On motion of Mr. Perrine the following subject was chosen: "Street Car Wheels and Axles."

On motion of Mr. Stephenson it was decided that a discussion should be had on the subject: "Transfers and Commutations," and that C. K. Durbin, general superintendent of the Denver Tramway Company, be requested to open the discussion.

The secretary announced that a special paper would be presented by M. F. Burke, superintendent of the Terre Haute Street Railway Company, on the following subject: "The T Rail Construction of the Terre Haute Street Railway Company."

At the suggestion by letter of John B. McClary, seperintendent of the Birmingham Railway & Electric Company, Mr. Perrine moved that Thursday morning, October 18, be set apart for an executive session of the Association, and that delegates be requested to come prepared to discuss freely and without reserve any subject relative to the operation or conduct of the street railway business in general, and of their own roads in particular. Carried.

Mr. Stephenson moved that committees be requested to prepare papers that will not take more than twenty minutes to read. Carried.

The question of the employment of a statistical secretary was considered. On motion, the further consideration of the question was postponed until after the next meeting of the Association.

Mr. Perrine introduced the subject of 'Street Railway Mutual Fire Insurance." On motion of Mr. Stephenson, the subject of "Street Railway Fire Insurance" was referred to a special committee, consisting of Mr. Perrine and the secretary, to report at the next meeting of the Association.

The subject of a "A Street Railway Institute" was considered. It was the judgment of the Committee that in consideration of the financial condition of the country, the subject be laid on the table.

On motion of Mr. Stephenson, the "Aragon," was selected as the headquarters of the Association.

It was moved that if suitable and proper arrangements can be made, that Machinery Hall, on the Exposition Grounds be selected for the place of meeting, and the exposition of street railway supplies. Carried

The president stated that representatives of the street railway and traction companies, of Chattanooga, Tenn., were desirous of having those in attendance at the Atlanta Convention, including ladies, visit Chattanooga on Friday, October 19; and that Lookout Inn, on Lookout Mountain, with 400 rooms, would be kept open until after the Convention, in order to accommodate the Association.

It was the judgment of the Executive and the Local Committees that the invitation of our Chattanooga friends should be accepted, and that the Association set apart Friday for the visit. On motion, adjourned.

SPECIAL REPORTS AND PAPERS.

The special reports and papers that have been prepared cover a wide range of subjects, and express the latest thought and practice in the business.

EXPOSITION.

The exposition of street railway supplies will be found of unusual interest, the products there displayed being the latest expression as to the needs of a street railway, especially if the motive power be electricity.

STREET RAILWAY LAW.

Judicial decisions and opinions have been issued during the year, and constitute parts of volumes X and XI of "Street Railway Law," as follows:

1893.

November—George Rouser *vs.* North Park Street Railway Co.
December—W. L. Allen *vs.* Birmingham Railway & Electric Co.

1894.

January—John C. Bleil *vs.* Detroit Street Railway Co.
February—George A. Jennings *vs.* Tacoma Railway & Motor Co.
March—Otto J. Lang *vs.* Houston, West Street & Pavonia Ferry Railroad Co.
April—Catherine King *vs.* Second Avenue Railroad Co.
May—James E. Johnson, *et. al.*, *vs.* Reading City Passenger Railroad Co.
June—James E. Morgan *vs.* Jersey City & Bergen Railroad Co.
July—Mary Flanagan *vs.* People's Passenger Railway Co.
August—Lena T. Cleveland *vs.* Bangor Street Railway Co.
September—State of Minnesota *vs.* Frank S. Hoskins and Dow S. Smith.
October—Youngstown Street Railway Co. *vs.* Elmer Haverstick and 115 others.

AMERICAN STREET RAILWAY DECISIONS.

The second volume of the work started some years since, entitled "American Street Railway Decisions," has been printed, and is now in the binder's hands, and will be issued to subscribers during November.

The editors have copy in hand to push the work to a speedy conclusion, and they promise to bring the matter down to date as rapidly as possible, consistent with accuracy. Companies that have not already subscribed for the work are reminded to send in their subscriptions. The price is $5 a volume, net, delivered.

PROPOSED AMENDMENTS.

Two proposed amendments, one to the Constitution, the other to the By-Laws, are herewith submitted, and, though it would not be binding in any sense, we should be pleased if a vote were taken at this meeting, without debate, that we might ascertain whether the judgment of the Association is in accord with that of your Committee on both subjects.

The proposed amendment to the Constitution is to provide for the admission of individuals, and companies, not street railways, as associate members, under certain conditions; such character of membership having been found conducive to the general welfare of kindred associations.

The proposed amendment to the By-Laws has in view morning sessions only; providing for less exhaustive meetings; for more opportunity for social enjoyment, as well as for opportunity to examine the display at the Exposition, which has become so important a feature of our annual meetings.

CONSTITUTION.

Members.

Article III. of the Constitution shall be amended, so as to read as follows:

Section I. There shall be two classes of members—active and associate.

Section II. Active members shall be American street railway companies, or lessees, or individual owners of street railways; and each member shall be entitled to one vote by a delegation presenting proper credentials.

Section III. Associate members shall be individuals or firms, or companies not embraced in section II., who shall have been recommended by an active member. Associate members shall not be entitled to vote.

BY-LAWS.

Article VII. shall be amended by the substitution of the word "Tuesday" for "Wednesday," and by the addition of the following words to the first sentence, namely; "and shall continue four days."

THE TECHNICAL PRESS.

It is with unfeigned pride that we regard the journals devoted to the street railway business. We desire as a committee, to acknowledge the services of their owners to this Association, in their earnest endeavors to increase the membership; and hereby express our appreciation of their efforts to make their publications the peers of any other trade papers in the land. The souvenir editions for fine character of typography, high grade of illustrations and thoughtful care in composition evidence the desire of their proprietors to set the best that is procurable before their readers. We heartily wish them all possible success in their earnest endeavors to excel. While we do not desire to make any particular distinction in our reference to the technical papers, we feel called upon to express our thanks to Mr. C. B Fairchild, editor of the STREET RAILWAY JOURNAL, for his personal efforts in the interest of the Association, in his contact with the street railway men of the country, and for the benefit conferred upon the fraternity in the production of the book entitled "Street Railways."

OBITUARY.

William Richardson departed this life December 31, 1893, in the seventy-first year of his age. He was for many years the president of the Atlantic Avenue Railroad Company of Brooklyn, from which position he retired the early part of last year. He began his street railway experience with the Dry Dock, East Broadway & Battery Railroad Company of New York, and was acting president of that company at the time of his death. He was a regular attendant at the annual meetings of this Association, and always took a lively interest in its welfare. He was an ideal companion in his home, of the strictest integrity in business, of untiring energy, and high ambition to excel in all he undertook to do, and withal a sincere friend. We shall miss his inspiring presence.

John H. Dalzell died May 29, 1894. He was the president of the Pittsburgh, Allegheny & Manchester Traction Company, and a man of large influence in the community in which he lived. He was blessed with exceptional foresight; and determining early to make a success in life, he succeeded by his indomitable pluck, energy and earnest purpose in attaining a position of large prominence. His loss is mourned by a large circle of friends.

Allen Tindolph died July 27, 1894, aged fifty-two years. He was president of the Vincennes Street Railway Company, and was prominent in other business enterprises in the place where he lived. He was a man who stood very high in the esteem of his fellow citizens, by reason of his sterling qualities of character. He was a Christian gentleman, a public spirited citizen, and a model in his home life.

For the first time in the history of the Association, an officer has died during his incumbency. William J. Stephenson left the sphere of his earthly activities on August 31, 1894. He was president of the Metropolitan Railroad Company, of Washington, having been previously connected with the Columbia Railway Company of the same city in a like capacity.

He was energetic, enterprising, in short a typical progressive American. Always enjoying the best of health, with ruddy, clear complexion, of commanding appearance, having convictions and the courage of them, a ready speaker, always with something to say, reinforced with deep interest in this Association. His was a familiar figure and voice at the annual meetings.

We shall sadly miss our friends and companions.

Respectfully submitted,

EXECUTIVE COMMITTEE.

On motion of Mr. Littell, the report was received.

The report of the treasurer was presented and showed the financial transactions of the year to have been :

Receipts	$8,290.79
Expenses	8,196.72
Balance	94.07

On motion of Mr. Bean, the report was approved.

A communication from the Georgia Electric Light Company was read, extending an invitation to the delegates to visit the plant.

The first committee report presented was on "The Best Method of Treating Accidents and Complaints." The report was presented by P. M. Dyer, claim agent of the West Chicago Street Railway Company. This will be found on page 695.

Mr. Dunlap, of Washington: We have been pursuing that course exactly as the gentleman has represented, and if I had been writing the paper, I should have said about the same thing.

Mr. Payne: The course pursued by the Chicago companies, is practically that pursued by the company which I represent; and I presume our experience is the same as that of all of you, that we have very little chance before a jury, and the sooner we settle a case the better it is for the company. It does not seem to make much difference what the merits of the case are; if we go before a jury we are almost sure a case will go against us. It is only in cases where the points of law are in our favor, that we stand any chance of success.

Mr. Littell, of New Orleans: I would like to ask Mr. Dyer when he gets a statement from his employes if it is sworn to be before a notary public?

Mr. Dyer: Sometimes but not always.

Mr. Littell: Where a motorman is responsible for an accident, either to a vehicle or a person, and you know he is responsible, what do you do with him?

Mr. Dyer: It depends upon the frequency of his accidents and what record he has. Sometimes we assess it against him.

Mr. Littell: Suppose that you had evidence that the car was going at the rate of eight or ten miles an hour, and the motorman had his head turned away and ran over a person, and cut off his legs, what would you do with your man?

Mr. Dyer: He would be discharged.

Mr. Littell: Discharged immediately?

Mr. Dyer: He would be suspended pending an investigation, and then he would be discharged.

Mr. Littell: You would discharge him as soon as you got his statement?

Mr. Dyer: Yes; because if we did not do that, and retained him in our employ, we would be criticized for having kept such a man in our employment, and it would get before the jury.

Mr. Shaw, of Newburyport: Would it make any difference from what cause he was looking off? I ask the question because I want to state a case.

Mr. Dyer: I do not think we would accept any excuse, if he did not have his car under control.

Mr. Shaw: In a road I am interested in the motorman had his attention attracted by a bicycle alongside of his car, at the time that he should have been attending to his duty. There was a car ahead of him that was grounded. He had, however, no reason to suppose that this car would stop or ground in a locality where there were no houses; but in the moment that he was looking at the bicycle, he ran up on the other car and caused an accident. What would you do in that case?

Mr. Dyer: I think that would be a matter entirely for the discretion of the superintendent.

Mr. Shaw: We decided to let that man go, although I thought it was a hardship to do so.

Mr. Fuller, of Chicago: I will say for the information of the gentleman, that it is a rule of the West Chicago Railway Company, that one car approaching another must slow down or stop before getting to it, and if the motorman does not do so, he is discharged.

Mr. Shaw: Our rule is to keep cars 500 ft. apart. In this case, where we discharged the man, he was within 175 ft. of the other car. If he had been 500 ft. away, we would have felt differently about it. That is the second instance where we had a ground without apparent cause. We found it was the rheostat; that the cable had broken and made a contact.

Mr. Littell: Has Mr. Dyer brought with him the various blank forms used for accident reports and interrogations sent out?

Mr. Dyer: I have not. The West Chicago Street Railway Company uses a report without any special interrogatories. The statement, which is sent from the office, is made up with a view of interrogating the witness as to the occurrence in a general way, touching upon the more important points, and then leaving it for the witness to explain further if desired.

Mr. Shaw: I think the report said something about temporary relief; to what extent do you carry that?

Mr. Dyer: That is carried to the extent of providing transportation to the home or hospital. A physician is also called in while the person is lying in the drug store and we pay that expense.

Mr. Shaw: That is the end of it?

Mr. Dyer: Yes, sir.

Mr. Shaw: What would you do in a case like this? We had a man who was fixing a belt, and by some means he got in the shafting and was severely injured about the head. The man was taken to the hotel by some of our men—no hospital in the place—and they have sent us in quite a bill; physician $60, and hotel, $75. The man is recovering, and will eventually get well. We had an assistant engineer who did not wait until his engine had turned over the last time, and he had his hand jammed, the wheel making only one part of a revolution, so that it was nearly stopped. He had three fingers amputated, and they want to know who is going to pay the expense of his medical care. We claimed that it was no fault of the company and there is no liability on our part. I had a talk with the representatives of the injured person, and also with physician and hotel keepers, and told them that we could not assume liability, as it might lead to further trouble.

Mr. Dyer: I should think the first thing to do would be to ascertain the law, whether or not there was any liability, before paying any charges. Of course, even if it was a case where we did not feel that we were legally responsible, there would often come up the question of charity, whether we should not give the man something, at the same time exacting a release, to relieve us from further liability. I would say that there is a great deal of money paid out year after year, which we charge up to donations. For instance, a person not connected with the company, who lost his leg, came into the office and said, "I have had my leg cut off by one of your cars. You are not in any way to blame, but I want a wooden leg. I am willing to make an affidavit that you are not to blame." This was an unusual thing for a man to do, and we gave him $100 to get his wooden leg, although there was no liability. These cases are disposed of on their own merits, each case by itself.

Mr. Shaw : Is your company insured ?

Mr. Dyer : We were from 1890 to '91 ; since then we have taken our own risks.

Mr. Littell : Did you carry it for a full year or did you abandon it ?

Mr. Dyer : We carried the contract for one year.

Mr. Payne: Bearing upon the question of the gentleman in regard to the propriety of paying expenses of taking care of people, we had an experience in our company in that direction, where the evidence seemed to point to the conclusion that the company was not liable. Our attorneys so advised us, and friends of the injured party admitted that there was no liability, and upon their admissions and representations, we sent the injured person to the hospital and cared for him for several months. I think we spent nearly a thousand dollars in the case. When we went to get a release, and offered to throw in, as a gratuity, a few hundred dollars, they refused to settle with us. We litigated,

because we were assured we had a perfect defense. Judgment was rendered against us for $7,800, and the fact that we had done something to alleviate the distress of the injured person, was used against us on the trial upon the ground that we must have believed that we were guilty of negligence, or we would not have expended so much money. That seems pretty hard—to help poor people out when they get injured and then have a jury render a verdict entirely against the weight of the evidence.

MR. SHAW: If we are liable the insurance company which insures us is liable.

MR. PAYNE: The trouble about insurance companies is, that they do not insure more than half the accidents. We think it a wise policy, as the gentleman from Chicago says, to settle our cases.

MR. CONNETTE, of NASHVILLE: We pursue about the same method outlined in the paper read. After the accident has occurred we investigate it immediately. If we find, upon investigation, that the company is liable, we then go ahead and take care of the parties the very best we can. If we find that the company is not liable, we then cease all expense in the case. Frequently, where we have the most trouble is with lawyers. They will hunt up a case and institute suit immediately, without making any effort toward a compromise. The only method I have found satisfactory in an instance of that kind is to endeavor to settle the case outside of a lawyer, which I have done in a number of instances, and cut him out of his fee. Where we cannot settle the case, I have found about the best way is to keep the matter in court as long as we can, because as long as it remains in court, the more easy it is to effect a compromise. After a case has been in court two or three years, it is easier to effect a compromise than it is at the time of the accident. I find another thing of importance, that is, to pursue these cases after they get into court. We should endeavor to use our influence to get such men on a jury as will give a corporation justice. I believe it is just as essential to keep up the political end of street railway management as it is any other part; and if you will endeavor to stand in with the powers that be, and with those who have influence, and with the authorities who have the appointment of these jurors, it is likely that you will secure better results. That has been our experience, and very few judgments have been rendered against us, the largest being $1,500.

MR. LITTELL: I suggest that Mr. Dyer furnish the secretary with a complete set of the blanks used on his road, and that they be published in conjunction with the report.

MR. COLE, of Elmira: It has been our experience that the sympathy of the average juror is usually with the plaintiff, and that the testimony of the witnesses is also apt to be warped in their favor; and I have been able to obtain favorable evidence from the witness by promising the motorman that if he cannot obtain such evidence as will exonerate him from blame, he will not be reinstated in his position. He will go to this witness, and get a written statement of his views of the accident, and, in a great many instances, where he represents that he is liable to lose his position, he will get fair and favorable evidence, and then the witness will keep to this before the jury when the trial comes off.

MR. MINARY, of Louisville: I understand you suspend the motorman?

MR. COLE: Yes, until he gets such evidence from the witness as will exonerate him from any blame, and we have been able to get good evidence in that way. If he cannot obtain the evidence, we will let him go on, but I think it is well to suspend him for a time.

MR. MINARY: As soon as you let him go, you acknowledge your responsibility for the accident.

MR. COLE: We do not let him go until after the matter is disposed of.

MR. SEMMES, of Mobile: Is the evidence which the motorman gets reduced to writing?

MR. COLE: Yes, we do this as far as possible.

MR. SEMMES: As I understand you, you simply suspend him during the investigation, and if you find he does not bring this testimony, then you discharge him?

MR. COLE: Not at that time; that would be hard against us in court, he is not discharged entirely from the company until the case is disposed of.

MR. SEMMES: What would you do in a case of that kind—put him on the "extra list" and pay him for his time?

MR. COLE: No sir, we give him some other work—in the shops.

MR. PAYNE: I take it in case you settle at the time, then you do not hold the motorman responsible?

MR. COLE: We do not.

The next business was the report on "A Uniform System of Street Railway Accounts," by H. I. Bettis. This paper is published in full on page 673 and following pages.

MR. PERRINE, of Trenton: I have listened with a great deal of interest to the paper of Mr. Bettis, and have given a great deal of attention to the subject. I move that the paper of Mr. Bettis be accepted and printed and the new arrangement of accounts be adopted by the Association and a copy be mailed to the auditor and treasurer of every street railway company in the country. Carried.

MR. MCNAMARA, of Albany: I wish that the committee was present so that he might answer some questions. I would call the attention of the Association to the maintenance of way and buildings. In Albany, we are required to distinguish between roadways and track, and renewals of ties, rails and paving. We put these under one head—everything for the roadbed, ties, rails and paving come under the head of roadbed, and in New York City there are other matters about monthly reports—how we shall submit a report to show the actual earnings of every month and every three months. Our dividends are declared in New York City quarterly, and it is quite important that the manager of a company should be able to demonstrate that the dividend of a particular quarter which the directors desire to declare was earned. Our auditor claims that a report of that kind should be made up from the books, so that the books should be compelled to verify everything in the report. Shall we put in the August account the expense for removal of snow and ice? It looks odd; but that is what we are doing. I regret the committee is not present so that we might be able to have an explanation. It seems to me it is just as the committee stated, that there is too much here. Take that one item of roadway and railway—what enters into roadbed? Ties, rails, spikes, joint plates, paving, sand, stone, labor. They ought to come under one head, and that is what is required by the railroad commissioners of New York. They do not object to our dividing it as much as we want in our books, but in the report submitted to them, it must all come under one head.

MR. DYER, of Augusta: I do not suppose it would be possible to get a form to fit every case. I imagine that a small road, if you carried out that plan entirely, would find it expensive, because they would be compelled to have a storekeeper, who would charge up these different things we use each day. I think it is the custom, as a rule, with small roads, to charge up their bills, each month as they come in, as if they had been used. It is not correct, but the expenditure for the man to take charge of the store room and keep accounts of the material used, would be in some cases almost as much as the cost of the material.

MR. MCNAMARA: That is what we find it necessary to do. We have not a large road, but we have a storekeeper, and he charges the several accounts with the material as it is used. There is no other way to determine what you have used in any particular month in the year as the writer of the paper suggests. We do not pay our storekeeper such a large amount, but we find he does good work for us, and it pays.

MR. PAYNE: Undoubtedly all of the larger roads do pursue the course recommended by the committee, but the suggestion in regard to the cost of removing snow is rather new. It never occurred to me to charge up by the month during the year the cost of removing snow during the winter months. It is uncertain what the cost will be. This year you may have very little or no snow or ice, and

if you undertake to make the charges next year on what you have expended in '93, you might fall short or over, and our company has never adopted that method, although I can see if there is any uniformity in the account expended, it would be the proper thing to do.

Mr. McNamara: I may say that the repairs to roadway and railway are reported in the winter months when we make no repairs. The question is, Which is the best way to get at the proper amount. We find, taking the average of three winters—we do not include the "blizzard"—they do not vary very much in the amount of expense involved. The important question is, How shall roads determine questions of this kind? Perhaps every road is to determine it for itself.

The secretary announced that upon the adjournment of the meeting the Convention would inspect the exhibits; that at four o'clock a visit would be made to the car house of the Atlanta Consolidated Street Railway Company, and that from six until nine o'clock a reception would be tendered to the delegates, and ladies accompanying, at the Capital City Club. On motion, adjourned.

The meeting was called to order promptly at 10 o'clock, and an executive session was at once ordered for the purpose of privately discussing several proposed amendments to the Constitution and By-Laws of the organization, as well as insurance and other matters of special interest to the members of the Association.

The secretary then read a letter from Mr. John Kilgour, president of the Cincinnati Street Railway Company, suggesting that city as the place of meeting for the fourteenth annual convention of the Association. Mr. Kilgour said, that at Cincinnati an excellent chance is presented to study the operation of the single and double trolley systems, as they are working side by side in the same street, also the cable, and inclined plane systems and grooved rail track construction. Letters were also read from Mr. J. J. Sullivan, president of the Electric Traction Company, of Philadelphia, and Mr. Samuel P. Ferree, treasurer of the Street Railway Advertising Company, inviting the Association to meet next year in Philadelphia.

The secretary stated that he felt that in connection with these invitations he should read a letter from a prominent street railway man in Montreal, written a year ago, asking that the convention for 1895 should he held in Montreal.

INVITATION TO MEET IN MONTREAL NEXT YEAR.

Mr. Edward Lusher, of Montreal: Gentlemen, at the meeting of the Committee this afternoon, in arranging for a place for the next meeting, I desired to get in edgeways that there is such a place as Montreal, but I was very properly ruled out of order, being a member of the Committee.

I should be very much pleased if the members of the Association would think of Montreal through the coming year, so that the year after next we might find a place in your memory. If you come to Montreal you will come to us as foreigners, but we will treat you as friends. We have good hotels and all that good hotels bring forth. We consider we have some interesting things in our city, and should like to get you there to see them, and will treat you in the best possible way we can. If the Convention will kindly think of this during the coming year, so that we might have the satisfaction and pleasure of your coming, we would be very glad.

A few years ago—in 1885—it was partly decided that you should go to Montreal; but 1885 proved to be a year of small-pox in our city. Small-pox, however, does not come more than once in twenty years. As I said before, if you come we will do everything we can to make your visit pleasant; we have only one railway, but that covers the entire city. [Applause.]

Mr. Ostrom ably advocated the selection of Philadelphia, stating that this city is no longer a slow town, but has become one of the most progressive in the country.

The question of the next convention city was referred to a committee appointed by the president to nominate new officers for the Association, this committee consisting of Messrs. T. H. McLean, of Indianapolis; E. G. Connette, of Nashville; G. W. Baumhoff, of St. Louis; A. F. Breed, of Lynn; R. Semmes, of Mobile, and John E. Rugg, of Pittsburgh.

Mr. Hurt, of Atlanta, chairman of the special committee on "T Rail Construction," appointed at the last meeting, submitted the committee's report, which will be found on page 681.

President Payne called the meeting to order at 10.30 A. M. The first business was the report of the Committee on "City and Suburban Electric Railways." This report is published in full on pages 677 to 680. On motion, the report was ordered to be printed in the proceedings.

The report on "The T Rail Construction of the Terre Haute Street Railway Company," was read by Mr. Harrison. This is published on page 696.

Mr. Seely: I would like to ask Mr. Harrison what is the cost of the T rail construction as compared with the girder rail construction of the same weight?

Mr. Harrison: I could not give any comparison as to the same weight of rail, because I never laid girder rail of that dimension. Our experience was with thirty-eight and forty-five pound girder rail, and that was all taken up long ago.

Mr. Seely: Have you had any experience with the T rail, outside of the brick and asphalt pavement; have you had any experience with granite blocks?

Mr. Harrison: No, sir; the brick pavement is much superior for smoothness and durability to granite blocks; but I am confident we can lay the rail as well and as successfully with the granite blocks as with the brick or asphalt pavement.

Mr. Seely: Do you not find that the concrete foundations are extremely rigid for the cars; that the wear takes place in the cars instead of the rail?

Mr. Harrison: The traffic is perfectly smooth, and there is no jolting or jar; no oscillation with our cars. When the car comes to a rail joint you cannot tell that you are passing over it. Our track foreman has had long experience in steam railroad practice, and he is instructed to spare no pains or expense in making the joints as solid and rigid as possible. I do that, because I believe that after you once put a track in a paved street, you do not want to repair the rail joint You want to have it so that it will not give you any trouble, and for that reason there is no money spared in laying the joints. The joints are laid as close as the natural expansion and contraction will permit.

Mr. Seely: The reason I bring up that point is that at the present time a great many railroads are being constructed where they are not allowing any space for contraction and expansion.

Mr. Harrison: My experience on that point is that there is so much metal down below the surface, where it is cool, and so little of it exposed to the heat, just the head—we have no grooved or girder rail in our city—and just a little on one side, that we do not suffer from contraction and expansion, as in the case of a girder rail. The joints are the Wheeler joints, and rest on the tie, and then we tamp the rail up with concrete, not only the ties supported with concrete, but under the rail also, and the concrete comes up over the tie, so that the rail and the tie both rest on solid concrete, with a heavy bed below, and when this brick paving is put on, and all cemented together, there are practically no joints; and you cannot feel them in passing over the rail. It gets no wear and tear, and that is why, in economy of operation, it is superior, because there are no joints to rattle a car in passing over

them. Our motors and cars last longer, and we have better service.

Telegrams were read from Thomas Lowry, president of the Twin City Rapid Transit Company, Minneapolis, and also from the Commercial Clubs of Minneapolis and St. Paul, inviting the Association to hold its next meeting in the great convention city of the Northwest—Minneapolis.

A letter from O. T. Crosby was read, regretting his inability, owing to pressure of business and absence from the country, to present a report on "Standards for Electric Street Railways," and asking that a new chairman be appointed in his place.

On motion of Mr. Perrine, the Committee on Standards was continued.

The following letter was read from M. K. Bowen, superintendent of the Chicago City Railway Company, recommending that a committee be appointed to investigate the subject of the validity of patented articles used by street railways.

CHICAGO CITY RAILWAY COMPANY.

2020 STATE STREET.

CHICAGO, OCTOBER 15, 1894.

To Henry C. Payne, Esq., President, and Members of the Executive Committee, American Street Railway Association:

GENTLEMEN:—The list of patented articles in use on street railways is growing very fast, and has increased wonderfully since the adoption of electricity as a motive power. All street railways are paying either directly to the patentee or indirectly to the manufacturer, a royalty on one or more devices in use in the operation their lines. In many cases the patent is worthless, yet no test or investigation has been made to determine whether a royalty is rightfully due the holder of the patent or not, and consequently many thousands of dollars are spent annually in royalties that could be otherwise saved, or the price of such articles reduced by concerted action in fighting and exposing all such so-called "patents."

The street railway companies are also liable to be made defendants in the suits for using articles that are an infringement on some patent, while the manufacturer is the party that should stand the burden of such litigation, and not the purchaser or consumer.

In this matter we are far behind the steam railroads of this country. In this city there is an organization known as the Western Railroad Association, that has been in successful operation for twenty-four years, and has a membership of ninety. There is also an Eastern Association, with headquarters at Washington, similar to the one here, and the two organizations have as members all the important railways in the United States, and most of the smaller ones. The several railways pay annual dues based either on their mileage or gross or net receipts. This Association furnishes reports and opinions on all patent matters on request from its members, and defends all patent suits in which the railroads are made defendants.

The railroad, as a rule, gets an opinion from the Association before buying, making or using any patented device. An association of this character would be highly beneficial to our street railway companies. If this could be carried into active operation by an association of street railways, all patented articles in use on our lines should be investigated and reported on.

In conclusion, will say that if it meets your approval I would recommend that a committee be appointed to take up this matter and submit a plan of organization, to report to the Executive Committee at their meeting in January.

Your's respectfully,
M. K. BOWEN, Superintendent.

Mr. Perrine moved that a committee be appointed on this subject. Carried; and the Chair appointed the following committee: F. R. Greene, secretary Chicago City Railway Company, chairman, and John W. McNamara, Albany, and C. W. Wason, Cleveland.

The matter of the proposed amendments to the Constitution and By-Laws, to provide for associate members, was then considered. An informal vote was taken as to the advisability of the adoption of the amendments; and it was the unanimous judgment of the members that the amendments should be adopted.

Action on the same will be taken at the next annual meeting.

The special committee appointed to interview the representatives of the Underwriters' Association of the South reported that they had been unsuccessful in meeting such officials.

MR. BROPHY, of Boston, president of the New England Reserve Fund Association, was introduced and said: I think it would be better for each state association of street railways, to make application to the board of underwriters of the mutual companies which controls its territory. I think something might be done in the way to secure a reduction of rates. Our company is not a stock company. We have no agents and pay no premiums, so that we can afford to carry the business at somewhat lower rates. Ours is the only mutual company which is at the present time carrying electric light and railway properties. We have been insuring electric light stations and power houses for two years, and car houses for one year. We have at the present time $7,000,000 of property of this class, and for the last ten or twelve months, ending October, our losses have been $2,300 on the $7,000,000. We have been able to pay a dividend of 70 per cent. on business written one year ago. We have been insuring this character of business for two years. I state this to show you that the electric business is not so hazardous as some people think it is. (Applause.) It can be insured at a profit. We have paid some losses; at the same time we have paid to our policy holders 40 per cent. of the premiums paid. The premiums collected have paid losses and expenses and left a balance to be returned to policy holders, so that the business is not so very bad. Our rate on electric light stations is 1 per cent., which calls for a station which is a model in every way. We do not ask for cement floors or iron floors, nor do we ask that the roof shall be eighteen feet high; but we want a plant that is clean and has no oil on the floors, no finish on the walls, and no attics or basements. If it has a basement or second floor, used for storage, they must be equipped with automatic sprinkers. Our experience with car houses has been very satisfactory. We do not know just what the losses will be, but our premiums so far have met all expenses. Our expenses for inspectors have amounted to 6 per cent. of premiums received, and the total expense, including losses, is 12 per cent. The stock company, of course, must necessarily pay commissions to its agents, and these commissions amount to about 33 per cent. of premiums, losses something like 63 per cent.

MR. BAUMHOFF: I would like to ask the gentleman in what cities his company carries insurance on electric railways; have you any district?

MR. BROPHY: We have no special district. Of course, the majority of our business is in New England; and the greater part of our insurance is on electric light property. We have $7,000,000 on this classed together, and about $500,000 of that is on railway property. Our basis rate on brick power houses is 1 per cent.; frame, 1¼; car house and contents, including cars, brick, 1¼; frame, 1½ per cent.

MR. BAUMHOFF: Are you limited as to the amount?

MR. BROPHY: We cannot carry over $60,000 on any one building and contents. We are somewhat handicapped; our company is not large enough to carry the insurance the large street railway companies would desire to place with us. We had an offer from a railway company recently, to place $300,000; power house, car house and shops; and as they were practically one building we could not take it. Of course, if they had formed three or four separate risks, we might have done the business. A mutual company will not take property exposed to a risk which it would not carry if it were offered. I think it might be well to appoint a committee to confer with some of the New England mutuals to see what they will do.

MR. HARRISON: I have had a satisfactory experience with the company Mr. Brophy represents, and I agree with the suggestion that it would be of interest and profit to the Association to have a committee appointed. I move that a committee of five be appointed to take the matter up with the New England companies. As far as our company is concerned, we can get all the insurance we want from the company represented by Mr. Brophy, but larger companies could not do it. They would not carry so much in one risk; it would be necessary to deal with two or three to carry the full risk.

MR. SEELY: In relation to insurance companies, the members of the National Electric Light Association had the same trouble that you are laboring under, and I believe the company which Mr. Brophy represents came to their relief. I have no doubt that the street railway

companies could get substantial relief in this direction by a conference with the representatives of the mutual companies. The Standard Oil Company carries its own insurance, and has a profit every year, and there is no reason why this great business should not do likewise. We could establish a mutual company of our own, and have a central office.

The motion to appoint the special committee was then put and carried.

The president appointed the following gentlemen: Messrs. Harrison, Terre Haute; Dyer, Augusta; Perrine, Trenton; Lusher, Montreal; Baumhoff, St. Louis.

Mr. Perrine offered the following resolution:

Resolved, that the Executive Committee is hereby requested to take under consideration the question of the enlargement of the field and scope of the Association, and submit a plan, suggesting ways and means therefor, at the next meeting of the Association. Carried.

The Nominating Committee presented the following report: President, Joel Hurt, Atlanta, Ga.; vice-president, W. Worth Bean, St. Joseph, Mich.; 2d vice-president, John M. Cunningham, Boston, Mass.; 3d vice-president, Russell B. Harrison, Terre Haute, Ind.; secretary and treasurer, William J. Richardson, Brooklyn, N. Y. Executive Committee: Henry C. Payne, Milwaukee, Wis.; W. H. Jackson, Nashville, Tenn.; D. G. Hamilton, St. Louis, Mo.; G. C. Cuningham, Montreal, Can.; J. N. Partridge, Brooklyn, N. Y.

The Committee recommended Montreal, Can., for the next meeting.

A motion was made to adopt the report, except as to Montreal for the place of next meeting. This motion was amended by a motion to adopt the report of the Committee as a whole. This latter motion was put to vote—ayes, 17; noes, 19.

On motion, Mr. Penington, of Chicago, was instructed to cast the ballot of the Association for the officers nominated.

This was done, and they were declared duly elected.

Mr. Penington moved that Philadelphia be substituted for Montreal as the place of meeting.

A spirited discussion ensued on the question; and during the calling of the roll there was much interest manifested. The vote when taken, stood:

Montreal, 38; Philadelphia, 17.

Mr. Cuningham, of Montreal: Gentlemen, I wish to say a few words to you to show how very pleased, indeed, I am to know that next year Montreal will receive this large and important Association. I can assure you that we will do everything in our power to remove any difficulties that may exist as to entering any supplies for the purpose of exhibition. I can confidently promise you that there will be no difficulty in bringing supplies to Montreal, any more than there was in bringing them to Atlanta. We recognize in Montreal, as well as do the residents of other places, that this exhibition, which is a part of the annual meetings, has become a very important feature, and should be maintained and improved, if possible, every year; and therefore, for that reason I can promise you that we will do all in our power to remove any difficulties that may exist in coming to Montreal. You will receive there a most warm and hearty welcome. [Applause.]

The report of the Committee on "Mail, Express and Freight Service on Street Railway Cars," was then read by title only. This is published on page 687. On motion the report was ordered to be printed in the proceedings.

The report of the Committee on "Transfers and Commutation" was read by title, and ordered to be printed in the proceedings. The report is given on page 680.

The report of the Committee on the "Use of the Booster on Electric Railway Circuits" was next in order, and after a few remarks by Mr. Vail, giving the substance of the paper, was ordered to be printed in the proceedings. The report is given on page 700.

Messrs. Dunlop, of Washington, and McNamara, of Albany, were appointed a Committee to escort the newly elected president to the chair.

Mr Payne introduced Mr Hurt, who said: Mr. President, and gentlemen of the Convention. I thank you sincerely for this honor. I have not sought it, but I appreciate it none the less. I assure you that I shall not take up your time in making a speech. I am fully in accord with those who have the interests of this Association at heart, and I shall do my best during the year to come to further its advancement. I can do no more than ask your co-operation, free consultation and help in every direction. The Executive Committee, of course, will have certain important matters before them; but with your secretary must lie main weight; and I have no doubt that he will in the future, as he has in the past, discharge his full duty. I feel that this Association is entering upon an era of much more useful work than has marked its past career. Its scope should be enlarged. There are many features of the work devolving upon the managers of street railways, in which they need help from this Association; and this question should have your special attention during the next twelve months. I can only promise you that my feeble effort will be given with the greatest earnestness whenever I see it can be of any avail. Thanking you again, gentlemen, for the honor, I wish you all God speed, and hope that we will meet again in another year, and have quite as full an attendance as we have had here. (Applause.)

On motion of Mr. Perrine, a vote of thanks was passed to the retiring officers. The Atlanta Consolidated Street Railway Company, the Capital City Club, the local press, and the citizens generally of the city of Atlanta, for the courtesies, kindness and attention, and courteous hospitality, which had been extended to the Association.

The report on "Destructive Arcing of Five Hundred Volt Fuses," was read by title, and ordered to be printed in the proceedings. The report is given in abstract, on page 699. The paper on "Brake Shoes" was read by its title, and was ordered to be printed in the proceedings. An abstract of this paper is given on page 689.

Mr. Davis: In accordance with the recommendation of the author of the paper, I move that a committee be appointed, to consist of two members of the Association, and one manufacturer, to investigate the subject of the adoption of a standard style of brake shoes, conduct experiments, and to report the data collected, and its conclusions, at the next meeting, without expense to the Association. Carried.

The report on "Power Brakes *vs.* Hand Brakes," by E. J. Wessels, was read by title only. It was ordered to be printed in the proceedings. The report is given on page 683.

Mr. E. A. Sperry: The paper just read by title contains a reference to a paper read by me before the American Institute of Electrical Engineers last month. The reference being somewhat unjust, I would like the opportunity of showing wherein some of such errors have occurred. My paper contained fourteen points of excellence, in which the electric brake was superior. These points have been taken up by Mr. Wessels in their order, and remarks attached to each, embodying claims on behalf of the air brake. For instance, I said that the use of the electric brake, which does not employ brake-shoes in the operation at all, would cause an entire saving in brake shoes, with a resultant saving of wheels from two to threefold. The author has attached to this the remark that a good air brake saves wheels. The air brake is used simply to increase the power of the application of the brake-shoes, which, while smeared with sand and dirt, attack the rims of the wheels, "drawing" the chills, and very soon grind off the face of the wheels to a point below the chills, when the wheels will have to be pressed off, and others substituted. The air brake, instead of saving wheels, simply tends to grind them down sooner by the superior pressure of the shoes upon the wheels, over and above that readily obtainable by hand. With the electric brake the wheels are retarded and brought to rest without the application of brake shoes, and the rolling contact between the wheel and rail, being the only point of wear, the grinding and ruining of the chill is entirely avoided.

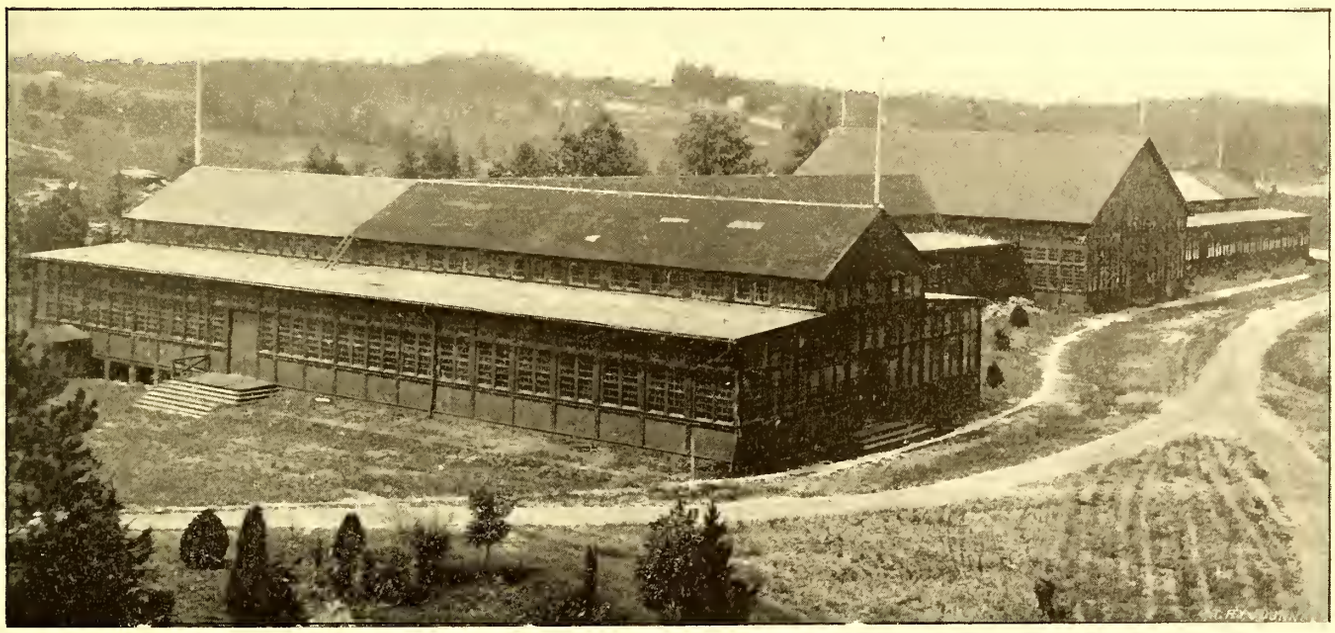
Another point referred to by the author is that of the air brake not causing flat wheels. It will be readily understood that with the electric brake this cannot occur, from the fact that when the wheels stop momentarily, the

motor, which has been converted into a dynamo, also stops, and therefore it cannot generate current with which to further and continuously hold such wheels, and they simply start again to roll slowly, which gives far better retardation than while sliding, and therefore cannot be ground flat. The comment upon this point is that a good air brake prevents flat wheels. It is not clear why the statement is made, no reasons being given.

With the air brake, a constant demand for energy is made at moneyed cost from the power station, which at the same time may be already well taxed and running up to its capacity. With the electric brake, on the other hand, we use nothing but the momentum or power stored up in the moving mass, and which in any case we wish to get rid of, the brake simply being a device whereby a part of this energy of motion is used to apply the brake and stop the car.

In answer to most of the points raised, the paragraphs quoted from my paper above referred to, are self-explanatory, and need not receive comment here. One, however, is an important one, which should receive explanation, namely, that of holding a car on a grade after it has been brought to rest. On the car in operation at this Convention, though unaware of it, you have nearly all seen a portion of the apparatus which is used to hold the car on grades; but which, on advice of counsel, has been removed from the wheels, and cannot be shown publicly until December 15. I might say, that by means of this device, the single controller handle by which the car is first started, may, by swinging around, bring the car to rest by use of the electric brake. By the simple act of holding this handle in the position where the brake is fully applied or fully on, the motorman is enabled to hold a heavily loaded car on an 8 per cent. grade. The holding is perfect, and remains so as long as the handle is in this position. We find one fact which greatly aids this process, namely, the friction of quiescence, which is, the natural resistance of any mass starting to move, after being once brought to rest.

I most heartily agree with the author as to the necessity of power brakes, but think that the highest order of engineering should be employed; and inasmuch as we have ample power stored up in the mass, this power should be used rather than to employ an additional draught of power from the central station at moneyed cost, and additional and otherwise unnecessary devices, which in some cases are liable to derangement, and also liable to give unnecessary and disagreeable noises in its operation. If the same controller handle can be used to start and stop the car by reverse motions, it is in the cause of simplicity to adopt it, and avoid a multiplicity of handles, whereby a motorman in case of an emergency, might become confused in their use. In the electric brake a single handle is used for all purposes, to run the motors, apply the brakes and hold the car upon a grade.



VIEW OF CONVENTION HALL, PIEDMONT PARK, ATLANTA.

The special paper, by Allen R. Foote, on "Taxation," was read by title, and ordered to be printed in the minutes. Mr. Foote's paper defined what are proper subjects for taxation and what are not, and recommended for adoption by the legislatures of the different states the clauses defining taxes given in the appendix to a paper on the same subject, read by Mr. Foote at the last meeting of the New York State Street Railway Association, and published in our last issue. The meeting then adjourned.

The social life of a great convention is to many of those in attendance more interesting than its business life. The story of how Atlanta was stormed and captured in the year of our Lord, one thousand eight hundred and ninety-four, by the largest and most successful convention of the American Street Railway Association ever held, and of how the hearts of the assaulting party were in turn conquered and, indeed, enslaved by the citizens of "The Gate City of the South," is one of such exceptional interest as to fully warrant the telling.

The Trip To Atlanta

Convention life began on the many trains, special and regular, which started from all parts of the country toward Atlanta—the first city in the South to receive as guests the American Street Railway Association. Acquaintances were formed on these trains which, strengthened into friendships during Convention time, have become permanent possessions for a life time. Who, for example, of those who joined in the war cry

Rat tat too,
Royal Blue,
Shenandoah Valley,
Brought us through.

as the magnificent special train from New York drew into the Atlanta station at six o'clock on Tuesday night, will ever forget the pleasant social visitations from car to car, the games of pok—er—whist, which beguiled the flitting hours, or the "horse play" possible only to men in rollicking mood who "own the train," and are able to act on the dictates of a passing fancy, untrammeled by officialism or severe glances from unfriendly eyes?

Tuesday afternoon and evening found Atlanta's expectations of a large attendance fully realized. A committee of prominent citizens received the many trains rolling into Atlanta, from East, West and North and "passed them on," with cheerful greetings, to the fine hostelries of the city. Soon the latters' corridors were filled to overflowing with nearly 1,000 men, shaking hands, renewing acquaintances, introducing each other and passing congratulations upon the weather, the attendance, the excellence of the accommodations and the prospects for "the biggest convention ever held," forgetting in the electric atmosphere of jollity and good cheer such minor troubles as overflowing chambers, cot beds, "lodgings out," etc., inseparable from the great meetings of the Association. At the Aragon, the earlier arrivals saw a cluster of well known street railway men resplendent in swallow tails and white ties, and found that the manager, Mr. Dodge, had proffered to a few choice spirits among the arrivals of Monday, an elegant little private dinner—if sixteen courses can be respectfully referred to as "little" —in honor of the first anniversary of his management of the hotel. At the Kimball House all was music and merriment, flags and bunting, in honor of the city's guests, and at the Marion and Markham Hotels, smaller but presumably more select gatherings found life quite bright enough for all practical purposes. In the later evening and after the wants of the inner man had been satisfied by substantial and well served dinners, bands of delegates might be seen parading the principal streets, singing war and other songs, and impressing upon the sober citizens of Atlanta, the fact that Convention life was gay, indeed, even to prosaic street railway engineers and operators.

Those who did not find each other on Tuesday night were satisfied on the following day at the Exhibition Hall, where the extensive exhibit of apparatus was made the excuse for a general reunion of friends.

"Delegates are requested to hand their names to some member of the local committee in order that the courtesies of Atlanta's Club may be extended to them, together with invitations to a reception tendered to the American Street Railway Association and others in attendance by the Capital City Club."

This is the substance of the kind and cordial note which was placed in each box at the different hotels, and Tuesday evening found many of the most cultured and delightful ladies and gentlemen in Atlanta society assembled in the beautiful home of the Capital City Club prepared to greet their new friends. The large ball room of the club was soon filled, and the inspiring music of a fine orchestra, in conjunction with a smooth and waxy floor, proved too great a temptation to be resisted, so that the reception was quickly turned into an impromptu ball, greatly to the pleasure of all concerned. The ladies of the Convention were many, but were so far outnumbered by the gentlemen that each lady was quickly surrounded by half a score of gallants eager for the honor of a dance—a situation so unusual in social entertainments as to be almost embarrassing, though quite satisfactory to the favored representatives of the fair sex.

Early in the evening, Major Livingstone Mims, president of the club, and a typical Southern gentleman of the old school, delivered from the floor a fine address of welcome which elicited the hearty applause of his hearers. Later on, an excellent collation was served in the banquet hall. The evening was thoroughly enjoyable from every point of view.

Thursday morning and afternoon were given over to shopping and sight seeing on the part of the ladies, while the gentlemen devoted themselves strictly to business at the Exposition Grounds. In the evening occurred the great social event of the Convention.

By eight o'clock the halls and parlors of the Kimball House were thronged with would-be banqueters waiting for the opening of the doors leading to the immense dining room of the hotel. Within a short time the latter had been so completely filled that hardly a seat was free for late comers. The banquet hall was draped with the national colors, caught into folds with shields and relieved in places by special effects in other decorative material. At the head of the hall were palms and potted plants in abundance, and directly in front, running transversely

across the hall, was the table reserved for the officials of the Convention and the speech makers. The remaining tables, four in number, extended throughout the entire length of the hall, and the beautiful linen, the bright silver and the fruit pieces "dressed" the banquet hall to an effect brilliant, cheerful and hospitable.

The menu was as follows:

Blue Points. Celery. Green Olives. Salted Almonds.	MANHATTAN COCKTAIL.
Green Turtle Clear.	SAUTERNES.
Broiled Pompano. Sauce Tartar. Duchess Potatoes.	
Fresh Lobster in cases à la Newburgh.	PONTET CANET.
Sweet Breads Glacé with fine French Peas.	
Electric Punch. Wafers.	
Roast Young Turkey with Cranberry Sauce. Asparagus.	POMMERY SEC.
Quail on Toast with Cresses. Currant Jelly.	
Celery Salad.	
Tutti Frutti Ice Cream with Cakes.	
Assorted Fruits.	
Roquefort and Edam Cheese with Bent's Crackers. Mocha Coffee.	CREME DE MENTHE.

The banquet over, President Payne rose to introduce Mr. J. H. Stedman, of Rochester, who read a witty poem on the origin of toasts, toasting and toastmasters, thus serving to pave the way for the president himself, who acted as toastmaster and called up the speakers of the evening.

In response to the toast on the "City of Atlanta," Hon. Howard E. W. Palmer eloquently set forth the virtues and advantages of the city, claiming for its citizens an enterprise and public spirit second to none found elsewhere South or North. In conclusion he proposed a toast to the American Street Railway Association, which was drunk standing, and with much enthusiasm.

Mr. C. D. Wyman, of Milwaukee, worthily responded to the toast "Our Association."

In the absence of Gen. W. H. Jackson, of Nashville, Mr. Lewis Perrine, Jr., of Trenton, talked about the "Street Car as a Factor of Civilization," and told a number of personal experiences and anecdotes which were highly appreciated.

Capt. Henry Jackson responded to the toast, "Railroads and the Law" in a vein generally serious, but enlivened by flashes of wit and humor, which met with a quick response from his audience.

Hon. Leonel C. Levy, of Columbus, delivered an eloquent oration upon "The New South" in the fervid, figurative style of the Southern orator of the old school.

Mr. James H. McGraw, of the Street Railway Journal, responded to the toast, "The Technical Press," briefly outlining the services which the latter was rendering to the street railway industry, and giving several specific illustrations, humorous and otherwise, of what the press had been able to accomplish.

One of the most brilliant and eloquent speeches of the evening was that of Mr. Lucien L. Knight, of the *Atlanta Constitution*, who charmed his hearers no less by his interesting personality, than by the substance of a most excellent speech.

The final toast, on the subject, "Our Country" was answered in a serious vein by Hon. Fleming duBignon, whose speech was enthusiastically applauded, and was a decided success.

The Convention then called loudly for Mr. Joel Hurt, "the next president of the Association," who spoke briefly and earnestly upon the future of the Association.

Capt. Robert J. Lowry, of Atlanta, in response to an urgent call, delivered the final speech of the evening—a speech refusing to make a speech. The banqueters then dispersed promising solemnly to meet each other again another year.

"A Royal Georgia Barbecue"—this was the attraction which drew to the beautiful grounds of the Ponce de Leon on Friday afternoon nearly all in attendance at the Convention. The barbecue was in charge of Mr. B. W. Kribacker, a prominent caterer, locally famous for his special ability as a "barbecuist." The process was decidedly interesting to the visitors, most of whom knew only by reputation the nature of the feast. A large trench, fifty feet long and three feet deep, had been dug and filled with burning coals. Across this trench were stretched five large hogs, seven kids, ten lambs, fifty chickens and twenty calf livers, about 750 lbs. of meat in all. The odor of the roasting flesh was simply delicious, and whetted the appetites of the 500 guests to a point where all care for formality and daintiness was forgotten. About 700 ft. of tables had been erected, and, standing around these, the guests partook of the roasted meats, of a "Brunswick stew," and of bread, beer and other eatables, the whole forming a most enjoyable, and long to be remembered feast.

While the barbecue was in progress, a roaring farce was being enacted in a portion of the grounds. It is hard for the average Southerner to understand how intensely amusing to the average Northerner is the Southern darkey of all ages—particularly of the pickaninny age. To get a couple of half grown lads to engage in a "butting match," to see the piles of colored humanity imitating a foot ball scrimmage where a nickel is the prize instead of a football, and to see a dozen darkeys in all conditions of clothing scampering around the Piedmont Race Course "for a dollar"— all these were sights which would cause even an anchorite to howl with laughter.

The breaking up of the Convention parties had to come at last, and the hotel scenes on Friday evening were in some cases pathetic, in others ludicrous. Each lady attending the Convention was surrounded by a group of newly formed admirers begging the privilege of further acquaintance, swearing eternal friendship, and expressing hopes of pleasant homeward journeys. At the desk, accounts were being wound up, and pocketbooks emptied in the process. In the corridors might occasionally be seen red faced, thick voiced individuals who had been noted during the Convention for their good fellowship and conviviality. In the café, a half dozen colored boys were singing and dancing, accompanied by a violin and 'cello, to an audience large, enthusiastic and decidedly liberal in its ideas of remuneration.

The magnificent special trains for New York, on the Southern—Pennsylvania and the Norfolk & Western—Baltimore & Ohio routes, started for Chattanooga at 11 and 11:30 o'clock, the former to treat its passengers to pleasant sojourns in Chattanooga on Saturday, and Asheville, N. C., on Sunday, and the latter to give its patrons even more delightful experiences at Chattanooga, Natural Bridge and Luray Caverns.

Thus closed the Convention, perhaps the most successful, from a social point of view, in the history of the Association. Atlanta was cordial and generous to us in the year of our Lord, one thousand eight hundred and ninety-four, and, with a warm and wholly fraternal feeling, her guests wish her a future full of good fellowship, and a material prosperity second to no other city in the world.

Railroad Officials Thanked.

The party of nearly one hundred who visited the Convention by the special train, on the Shenandoah Valley route, were treated to a number of special privileges not enjoyed on other trains. The train, as made up at Hoboken, consisted of four sleepers, a dining car and a baggage car, all going through without change and arriving at Atlanta almost exactly on schedule time. The dining car service was unusually fine, all the delicacies of the season being offered to the guests, and as the company was thoroughly congenial and well assorted, the Southbound trip was a highly enjoyable affair. But an even greater pleasure was in store on the return trip, for, through the kindness of the Norfolk & Western and the Baltimore & Ohio Companies, the train was run as an "excursion special," leaving Atlanta at 11:30 Friday night, and arriving in Chattanooga in the early morning. Leaving Chattanooga at 6:30 in the evening, after a most pleasant trip to Lookout Mountain, Missionary Ridge and other points of interest in the city, the train arrived at Natural Bridge early Sunday morning. Tally-ho coaches had been telegraphed for, and the entire party enjoyed a beautiful morning ride over the Virginia hills to this world famed natural curiosity, which was thoroughly explored from top to bottom. The train then left for Luray, which was reached at about 4:30, and again carriages and guides were found in attendance. The trip through the wonderfully beautiful caverns, rivaling the famous Mammoth Cave of Kentucky, was one of unusual delight. Some of the great halls of the weird and mysterious cave seemed like most charming cathedrals, appropriate to the day, and the "organ," formed by certain stalactites and stalagmites in the heart of the cave, carried out the hallucination. It was with much difficulty that the party could be brought together so as to leave Luray at the schedule time, 7:15 Sunday evening. The train arrived at Jersey City less than ten minutes late—a remarkable record, due largely to the skill, forethought and railroad experience of Mr. Leroy J. Ellis, Eastern passenger agent of the Norfolk & Western Railroad Company, who was in charge of the excursion throughout the trip, and who was indefatigable in his efforts to please passengers and to save them trouble. His kindness and attention were so exceptional that an impromptu mass meeting was held at Luray, at which the following resolutions were adopted:

Natural Bridge, Va., Oct. 21, 1894.

Whereas: A large number of those attending the Atlanta Convention, of the American Street Railway Association, have traveled to and from that city over the Shenandoah Route, and

Whereas: The unqualified pleasure and the brilliant success of the railway trip have been due to the unwearied efforts and thoughtful supervision of Mr. Leroy J. Ellis, Eastern Passenger Agent of the Norfolk & Western Railway, be it therefore

Resolved, That the hearty thanks of the passengers on the special train personally conducted by Mr. Ellis, be and hereby are extended to that gentleman for his unremitting attention to their comfort and his prompt acquiescence in any suggestion that could be made.

Resolved, Further, that Mr. Ellis be and is hereby congratulated upon the striking punctuality in the adherence to the train schedule, as evidencing the high standard of railroad efficiency in the New South, and

Resolved, That a copy of these resolutions be engrossed and presented by a committee to Mr. Ellis, together with a souvenir that may serve to remind him of the occasion as well as of the high esteem in which the street railway men and street railway supply men hold a typical steam railroad man.

Committee for Presentation.
E. Peckham,
W. J. Richardson,
J. R. Beetem,
J. H. McGraw,
W. S. Silver,
H. C. Evans.

Chairman, E. Peckham.
Secretary, T. C. Martin.

These resolutions were ordered to be engrossed and presented to Mr. Ellis with a handsome souvenir of the trip, to be selected by Mr. E. Peckham, chairman of the meeting.

It is also fair to say that to Maj. F. K. Huger, superintendent of the Southern Railway Company, and vice-president of the Knoxville Electric Railway Company, is due considerable credit for his efforts in pushing forward the special train and making up time between Bristol and Atlanta on the Southbound trip.

Resolutions on the Southern Railway.

Representatives from the several cars composing the special train from the East to Atlanta and return, October 15 to 27, assembled in the car "Tiber," at Hickory, N. C., and were called to order by Col. John H. Cunningham, of Boston, second vice-president of the American Street Railway Association, who stated that he had been requested to convene those present for the purpose of giving expression to their appreciation of the attentions they had received from the railroad representatives.

On motion of Mr. Charles Clark, Colonel Cunningham was requested to appoint a committee to draft proper resolutions. The committee reported later the following preamble and resolutions which were enthusiastically adopted.

Whereas: The ladies and gentlemen composing the special train from New York to the Convention of the American Street Railway Association at Atlanta, October 17 to 19, traveling over the Pennsylvania Railroad and the Southern Railway, have enjoyed unusual privileges and advantages over the system of the Southern Railway, whereby they have been enabled to visit the historic grounds of Lookout Mountain and Missionary Ridge, at Chattanooga, Tenn., and view some of the grandest scenery of the world in the Blue Ridge Mountains around Asheville, N. C., and have received unsurpassed accommodations at every point, therefore be it

Resolved, That the cordial thanks of this entire party be heartily extended to the above corporations for their courtesy and kindness throughout.

Resolved, That special special thanks are due to W. A. Turk, of Washington, D. C., general passenger agent of the Southern Railway; to S. H. Hardwick, Atlanta, assistant general passenger agent, and to A. S. Thweatt, of New York, Eastern passenger agent of the company, for the general plan and arrangement of our itinerary.

Resolved, That we particularly desire to thank Mr. Geo. C. Daniels, New England traveling passenger agent of the Southern Railway, who accompanied us on the entire trip, for his courteous, tireless and unceasing attention, and we do most sincerely congratulate the Southern Railway Company, on having such an efficient and obliging agent in their service.

(Signed) R. S. Brown, Chairman.
Chas. W. Price. Secretary.
John N. Partridge.
John H. Cunningham.
W. L. Candee.
I. A. Shaler.

Hickory, N. C., October 21, 1894.

Ladies in Attendance.

Bean, Mrs. W. Worth, St. Joseph, Mich.
Berry, Miss Mary, Rome, Ga.
Blackwell, Mrs. J. H., Trenton, N. J.
Bradford, Mrs. H. P., Cincinnati, O.
Candee, Mrs. W. L., Brooklyn.
Connette, Mrs. E., Nashville, Tenn.
Dimmock, Mrs. W. S., Council Bluffs. Ia.
Dunlop, Mrs. G. T., Washington, D. C.
Farson, Mrs. J., Chicago, Ill.
Gordon, Mrs. J. R., Charlotte, N. C.
Hardin, Miss Lucille, Rome, Ga.
Harris, Mrs. H. E., Birmingham, Ala.
Higgins, Mrs. D. W., Victoria, B. C.
Hunt, Mrs. W. T., New York.
Johnston, Mrs. W. J., New York.
Jones, Miss, Milwaukee.
Kelly, Mrs. W. F., Columbus, O.
McLean, Mrs. Thos. H., Indianapolis, Ind.
McNamara, Mrs. John W., Albany, N. Y.
Musser, Mrs. F. B., Harrisburg, Pa.
Nourse, Mrs., Chicago.
Payne, Mrs. H. C., Milwaukee.
Perrine, Mrs. Lewis, Trenton, N. J.
Pond, Mrs. A. E., New Haven, Conn.
Richardson, Mrs. H. C., Brooklyn.
Richardson, Mrs. W. J., Brooklyn.
Seely, Miss, New York.
Seguine, Miss, New York.
Short, Mrs. S. H., Cleveland, O.
Simmons, Mrs. E. A., New York.
Simons, Miss Susan, Buffalo, N. Y.
Smith, Mrs. E. A., Chicago.
Smith, Mrs. E. W., Philadelphia.
Stone, Mrs. E. K., Quincy, Ill.
Sullivan, Mrs. M. J., Chicago.
Turner, Mrs. A. M., Chicago.
Van Dorn, Mrs. W. T., Lincoln, Neb.
Windsor, Mrs. H. H., Chicago.
Wyman, Mrs. E. B., New York.

STREET RAILWAY MEN AT THE CONVENTION.

Adair, A. D., Atlanta, Ga.
Adams, J. T., Atlanta & Chattahoochee Railroad Co., Atlanta, Ga.
Adkins, Jas., Lindell Railway Co., St. Louis, Mo.
Aitken, Jno. N., Carbondale & Forest City Pass. Ry. Co., Carbondale, Pa.
Akarman, John N., Worcester, Con., St. Ry. Co., Worcester, Mass.
Allen, John C., Southern Electric Railway Co., St. Louis, Mo.
Armstrong, R. C., Atlanta, Ga

Baker, R. F., Columbia Railroad Co., Washington, D. C.
Baldwin, Bert L., Cincinnati Street Railway Co., Cincinnati, O.
Bartlett, Chas. H., Manchester Street Railway Co., Manchester, N. H.
Baumhoff, Geo. W., Lindell Railway Co., St. Louis, Mo.
Beall, Robert, Metropolitan Railroad Co., Washington, D. C.
Bean, W. Worth, St. Joseph & Benton Harbor Electric Railway & Light Co., St. Joseph, Mich.
Belden, D. A., Aurora Street Railway Co., Aurora, Ill.
Barnes, C. E., Plymouth & Kingston St. Ry. Co., Plymouth, Mass.
Bickford, J. H., Salem, Mass.
Blackwell, J. H., Trenton, N. J.
Bradford, H. P., Cincinnati Incline Plane Railway Co., Cincinnati, O.
Bradley, Chas. G., Atlanta Consolidated Street Ry. Co., Atlanta, Ga.
Brang, C. A., Clearfield Traction Co., Phillipsburg, Pa.
Breed, E. S., Central Railway & Electric Co., New Britain, Conn.
Bridges, E., Wayne Street Railway Co., Dayton, O.
Brown, N. W. L., Consolidated Street Railway Co., Atlanta, Ga.
Bull, J. V., Easton Transit Co., Easton, Pa.
Burke, M F., Terre Haute Electric Railway Co., Terre Haute, Ind.

Cameron, W. H., Milwaukee Street Railway Co., Milwaukee, Wis.
Chidsey, A. D., Easton Transit Co., Easton, Pa.
Clark, C. S., L., L. & H., Street Railway Co., Lawrence, Mass.
Cole, Wm. W., West Side Railway Co., Elmira, New York.
Connette, E. G., Nashville Street Railway Co., Nashville, Tenn.
Convers, C. G., Hot Springs Street Railroad Co., Hot Springs, Ark.
Costello, Thos., Lowell & Suburban St. Ry. Co., Lowell, Mass.
Cougot, P., Orleans Railroad Co., New Orleans, La.
Coolahan, Edw. L., Montgomery St. Ry. Co., Montgomery, Ala.
Cuningham, G. C., Montreal Street Railway Co., Montreal, Can.
Cunningham, J. H., Gloucester Street Railway Co., Boston, Mass.

Davis, F. C., Miami Valley Railway Co., Piqua, O.
Davies Ernest H., Williamsport Pass. Ry. Co., Williamsport, Pa.
Dimmock, W. S., Omaha & Council Bluffs Railway & Bridge Co., Council Bluffs, Ia.
Dodge, G. A. W., New Haven Street Railway Co., New Haven, Conn.
Duncan, D. J., Lackawanna Valley Rapid Transit Co., Carbondale, Pa.
Dunlop, G. T., Wash'n & Georgetown R. R. Co., Washington, D. C.
Dyer D. B., Augusta Railway Co., Augusta, Ga.
Dyer, P. M., West Chicago Street Railroad Co., Chicago, Ill.

Edgar, H. T., Georgia Electric Light Co., Atlanta, Ga.
Elkins, W. L., Pittsburgh Traction Co., Pittsburgh, Pa.
Elliott, Thos., Consolidated Street Railway Co., Atlanta, Ga.
Eno, J. W., Wilkesbarre Traction Co., Wilkesbarre, Pa.
Evans, Clement A., Atlanta, Ga.
Evans, D. E., Gainesville Hall Co. St. R. R. Co., Gainesville, Ga.
Ewing, A. B., People's Railroad Co., St. Louis, Mo.
Ewing, F. W., Nashville Street Railway Co., Nashville, Tenn.

Fagan, J., Wilkesbarre Traction Co., Wilkesbarre, Pa.
Farson, John, Calumet Electric Street Railway Co., Chicago.
Ferguson, W. B., Worcester, Leicester & Spencer Street Railway Co., Worcester, Mass.
Ferguson, W. L., City Electric Railway Co., Decatur, Ill.
Fishbrome, Julian, Charleston, S. C.
Flesh, L. M., Miami Valley Railway Co., Piqua, O.
Flynn, C. E., Central Railway Co., Peoria, Ill.
Ford, D. J., Gloucester Street Railway Co.. Gloucester, Mass.
Fuller, J. P., Consolidated Street Railway Company, Atlanta.

Garth, R. L., Chicago City Railway Co., Chicago, Ill.
Gillee, O. C., Columbia Railroad Co., Washington, D. C.
Glasier, A. F., Brockton Street Railway Co., Brockton, Mass.
Glenn, Walker, Consolidated Street Railway Co., Atlanta, Ga.
Glenn, W. F., Atlanta, Ga.
Glenn, W. H., Consolidated Street Railway Co., Atlanta, Ga.
Goff, R. S., Globe Street Railway Co., Fall River, Mass.
Goodrich, E. S., Hartford Street Railway Co., Hartford, Conn.
Graham, J., Wilkesbarre Traction Co., Wilkesbarre, Pa.
Green, Alfred, Rochester Railway Co., Rochester, N. Y.
Green, Chas., People's Railroad Co., St. Louis Mo.
Green, E. M., City Electric Railway Co., Rome, Ga.
Griffith, J. B., Hamilton Street Railway Co., Hamilton, Ont.

Hamilton, D. G., National Ry. Co., of St. Louis, Chicago, Ill.
Hammond, J. A., Atlanta Con. St. Ry. Co. Atlanta, Ga.
Hauck, C. A. B., Lehigh Traction Co., Hazleton, Pa.
Harper, T. J., Atlanta, Ga.
Harris, Geo. H., Birmingham, Ala.
Harrison, Russell B., Terre Haute St. Ry. Co., Terre Haute, Ind.
Harrington, W. E., Camden Horse Railroad Co., Camden, N. J.
Hendricksen, B. F., Bay City, Mich.
Henry, W. L., Brockton Street Railway Co., Brockton, Mass.
Herley, J. H., Macon & Indian Spring Railway Co., Macon, Ga.
Heyward, J. F., City & Suburban Railway Co., Baltimore, Md.
Hickson, F. A., Rochester, N. Y.
Higgins, D. W., Victoria, B. C.
Hippee, G. M., Des Moines City Railway Co., Des. Moines, Ia.
Hollenback, J. W., Wilkesbare Traction Co., Wilkesbarre, Pa.
Hollis, R. W., Atlanta, Ga.
Hood, W. S., Springfield Railway Co., Springfield, O.
Howard, W., Youngstown Street Railway Co., Youngstown, O.
Hull, J. H., Trenton, N. J.
Hunter, Frederic W., Nashville Traction Co., Nashville, Tenn.
Hunter, R. S., Springfield Railway Co., Springfield, O.
Hurt, C. D., Consolidated Street Railway Co., Atlanta, Ga.
Hurt, H. N., Consolidated Street Railway Co., Atlanta, Ga.
Hurt, Joel, Consolidated Street Railway Co., Atlanta, Ga.

Jackson, Henry, Consolidated Street Railway Co., Atlanta.
Jackson, Walter M., Augusta, Ga.
Jenkins, Thomas M., So. Covington & Cincinnati Street Railway Co., Covington, Ky.
Jewell, W. S., Consolidated Street Railway Co., Toledo, O.
Johnson, C. S., Consolidated Street Railway Co., Grand Rapids, Mich.
Johnson, J. W., Citizens' Street Railway Co., Kalamazoo, mich.
Jones, C. L., Milwaukee Street Railway Co., Milwaukee, Wis.
Jones, F. G., Citizens' Street Railroad Co., Memphis, Tenn.

King, J., City Electric Railway Co., Rome, Ga.
Knight, F., Easton Transit Co., Easton, Pa.
Kobusch, G. J., Citizens' Street Railway Co., Kalamazoo, Mich.
Koche, J., Cleveland City Railway Co., Cleveland, O.
Krotz, A. S., Springfield Railway Co., Springfield, O.

Landon, E. F., Dry Dock Railroad Co., New York.
Larendon, W. S., Atlanta & Chattahoochee River R. R. Co., Atlanta. Ga.
Lemon, W. H., Atlanta, Ga.
Levy, Lionel, Columbus, Ga.
Littell, H. M., New Orleans Traction Co, New Orleans, La.
Lott, Chas. D., Atlanta, Ga.
Lowe, Henry E., Macon, Ga.

McAdoo, M. R., Paterson Railway Co., Paterson, N. J.
McClary, J. B., Birmingham Ry. & Elec. Co., Birmingham, Ala.
McCrary, J. B., Consolidated Street Railway Co., Atlanta, Ga.
MacCredie, James, Albany Railway Co., Albany, New York.
McCulloch, Richard, Cass Ave. & Fair Grounds Ry., Co., St. Louis, Mo.
McCulloch, Robert, St. Louis Railroad Co., St. Louis, Mo.
McFarland, J. W., Electric Railway Co., Savannah, Ga.
McKinney, C. A., Houston City Street Railway Co., Houston, Tex.
McLaughlin, Jas. F., Philadelphia, Pa.
McLean, Thos. H., Citizens' Street Railroad Co., Indianapolis, Ind.
McNamara, John W., Albany Railway Co., Albany, N. Y.
McWater, G. S., Consolidated Street Railway Co., Atlanta, Ga.
Mahoney, D. J., People's Railroad Co., St. Louis, Mo.
Malochee, H. J , Orleans Railroad Co., New Orleans, La.
Maltby, Geo. E., Jamestown Street Railway Co., Jamestown, N. Y.
Markle, A., Lehigh Traction Co., Hazleton, Pa.
Marshall, J. Q., Col. Elec. St. Ry., Lt. & Pow. Co., Columbia, S. C.
Meixell, J. C., Wilkesbarre Traction Co., Wilkesbarre, Pa.
Meons, E. C., Pittsburg, Pa.
Miley, C. E., Springfield Ry. Co., Springfield, O.
Minary, T. J., Louisville Railway Co., Louisville, Ky.
Moore, Morton, Atlanta, Ga.
Moore, W. E., Augusta Railway Co., Augusta, Ga.
Morgan, J. W., Camden Gl'ster & Woodbury Ry. Co., Camden, N. J.
Morse, Geo. C., Taunton St. Ry. Co., Taunton, Mass.
Moses, Maurice, Natchez Street Railroad Co., Natchez, Miss.
Musser, F. B., East Harrisburg Railway Co., Harrisburg, Pa.

Nelson, S. L., Springfield, Railway Co., Springfield, O,
Nyhan J. T., Macon & Indian Springs Electric Ry Co., Macon, Ga.

Oliphant, John, Jr., Calumet Electric Street Ry., Chicago, Ill.
Orr, A. M., Miami Valley Railway Co., Piqua, O.

Parke, J. G., Washington & Georgetown R. R. Co., Washington, D.C.
Parker, B., Consolidated Street Railway Co., Atlanta, Ga.
Partridge, John N., Bklyn. City & Newtown R. R. Co., Brooklyn, N. Y.
Passailaigue, T. W., Enterprise Railroad Co., Charleston, S. C.
Patterson, W. H., Bloomington City Railway Co., Bloomington, Ill.
Payne, H. C., Milwaukee Street Railway Co., Milwaukee, Wis.
Penington, T. B., Chicago City Railway Co., Chicago, Ill.
Perrine, Lewis, Jr., Trenton Passenger Railway Co., Trenton, N. J.
Pierson, C. H., Union Depot Railroad Co., St. Louis, Mo.
Read, W. P., Salt Lake City Railroad Co., Salt Lake City, Utah.
Rhea, R. M., West End Street Railroad Co., Knoxville, Tenn.
Rice, F., Jr., Atlanta Consolidated Street Railway Co., Atlanta, Ga.
Richards, E. J., Passenger & Belt Railway Co., Lexington, Ky.
Ruick, H., Easton Transit Co., Easton, Pa.
Rugg, J. E., Citizens' Traction Co., Pittsburgh, Pa.
Rush, C. C., Bay Cities Consolidated Street Ry Co., Bay City, Mich.
Pond, A. E., Winchester Ave. Railroad Co., New Haven, Conn.
Pratt, Chas. B., Worcester Consolidated St Ry Co., Worcester, Mass.
Pratt, E. J., Southwest Missouri Electric Railway, Webb City, Mo.

Sanders, W. C., Consolidated Street Railway Co., Atlanta, Ga.
Sargeant, Chas. S., West End Street Railway Co., Boston, Mass.
Scott, R. F., Montgomery Street Railway Co., Montgomery, Ala.
Seddon, W. L., Atlanta Traction Co., Atlanta, Ga.
Seibel, G. F., Taunton Street Railway Co., Taunton, Mass.
Semmes, R., Mobile Street Railway Co., Mobile, Ala.
Sloan, Frank H., City & Surburban Railway Co., Baltimore, Md.
Shaffer, H., Seashore Electric Railway Co., Asbury Park, N. J.
Sharp, James, Atlanta, Ga.
Shaw, E. P., Winchester Avenue Railway Co., New Haven, Conn.
Sinclair, Wm. H., Galveston City Railroad Co., Galveston, Tex.
Smith, B. G., La Crosse Street Railroad Co., La Crosse, Wis.
Smith, C. H., Troy City Railway Co., Troy, N. Y.
Smith, E. A., Consolidated Car Heating Co., Chicago.
Smith, J. A., Cincinnati Inclined Plane Railway Co., Cincinnati, O.
Smith, W. A., Omaha Street Railway Co., Omaha, Neb.
Smith, W. Nelson, New Orleans Traction Co., New Orleans, La.
Somerset, H. J., Winnipeg Electric Railway Co., Winnipeg, Man.
Spalding, A. T., Atlanta, Ga.
Steele, A. B., Atlanta, Ga.
Stevens, E. H., Johnson City & Carnegie St. Ry, Johnson City, Tenn.
Stone, E. K., Jr., Quincy Horse Railway & Carrying Co., Quincy, Ill.
Stratton, Jas. A., Birmingham Ry. & Elec. Co., Birmingham, Ala.
Sullivan, P. F., Lowell & Suburban Street Railway Co., Lowell, Mass.
Sweetzer, D. H., Washington, D. C.

Thomas, T. J., West End Street Railroad Co., Knoxville, Tenn.
Thompson, A. C., Missouri Railroad Co., St. Louis, Mo.
Thompson, S. B., City & Suburban Railway Co., Baltimore, Md.
Titus, A. C., Newport Street Railway Co., Newport, R. I.
Tully, A. C., Metropolitan Street Railway Co., New York.
Turner, A. M., Hammond, Whiting & E. Chicago Railway Co., Hammond, Ind.
Tyson, L. D., West End Street Railway Co., Knoxville, Tenn.
Urie, J. K., Galveston City Railroad Co., Galveston, Tex.
Wason, Chas. W., Cleveland Electric Railway Co., Cleveland, O.
Wakefield, R. S., Queen City Railway Co., Dallas, Tex.
Wallace, Alfred, Columbia St. Ry. Lt. & Pow. Co., Columbia, S. C.
Wendell, S. S., Union Street Railway Co., New Bedford, Mass.
White, H. B., Calumet Electric Street Railway Co., Chicago, Ill.
Whitehead, W. E., Atlanta, Ga.
Wight, Chas. L., Toledo Consol. Street Railway Co., Toledo, O.
Williams, Chas., Manchester Street Railway Co., Manchester, N. H.
Williams, S. A., Rochester Ry. Co., Rochester, N, Y.
Williams, W. M., Easton Transit Co., Easton, Pa.
Wilson, J. H., Mobile, Ala.
Woodruff, E., Consolidated Street Ry. Co., Atlanta, Ga.
Woodruff, R. S., Trenton Pass R. R. Co., Trenton, N, J.
Wyman, C. D., Milwaukee Street Ry. Co., Milwaukee, Wis.

Others in Attendance.

Ackerman, P. C., American Electrical Works, Providence, R. I.
Allen, E. H., Allen Electric Supply Co., Philadelphia.
Allen, J. H., *Dixie*, Atlanta, Ga.
Allen, Wilbur B., Brownell Car Co., St. Louis, Mo.
Allison, J. W., St. Louis Register Co., St. Louis, Mo.
Angell, F. R., National Malleable Casting Co., Chicago.
Atkinson, J. M., Walker Manufacturing Co., Cleveland, O.

Bailey, T. P., General Electric Co., Chicago.
Baird, M. E., Eddy Electric Manufacturing Co., Windsor, Conn.
Baker, John W., E. T. Burrowes Co., Portland, Me.
Ball, G. M., American Iron Bolt Co., Cincinnati.
Ball, G. Mays, American Engineering Co., Atlanta, Ga.
Barr, B. N., Walker Manufacturing Co., Cleveland, O.
Baylis, R. N., Walker Manufacturing Co., Cleveland, O.
Batchelder, Mark D., The Mark D. Batchelder Co., Atlanta, Ga.
Barnard, G. A., Buckeye Engine Co., Salem, O.
Barrett, C. E., Hale & Kilburn Manufacturing Co., Philadelphia.
Baylor, A. K., General Electric Co., New York.
Beadle, Edward, Railway Register Manufacturing Co., New York.
Bennett, J. B., Street Railway Journal, Chicago.
Benton, John B., Sterling Supply & Manufacturing Co., New York.
Berg, Max A., Wallace Electric Co., Chicago.
Bibber, C. E., Cutter Electrical & Manufacturing Co,, Boston.
Bone, W. H., Walker Manufacturing Co., Cleveland, O.
Bouchard, S. O., R. D. Nuttall Co., Allegheny City, Pa.
Boughton, W. E., The Johnson Co., Philadelphia, Pa.
Boyd, F. C., New Haven Car Register Co., New Haven, Conn.
Boyd, J., *Street Railway Review*, Chicago.
Bowman, S., Morris, Tasker & Co., Philadelphia.
Bradley, John S., New Haven Car Register Co., New Haven, Conn.
Bragg, F. A., Bragg Fender Co., Troy, N, Y.
Brill, John A., J. G. Brill Co., Philadelphia, Pa.
Brooks, Woodford, Georgia Equipment Co., Atlanta, Ga.
Brophy, W. B., Industrial Mutual Insurance Co., Boston.
Brown, Geo. S., Brown & King Supply Co., Atlanta, Ga.
Brown, R. S., Westinghouse Elec. & M'f'g. Co., Boston.
Bruner, H. C., Pontiac, Ill.
Bullen, D. R., General Electric Co., Atlanta, Ga.
Burke, J. W., E. T. Burrowes Co., Portland, Me.
Burns, Chas. F. Chas. F. Burns & Co., Rochester, N. Y.
Burter, O. A., Genett Air Brake Co., New York.
Bushe, J. F., Keller Printing Co., New York.
Bushnell, E. M., Bushnell Manufacturing Co., Easton, Pa.
Buss, E. W., Chapman Valve Manufacturing Co., Chicago, Ill.

Caldwell, Edward, Street Railway Journal, New York.
Candee, W. L., Okonite, Co., New York.
Card, J. F., Card Electric Co., Mansfield, O.
Card, Geo. H., Card Electric Co., Mansfield, O.
Carpenter, Reid, Card Electric Co., Mansfield, O.
Carson, J. H., Sterling Supply & Mfg. Co., New York.
Carry, E. F. Jr., Wells & French Co., Chicago.
Case, F. R., Hoopes & Townsend, Philadelphia.
Cicott, Frank X., Pettingell Andrews Co., Boston.
Clark, W. C., Westinghouse Electric & Mfg. Co., Pittsburgh, Pa.
Clark, Charles S., Pennsylvania Steel Co., Boston, Mass.,
Clark, Wm. J., General Electric Co., New York.
Cobb, J. M., Fairbanks, Morse & Co., Chicago, Ill.
Colgate, Geo. L., The Geo. L. Colgate Co., New York.
Collins, G. Frederic, Valentine & Co., New York.
Collins, W. F., *Western Electrician*, Chicago, Ill.
Cornell, Chas. L., Electrical Engineer, Hamilton, O.
Corson, H. H., General Electric Co., Nashville, Tenn.
Cooagna, Chas. A., R. D. Nuttall Co., Cincinnati, O.
Cooke, Wm. E., Peckham Motor Truck & Wheel Co., New York.
Cooke, W. J., McGuire Manufacturing Co., Chicago, Ill.
Coolidge, Dan'l, The Johnson Co., Johnstown, Pa.
Crandall, W. M., United States Street Car Fender Co., New York.
Crane, W. F. D., H. W. Johns Manufacturing Co., New York.
Crawford, R. A., R. A. Crawford Manufacturing Co., Pittsburgh, Pa.
Crossman, T. C., Official Stenographer, Brooklyn, N. Y.
Crowley, H. J., General Electric Co., Philadelphia, Pa.
Curwin, M., J. G. Brill Co., Philadelphia, Pa.
Curwin, Sam., J. G. Brill Co., Philadelphia, Pa.
Cushing, Geo. A., Adams & Westlake Co., New York.

Deegan, Thomas, The Stirling Co., Chicago, Ill.
Dewitt, E. F., E. F. Dewitt & Co., Lansingburgh, N. Y.
Dorley, E. C., Rankin & Fritsch F'ndry & Mach. Co., St. Louis, Mo.
Douglass, W. A., *The Car*, Chicago.
Davis, H. M , *Electric Power*, New York.
Dean, D. B., Terre Haute Car Manufacturing Co., Chicago, Ill.
Degenhardt, F. E., Standard Underground Cable Co., Chicago, Ill.
Devon, Geo., Post-Glover Electric Co., Cincinnati, O.
Dick, Henry C., Flood & Conklin, Newark, N. J.
Dutton, W. A., Dorner & Dutton Mfg. Co., Cleveland, O.

Edwards, B. E., Maxwood Brake Shoe Co., La Crosse, Wis.
Ellicott, Jos. R., The General Agency Co., N. Y.
Ellis, L. J., Norfolk & Western Railroad, New York.
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Evans, H. C., The Johnson Co., New York.
Evans, H. F., Hartford Woven Wire Mattress Co., St. Louis, Mo.
Evans, O. C., The Johnson Co., Cincinnati.
Evans, Powell, Wm. Wharton, Jr., & Co., Philadelphia.
Ewing, Geo. C., Composite Brake Shoe Co., Boston, Mass.

Fairbrother, Howard, New York Leather Belting Co., New York.
Fairchild, C. B., Street Railway Journal, New York.
Faucett, E. V., Safety Clutch Brake Co., Philadelphia.
Field, C. J., New York City.
Field, John M., Berlin Iron Bridge Co., East Berlin, Conn.
Fisher, W. H., Hoopes Manufacturing Co., Springfield, O.
Flanders, C. T., Morris, Tasker & Co., Philadelphia, Pa.
Foster, Horatio A., *Electric Power*, New York.
Foster, H. H., Dreher Manufacturing Co, New York.
French, A., A. French Spring Co., Pittsburgh, Pa.
French, P. N., A. French Spring Co., Pittsburgh, Pa.,
Fuller, C. M., Davis Car Shade Co., Portland, Me.
Fuller, F. G., with W. R. Brixey, New York.

Gerleman, J. F., American Electrical M'fg. Co., St. Louis, Mo.
Gordon, J. R., Westinghouse Elec. & M'fg. Co., Charlotte, N. C.
Gould, W. H., H. W. Johns Mfg. Co., New York.
Graham, Geo. H., Chicago Electric Truck Co., Chicago, Ill.
Gray, L. E., Adams & Westlake Co., Chicago.
Greene, B. E., *Electricity*, New York.

Hanna, J. A., McGuire Manufacturing Co., Chicago, Ill.
Harding, H. Mc.L., Walker M'fg. Co., New York.
Harris, H. E., Harris Life Guard, Boston.
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Haskell, G. M., J. G. Brill Co., Philadelphia.
Hastings, Jack, *Atlanta Journal*, Atlanta, Ga.
Hatch, E. B., Johns-Pratt Co., Hartford, Conn.
Haycox, W. E., Fulton Truck & Foundry Co., Mansfield, O.
Hazelton, Wm., 3rd., Fulton Truck & Foundry Co., New York.
Heinrichs, E. H., Westinghouse Electric & Mfg. Co., Pittsburgh.
Heinrichs, R. O., Weston Electrical Instrument Co., Newark, N. J.
Heulings, Wm., J. G. Brill Co., Philadelphia.
Hicks, L. P., Davis Car Shade Co., Portland, Me.
Higgins, E. E., New York.
Hills, E. P., Davis Car Shade Co., Portland, Me.
Hoagland, C. A., John H. Graham & Co., New York.
Hoch, Sydney, Central Electric Heating Co., New York.
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Hopkins, J. M., Barney & Smith Car Co., Dayton, O.
Hough, A. H., Brush Electric Co., Cleveland, O.
Huntress, Franklin E., Laconia Car Co., Laconia, N. H.
Hurley, Thos. A., Holmes, Booth & Haydens, Waterbury, Conn.
Hunt, W. T., *Electrical Age*, New York.

Issertel, H. G., H. W. Johns Manufacturing Co., New York.

Jackson, J. H., Jackson & Sharp Co., Wilmington, Del.
Jeans, J. F., Thiel's Detective Service, St. Louis, Mo.
Jerome, R. S., Central Electric Heating Co., New York.
Jessop, Wm., Technical School, Atlanta, Ga.
Johnston, W. J., *The Electrical World*, New York.
Jones, B. J., Sargent & Lundy, Chicago, Ill.
Jones, F. W., Anniston Cordage Co., Anniston, Ala.

Kelley, W. M., Carnegie Steel Co., Atlanta, Ga.
Kenfield, H. J., *Street Railway Review*, Chicago, Ill.
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Kissam, George, Carleton & Kissam, New York.
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LeVan, W. B., Jr., Brooklyn Car Wood & Veneer Works, Bklyn., N.Y.
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Martin, T. C., *Electrical Engineer*, New York.
Mason, W. R., Mason Electric Co., Chicago, Ill.
Mayer, Chas. J., R. D. Nuttall Co., Philadelphia, Pa.
Meaker, J. W., Meaker Manufacturing Co., Chicago, Ill.
Meier, E. D., Heine Safety Boiler Co., St. Louis, Mo.
Mercur, R. J., New York Car Wheel Works, Buffalo, N. Y.
Myers, Louis E., Electrical Installation Co., Chicago, Ill.
Miles, Fred, Southern Electric Works, Atlanta, Ga.
Millen, Thos. C., with Chas. G. Smith, New York.
Mitchell, R. R., Robert Mitchell & Co., Montreal, Can.
Moan, A. J., Wadhams Oil & Grease Co,, Milwaukee, Wis.
Morgan, D. Goode, *Atlanta Journal*, Atlanta, Ga.
Morrell, Frank A., Lewis & Fowler M'f'g. Co., Brooklyn, N. Y.
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Myers, Garson, Standard Railway Supply Company, Chicago, Ill.

Naeef, M. A., Civil Engineer, Atlanta, Ga.
Nagle, Jas. W., *The Car*, Philadelphia.
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Partridge, Arthur S., St. Louis, Mo.
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Powers, E. L., *Electrical Industries*, Chicago, Ill.
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Pratt, Geo. E., Jackson & Sharp Co., Wilmington, Del.
Price, Chas. W., *Electrical Review*, New York.
Pugh, D. W., John Stephenson Co., New York.
Pugh, John S., Dorner & Dutton Manufacturing Co., New York.

Randall, F. C., J. G. Brill Co., Chicago.
Ransom, H. N., Consolidated Car Heating Co., Albany, N. Y.
Record, E. A., Vacuum Oil Co., Boston, Mass.
Regenstein, J., Jr., Georgia Equipment Co., Atlanta, Ga.
Rein, Gustav, St. Louis Register Co., St. Louis, Mo.
Reinoehl, Chas. W., Pennsylvania Steel Co., Steelton, Pa.
Rhotehamel, J. H., Columbia Incandescent Lamp Co., St. Louis, Mo.
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Richardson, W. J., Secretary, Brooklyn, N. Y.
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Rogers, Frank A., Fulton Truck & Foundry Co., Cleveland, O.
Ross, E. L., Chapman Valve Mfg. Co., Indian Orchard, Mass.
Russell, F. D., Rochester Car Wheel Works, Rochester, N. Y.
Rutherford, J. A., Westinghouse Elec. & Mfg. Co., Pittsburgh, Pa.

Scarritt, S. G., Scarritt Furniture Co., St. Louis, Mo.
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Streeter, G. A., Wadhams Oil & Grease Co., Milwaukee, Wis.
Stump, C. E., *Street Railway Gazette*, New York.
Sullivan, M. J., *The Electrical World*, Chicago, Ill.

Taft, Benjamin, Industrial Mutual Ins. Co., Boston, Mass.
Taylor, John. Taylor Electric Truck Co., Troy, N. Y.
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Taylor, W. H., STREET RAILWAY JOURNAL, Chicago, Ill.
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Vail, J. H., Electrical & Mechanical Eng. & Trading Co., New York.
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Wadhams, G. A., Wadhams Oil & Grease Co., Milwaukee, Wis.
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Wessels, E. J., Genett Air Brake Co., New York.
Whipp, Geo. S., Lewis & Fowler Co., Brooklyn, N. Y.
White, T. C., Central Union Brass Co., St. Louis, Mo.
Whitehead, E. J., Stilwell-Bierce & Smith-Vaile Co., Dayton, O.
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Wirt, H. C., General Electric Co., Schenectady, N. Y.
Wood, Chas. N., R. D. Nuttall Co., Boston.
Woodward, C. F., Wakefield & Stoneham St. Ry., Wakefield, Mass.
Woodward, J. H., Benedict & Burnham M'f'g. Co., New York.
Wyman, Edward B., Central Electric Heating Co., New York.
Wurts, Alexander Jay, Westinghouse Elec. & M'f,g. Co., Pittsburgh.

Yardley, John H., Philadelphia Car Wheel Co., Phila., Pa.

Zimmermann, W. F., Westinghouse Electric & Mfg. Co., New York.

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We heartily invite correspondence upon all subjects of interest to street railway men. Information regarding changes of officers, new equipment, extensions, etc., will be greatly appreciated for our official directory and news columns. We especially invite the co-operation of all interested to furnish us particulars that the directory may be correct and of the greatest possible value.

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The Convention at Atlanta was successful in every material respect. "The first Southern city to receive the Association" opened its arms with a cordiality and heartiness of welcome most gratifying to all its guests. The hotel accommodations—and all know to how great an extent the success of a convention depends upon these—were ample and satisfactory to a degree surprising to those who feared that Atlanta was too small a city to properly take care of so large a convention. The magnitude of these street railway conventions, and the business and social standing of the representatives in attendance, is now so generally understood, that great preparations are made, not only to provide sufficiently for physical comfort and well being, but to see that social entertainment is not wanting. The privacy of a city's clubs is guarded with a care almost as jealous as that of its homes. It was, therefore, a graceful and not undeserved compliment to the Association, that its members were freely welcomed to the privileges of Atlanta's most exclusive clubs, and that a special club reception even should be tendered to those who, while entire strangers to Atlanta's ladies and gentlemen, were yet recognized as possessing, as a body, all the attributes which go to form the best society in all sections of the country.

* * * * *

We speak strongly of the social life at Atlanta, not only because it formed so enjoyable a feature of the week, but because it almost interfered in some degree with the real business of the Convention. The pressure upon the time of the Association, particularly in these later years, has become too great to permit sufficiently careful consideration and discussion of the many valuable papers which represent the best thought and effort of the members. Five papers out of eleven presented at Atlanta were read by title only, and but three of these were discussed to any extent by the delegates. This is wrong, and we are glad, indeed, that the Executive Committee has taken steps to correct this tendency to haste by providing for a four days' session instead of three. It is unfortunate that the remedy cannot be officially applied at next year's Convention. Would it not be possible—since the Association is shown by a test vote to be unanimously in favor of a four days' session—for the manufacturers to have their exhibits ready for inspection at Montreal on Tuesday instead of Wednesday, and for the delegates to reach the convention city next year one day earlier than usual, so as to perform one of the most important parts of the convention function, the investigation of new apparatus?

* * * * *

The exhibition of apparatus and material at Atlanta was exceptionally fine, and there is no doubt that the time and effort annually given to this branch of the convention work is well spent, and brings about a closer understanding and harmony of interests between the manufacturers and the street railway operators, than could possibly be achieved in any other way. The Exposition Buildings were large enough to permit the most lavish use of space, and the display of apparatus was attended, not only by the street railway men themselves, but by large numbers of Atlanta citizens, attracted by the novel and gaily painted cars sent down by the manufacturers for operation on the city street railway lines, and by the glowing and highly eulogistic accounts of the Convention given in all the Atlanta papers.

* * * * *

One of the most high-minded and prominent street railway men in the country has been chosen by the Association as its next president. Mr. Joel Hurt, president of the Atlanta Consolidated Street Railway Company, is too well known to require extended mention here. Those who were at Atlanta, found that, in his case, a "prophet has honor in his own country," for no one, in that enterprising city of the South, stands higher than he in the confidence and respect of his fellow citizens. Mr. W. Worth Bean, the newly elected first vice-president, enjoys the almost unique distinction of having attended every one of the thirteen conventions of the Association. His election is a well deserved recognition of his faithfulness and devoted services. The selection of Montreal as the Convention City for 1895, was, on the whole, a wise action, notwithstanding the fear, which is probably quite groundless, that trouble will be experienced in getting the exhibits through the Custom House. The Association is *American*, not National, and in no way can this fact be more clearly enunciated than by the choice of a Convention city outside the United States; and when, as it happens, this city is one of the most enterprising, progressive and hospitable on the American continent, no fault can be found with a determination to ignore precedent, and to strike out into new fields.

* * * * *

It is difficult to speak of the retiring president of the Association without a feeling of regret that a personality so fine and so unusual cannot come more intimately into our daily lives. Mr. Payne is a man of broad human sympathies, of wide culture and experience, and of so kindly and generous a nature that respect for his achievements in the world of railroad finance and management is lost in what almost dares to be a warm personal affection. It has been the privilege of the Association to honor him with its highest office. He has given care and attention

to its interests to a degree hardly to be expected from one whose burdens and responsibilities in other fields are so serious. In leaving the presidency of the Association he takes with him the knowledge that no "past president" will be held in more genuine honor and esteem than he who has so wholly won our hearts in this—the twelfth year of the Association's life.

The Papers and Committee Reports prepared for the Association were of important practical interest and these, together with the president's address and certain important communications received from absent members, will furnish material for serious thought and careful experimental work during the coming year. The address of President Payne dealt briefly with the effects of the financial depression, the elevation of the street railway business to a higher plane by the general adoption of electricity, difficulties in dealing with adverse legislation, the overvaluation of franchises, and the insurance problem—all matters of anxious consideration among conscientious managers. Well deserved tributes were paid to the memories of William Richardson and William J. Stephenson, who have done so much for the Association, and whose loss is keenly felt by its members.

* * * * *

Mr. Dyer's report on "The Best Methods of Treating Accidents" was a clear and valuable description of the system adopted by the prominent Chicago companies to ascertain the real responsibility for accidents and to effect settlements as promptly as possible without costly litigation. The brief discussion following the report might well have been heard by the public at large, and the newspaper editors of the country in particular, for the speakers expressed so keen an appreciation of their duties and responsibilities to those injured by their cars that the current opinion about the heartlessness of corporations would surely be revised in the interests of justice. Street railway companies almost invariably bear the expense of temporary medical care and transportation, without regard to their corporate liability for the accident; they seek to avoid damage suits by offering a prompt settlement, thereby saving to themselves the expense and annoyance of protracted litigation, and to the claimants the exactions of "shyster lawyers," who are only too anxious to take up all cases, just or unjust, against corporations; and, finally, they often donate to the injured in simple charity what could not, by any process of law or reason, be obtained from them otherwise.

* * * * *

The report on "A Standard Form of Street Railway Accounts" was in some respects admirable, in others disappointing. The subdivision of accounts recommended by the committee has evidently been thought out with care on the broad lines laid down by railroad practice, but we believe that Mr. Bettis has missed the true function of railway accounting in laying so much stress upon its usefulness to bankers, brokers, stockholders and directors. The real purpose of systematic accounting is the continuous education of *managers*. It is the manager—not the stockholder or director, except in a far more general way—who wants to know whether or not he is operating his power house as cheaply per car mile as his neighbor is doing elsewhere, if his repairs of roadbed or cars are above the average, or if he is making a saving in special departments from year to year. His stockholders look to him for broad results—for net earnings, in short, as Mr. Bettis well says—but what is not clearly brought out is that, in order to produce these results, the manager must himself classify his expenditures so as to know how to effect economies in every detail of his business. Street railroad accounting, therefore, is by no means superfluous, and its importance should not be depreciated in the slightest degree. As to Mr. Bettis' subdivision of operating expenses, our chief criticism would be that he puts too many principal accounts upon his report blanks. For example, the ten headings which he gives under "Transportation Expenses" are valuable as ledger accounts and for the detailed information of managers, but for reports to directors they may all be grouped under two, or at the most three, principal headings, such as "Operation of Power Station," "Operation of Rolling Stock," and "Miscellaneous," the latter covering, perhaps, "Wrecking," and one or two other charges not easily classified. Other changes in nomenclature and arrangement might be suggested, and we doubt if the classification can be considered final, or will be generally adopted by the members of the Association. Nevertheless, Mr. Bettis' work in this direction is worthy of commendation, and we shall hope to see a steady advance towards uniformity in street railway accounting, to the end that those who are directly responsible for the profitable operation of their properties may be guided by statistical wisdom of real and not of doubtful value.

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There is no question that T rail construction is, in important respects, superior to any other from a street railway point of view, hardly excepting even the long time favorite center bearing rail, whose usefulness is lessened by the necessity of using wooden stringers in the older construction, and by the side strains produced by heavy teaming in the more recent girder construction. The real question has been, therefore, whether or not it is possible in individual cases to get permission to use T rails. The excellent methods described by the special committee appointed at the last Convention and by Mr. Harrison, seem to point to an affirmative answer to this question, although much missionary work will doubtless have to be done before sceptical city fathers can be convinced that there is any rail construction half so good as the ideal (*sic*) side bearing sections.

* * * * *

Mr. Foster's paper on "City and Suburban Electric Railways" contained many valuable and suggestive hints as to the possibilities and limitations of different classes of street railway work. Mr. McCulloch's paper on "Mail, Express and Freight Service for Street Railway Cars" was a revelation to us, and we have no doubt to many street railway operators also, of what has been accomplished in this branch of profit making, hitherto considered an almost unimportant side issue. Mr. McCulloch's suggestions are practical and absolutely sound, and his paper has, in addition, a distinct literary merit not always found in technical dissertations. Mr. Beckley's paper on "Transfers on Street Railways" deals with a subject of great importance, and one in which the Rochester Railway Company has taken advanced ground.

The Special Papers presented at Atlanta were five in number, viz., "Brake Shoes," by Powell Evans and D. F. Henry; "Power Brakes *vs.* Hand Brakes," by E. J.

Wessels; "The Use of the Booster on Electric Railway Circuits," by J. H. Vail and S. H. Wynkoop; "The Destructive Arcing of 500 Volt Fuses," by W. E. Harrington; and "Taxation," by Allen R. Foote. It was unfortunate that the time of the Association did not permit a thorough discussion of these papers, as there were a number of very important facts brought out in them, and the experience of others would undoubtedly have proved of great value.

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The first two papers mentioned treat upon a subject to which very little attention has been given in previous conventions, though the subject of braking is a most important one. The authors of the first paper mentioned echo a popular sentiment in advocating the standardizing of brake shoes, for, however difficult and even inadvisable it might be to attempt to standardize many portions of a street railway company's rolling stock, wheels and brake shoes seem certainly adapted for standardization. A company using several different types of trucks has often as many different styles of brake shoes, a number of each of which must be kept in stock.

The energy of a car can be overcome by the brake shoes in two ways; first, through the generation of heat by friction, and second, by grinding off the metal in either shoe or wheel or both, which also produces heat. As the shoe is cheaper than the wheel it seems better to provide a shoe which will itself wear out, rather than one which will wear the wheel out. According to Mr. Evans, it is generally conceded that the use of chilled iron or steel brake shoes is not advisable. Practice in many cases seems to be tending towards some type of composite shoe. Conditions of grades, track, etc, vary so widely, however, that we are not disposed to agree with Mr. Evans' statement that the best material for shoes on one road would be best for all. The Master Car Builders' Association, to whose 1893 proceedings reference was made in the paper, continued at its last (1894) annual meeting, its committee on the subject of brake shoes. Very valuable work, it was reported, is being performed under the direction of this committee, although the results have not yet been announced. Seven steam railway companies are carrying on a series of tests to determine the value of different materials for brake shoes under different conditions, and a series of experiments are also being conducted in the same line in the laboratory of the Westinghouse Air Brake Company under the direction of the Association's committee. It should be borne in mind, however, that the conditions on steam railways differ so greatly from those met on street railways that the results of these researches cannot probably be made exactly applicable to street railway companies. The work of a committee therefore, which is to be appointed by the American Street Railway Association will in no respect traverse ground covered by other associations. We regret that in neither of the papers the subject of the effect of braking or of different forms of brake shoes on the life of wheels was taken up. The first paper gave some figures from steam railway practice on this subject, but the wear on street railway wheels from the application of brake shoes, owing to the large amount of grit on the wheels, must make these figures almost useless as a criterion in street railway practice. We would also be very glad to have had some facts presented on the effect of the kind of soil in which the track is laid on the life of the brake shoes and wheels.

Recognition of the need of power brakes on heavy electric or cable cars, especially where there are heavy grades, or where high speed is maintained, seems to be general As Mr. Wessels has well pointed out, many disastrous accidents might have been avoided by the use of a more powerful brake than could be applied by hand. The brake being under more ready control of the operator, we should imagine that the life of wheels might be quite as long under cars equipped with power brakes as with hand brakes, and we would have been glad to have seen some figures on this subject.

* * * * *

On long lines the question of keeping up the voltage at the ends of the line is an important point. A limit will soon be reached where the ordinary feeder system cannot be relied upon, as, with a given percentage loss in the lines, the size of the feeder increases as the square of the distance. In a number of cities an extra positive bus bar is used to keep up the voltage on long lines. This is kept at a higher potential than the main bus bar, and to it any feeder or generator can be connected. The paper by Messrs. Vail and Wynkoop relates to the use of the "booster" system employed to a considerable extent in electric lighting plants. It consists in the use of an additional generator, which is operated from the main circuit, and which raises the voltage of the feeder at the station end to an amount equal to that required at the farther end. The system is, in some respects, superior to that of auxiliary bus bars above referred to. The Poughkeepsie City & Wappingers Falls Railway, the first, we believe, to employ boosters, is described in this issue of the Journal, and the results secured on that road will be watched with interest.

* * * * *

Of the other two special papers, that of Mr. Harrington is interesting, as showing that long fuses do not necessarily guard against short circuits any better than short ones. The economic absurdity of our taxation laws is again described by Allan R. Foote. Street railway companies, like other corporations, as shown in Mr. Foote's paper, pay a double tax, once on their property, and again on the certificates of their stock. Most street railway companies are also taxed over and over again, under the guise of car licenses, compensation for the use of streets, etc. We have always maintained that, as a matter of economic policy, the most liberal treatment of surface transportation systems will be found to be identical with the prosperity of the communities in which they operate, and Mr. Foote's treatises on this subject show that, from the standpoint of justice as well, street railway companies should be relieved of many of the burdens now imposed upon them.

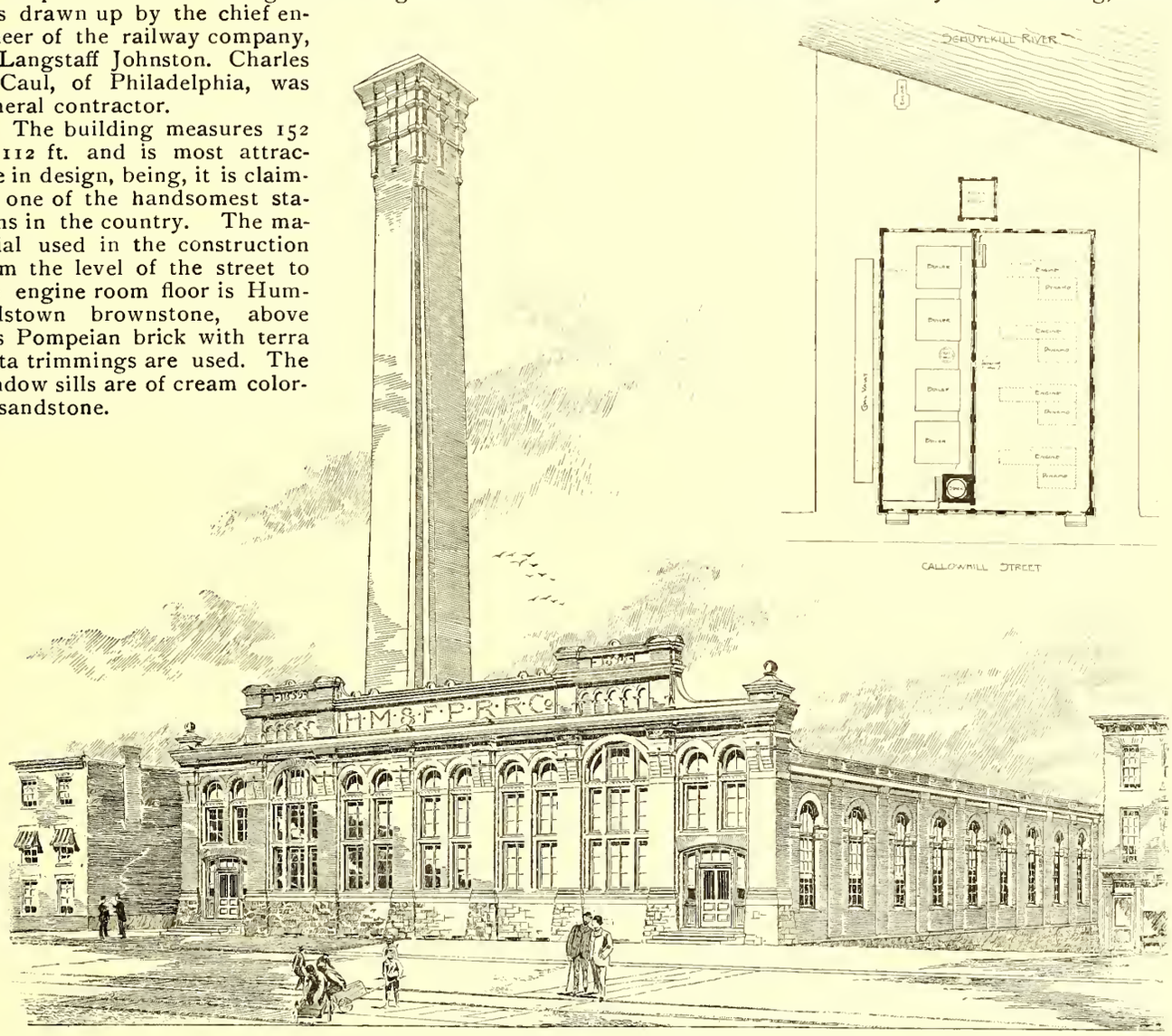
Our Souvenir.

We confess that we were, even at first, a little proud of the "Souvenir," which we issued last month, in commemoration of the tenth anniversary of our own birth, and the twelfth anniversary of that of the Street Railway Association, but we were hardly prepared for the storm of congratulations upon our "magnificent special number" which greeted us on every hand at the Convention, nor for the kindly and generous words of appreciation, which have come to us through the columns of our contemporaries in the electrical and street railway field. It is with sincere gratitude, that we say to our friends, and to the Executive Committee of the American Street Railway Association, which has seen fit to honor our Editor with special and favorable mention, that their kindness will never be forgotten.

The Power Station of the Hestonville, Mantua & Fairmount Passenger Railway Company.

A full description of the electric railway system of the Hestonville, Mantua & Fairmount Passenger Railway was published in our last issue, together with several sections of the power station of that company located on the Schuylkill River at 25th and Callowhill Streets. We present on this page an engraving showing the completed power station. The general design of the station was drawn up by the chief engineer of the railway company, A. Langstaff Johnston. Charles McCaul, of Philadelphia, was general contractor.

The building measures 152 × 112 ft. and is most attractive in design, being, it is claimed, one of the handsomest stations in the country. The material used in the construction from the level of the street to the engine room floor is Hummelstown brownstone, above this Pompeian brick with terra cotta trimmings are used. The window sills are of cream colored sandstone.



POWER STATION OF THE HESTONVILLE, MANTUA & FAIRMOUNT PASSENGER RAILWAY CO.—PHILADELPHIA.

As mentioned in our last issue, considerable difficulty was experienced in the construction of the foundation of the building and the solution of this problem required a great deal of study. The machinery which is now being installed will consist of four Greene tandem compound, condensing engines of 500 H. P. each, direct connected to General Electric multipolar generators of 400 K. W. each.

The company hopes to commence operations electrically by December 1.

Rapid Transit in Europe.

At a meeting of the Rapid Transit Commission, of New York, held October 9, W. B. Parsons, chief engineer of the commission, presented a report upon what he saw of European rapid transit systems during the summer visit which he paid to London, Glasgow, Liverpool and Paris. This report included many interesting details of the lines visited. In regard to cost of operation, the report gives the following figures for the City & South London underground electric road, and the Liverpool overhead electric road, covering the half year up to June 30, 1894.

City & South London: Train miles, 8,769 per week; expenses, eight and a half cents per train mile. Each locomotive weighs thirteen and a half gross tons, and draws three thirty-two foot cars at a speed of eleven and a half miles per hour, including stops.

Liverpool elevated electric railway: A total of 265,349 train miles had been run at an expense of less than six cents. The cars are each forty-five feet long, and seat sixteen first class passengers and forty-one of the second class. The trains are made up of two cars each.

Then follows a full description of these railways as well as of the Glasgow rapid transit system and a new electric underground road to be installed in Paris. Of this Mr. Parsons speaks in the highest terms.

Mr. Parsons believes in an underground electric railway for New York, and states that the advice and experience of foreign engineers lean toward keeping the rail level as close to the surface as possible, and that excavating from the surface is cheaper and safer than tunneling, but, if conditions demand, a deep tunnel can be constructed, for which the circular form is best. He also believes that the work can be carried on through a busy street without endangering the houses and without seriously impeding travel.

Two Passengers for One Cent.

A street railway war between the lines of Savannah, Ga., has been in progress all summer and fares have gradually been reduced until, October 15, one of the lines announced two rides for one cent. It is said that the rival company will meet the cut.

The Street Railway System of Roanoke, Va.

Roanoke is a beautiful city of approximately 20,000 inhabitants, situated in the southwestern part of Virginia between the Blue Ridge and Allegheny Mountains and at the junction of the Norfolk & Western, Shenandoah Valley and Roanoke Southern Railways. It has acquired the title of the "Magic City" of the South, from its rapid growth from only 400 inhabitants in 1882 to 20,000 in 1892. As Roanoke had been making advancing strides in other directions, it was necessary, in order to keep up with the procession of progress, that a change be made in the street railway system, and electricity as a motive power be introduced. Up to April 1, 1892, the street railway system of Roanoke consisted of two steam dummy lines running into the suburban towns of Salem and Vinton, the former eight and a half miles distant, the latter two and a half miles, together with about two miles of track in the city proper, with mules as a propelling power. The rolling stock consisted of two steam dummies, five Brill cars and four Stephenson ten foot body cars. These last were some of Stephenson's first make.

On February 1, 1892, the old company was bought out by a new local corporation with a capital stock of $300,000, composed of leading capitalists of the city, and officered as follows: S. W. Jamison, president; Jos. T. Engleby, vice-president; treasurer, Geo. C. McCahan; secretary. Board of directors: Payton L. Terry, Henry S. Trout, S. W. Jamison, Jos. T. Engleby, T. T. Fishburne, James R. Terry and John Sexton.

This new company secured the services of W. Frank Carr, formerly engineer in charge of construction of the large Minneapolis & St. Paul system, as its general manager and engineer. Mr. Carr was given full authority to go ahead and remodel and extend the system. Contracts were immediately let for power plant and rolling stock, the General Electric Company furnishing the station equipment, E. P. Hampson & Company the steam plant, Westinghouse Electric & Manufacturing Company the motor equipment, and the Gilbert Car Company the cars.

On May 12, 1892, the same body of capitalists purchased the plant and franchise of the Roanoke Electric Light & Power Company, capitalized at $55,000, and officered as follows: Jos. T. Engleby, president; S. W. Jamison, vice-president and treasurer; Geo. C. McCahan secretary, with W. Frank Carr as manager and engineer. This purchase facilitated matters for the street railway company by providing it a power house for its machinery.

On June 17, 1892, electricity was first introduced on the Crystal Spring line. June 18, 1892, was "Decennial Day," and on that day the two electric cars carried on the Crystal Spring line 6,997 passengers without a hitch of any kind or an accident to person or property of any kind.

FIG. 2.—T RAIL IN BRICK PAVING—ROANOKE.

By the spring of 1893 the business of the electric light department had increased so considerably, it was decided to build a new power house in the rear of the car house on Earnest Avenue. The contract for the building was let in June and by September 30 was ready for occupancy. Foundations for engines and boilers were built, all outside wiring arranged, switchboard erected and inside wiring ready, the street railway machinery and switchboard appliances were shifted between 10 P. M. and 7 A. M. one night, and cars running without a hitch. The

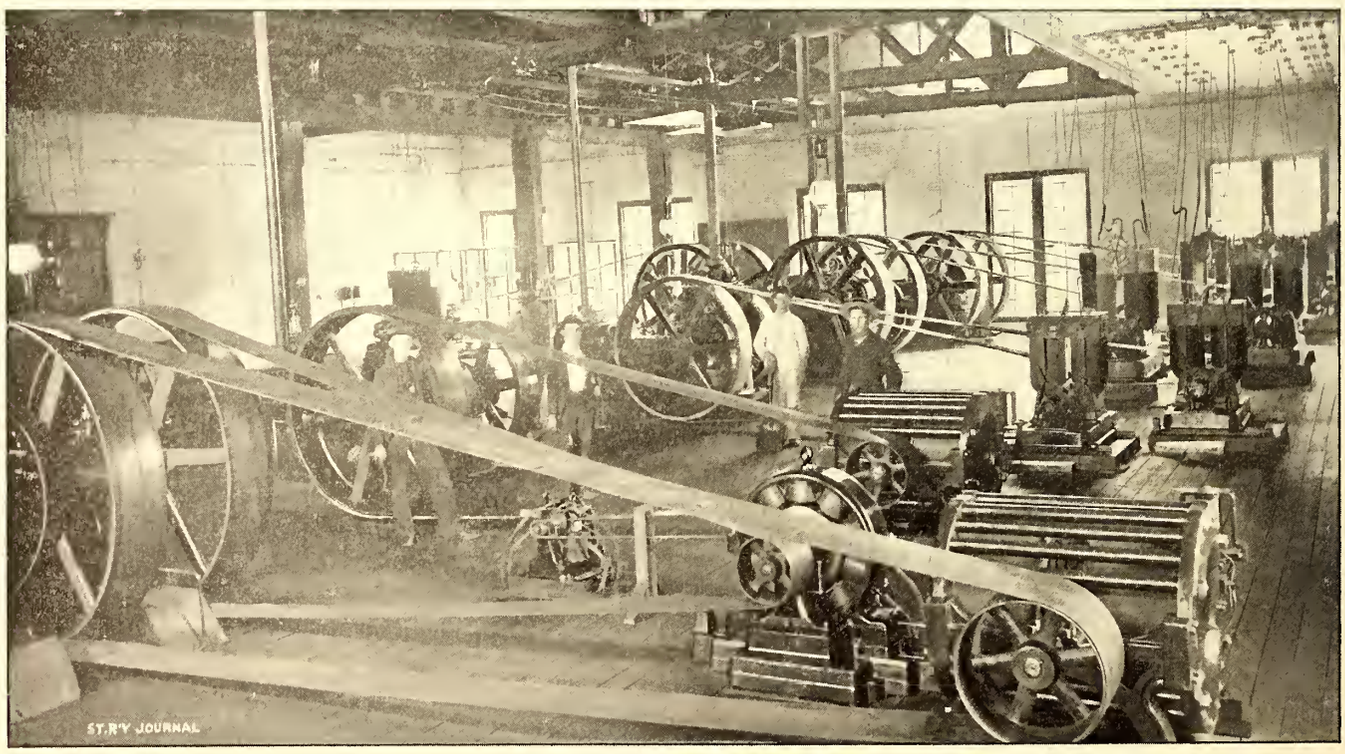


FIG. 1.—INTERIOR OF POWER STATION—ROANOKE STREET RAILWAY CO.

shifting of the electric light plant was somewhat slower, as all outside wiring had to be brought to a new station, and shifting made so as not to interfere with the full twenty-four hours a day run. By December 1, 1893, the new station was complete and in running order. By this change the engine power was increased from 535 H. P. to 1,100 H. P., thereby providing plenty of relay power. The plant has had very few shutdowns, and those due to trolley wires breaking as a rule.

The total damage claims paid by the company, from April 1, 1892 to July 1, 1894, has not exceeded $300. No injury to person is recorded.

All plans and estimates of entire plants of street railway and electric light companies, even to the minutest detail, were made by General Manager and Engineer Carr, and construction of same personally supervised by him. The setting and erecting of all engines, generators and boilers was under the personal charge of W. J. Updyke, chief engineer of power plant.

FIG. 3.—EXTERIOR OF POWER STATION—ROANOKE STREET RAILWAY CO.

The power station measures 95 × 125 ft. and is of brick with three stacks 48 ins. in diameter and 70 ft. high. The engine house is 125 × 55 ft., and contains a 250 H. P. Armington & Sims engine for railway work, with cylinder dimensions 21½ × 18 ins., and for lighting work two 200 H. P. McIntosh & Seymour engines, two 90 H. P. Armington & Sims engines and two 125 H. P. Buckeye engines. The boilers are five in number, two 150 H. P., two 125 H. P. and one 150 H. P., the latter three being of the National tubular type. Stilwell & Bierce open feedwater heaters and Knowles pumps are used.

The water supply is from a private well sixty feet in depth, the city pressure being relied upon for fire protection. For all work the company uses about 1,000 gals. per hour, pumped by a steam pump to a tank directly above the well, giving thirty feet head of water. Vacuum oil is used throughout for lubricating purposes.

The railway generators are two in number, of the 100 K. W. General Electric bipolar type, and are driven from the engines by Graton & Knight sixteen inch belts. Room is provided for adding four 100 K. W. machines. On the switchboards, which were designed by W. F. Carr, each line is provided with an ammeter and fuse switch. The line of the company consists of twenty-two miles of single track with a maximum grade of 7 per cent. T rail is used throughout, sixteen and a half miles being fifty pound rail and the balance twenty-five pound. In the business portions of the city the T rail is laid in brick paving, using next to the rail, both on the inside and on the outside, a special shaped brick. Space is allowed on the inside for the flange of the car wheel. This construction has proved very satisfactory. About three miles of track is also laid on macadam paved streets. Johnson girder switches and the standard crossings of the Weir Frog & Crossing Company are employed.

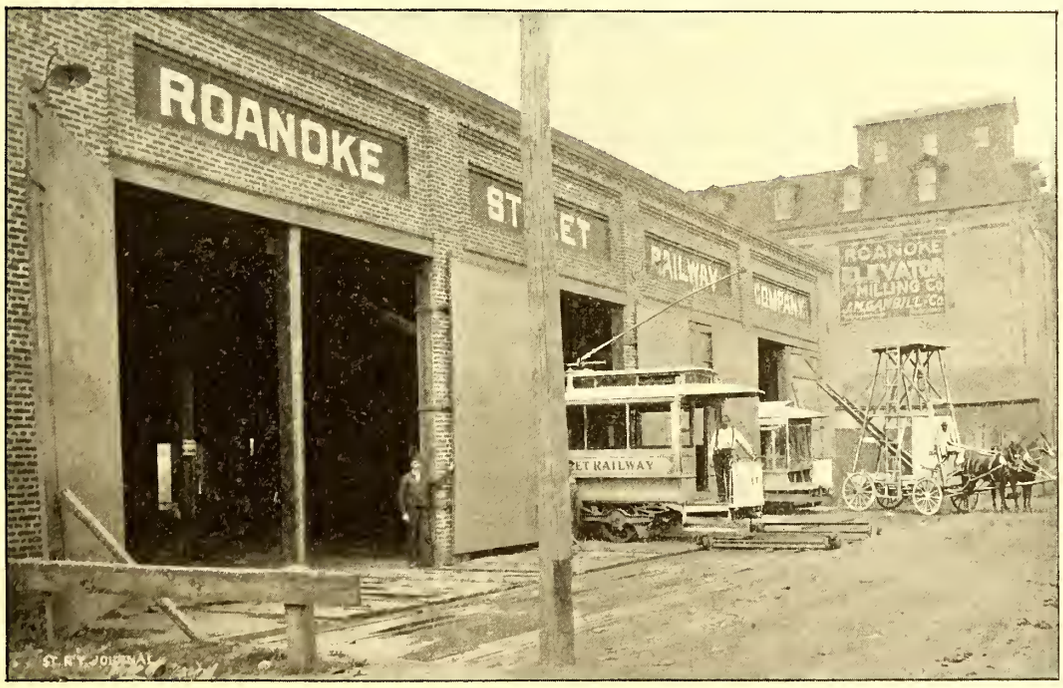


FIG. 4.—CAR HOUSE—ROANOKE STREET RAILWAY CO.

The trolley wire employed is No. 0 hard drawn copper, supplied by John A. Roebling's Sons Company, and the feed wires vary from No. 0 to 0000. A double riveted bond, using No. 4 B. & S. iron wire, is employed. The overhead construction is very substantial, requiring very little attention to maintain, and one man has been found all that is necessary to perform all the repairing for both the street railway and electric light service wires.

The rolling stock consists of seven sixteen foot Gilbert cars, with cherry finish, two Brill cars, with twenty-five foot bodies, same finish, and two open Laclede cars. The short cars are mounted on Baltimore trucks, and the long cars on the Brill Eureka maximum truck. The motors used are five Westinghouse No. 3, three G. E. No. 14, and one G. E. F 40. The cars are equipped with Stanwood steps, Nuttall trolleys, and Lewis & Fowler registers. The company also owns a tower wagon and hurry-up team.

The car house is of brick, 85 × 100 ft., which, as shown in Fig. 5, has eight parallel tracks. Owing to the fact that the street upon which the car house is located is very narrow, and to lack of room on the car house lot, preventing the use of curves for entering, a transfer table was erected outside of the car house, as shown in Fig. 5. The car house is provided with a pit room for repairs, a shop and store room. The pit room has a glass roof, and the shop contains two lathes, testing boards, a blacksmith shop, etc., allowing the company to rewind all its own armatures, and do other repair work necessary. The car house force consists of four men—a car repairer, blacksmith, general helper and night inspector. One of the motormen works part of the day on a car, and part keeping up all electrical repairs. Wages paid to motormen are twelve and a half cents per hour, and on one high speed line fifteen cents. The cars on the latter line make an average of 200 miles per day.

The company early realized the advantage of keeping careful account of all expenses, and though all clerical

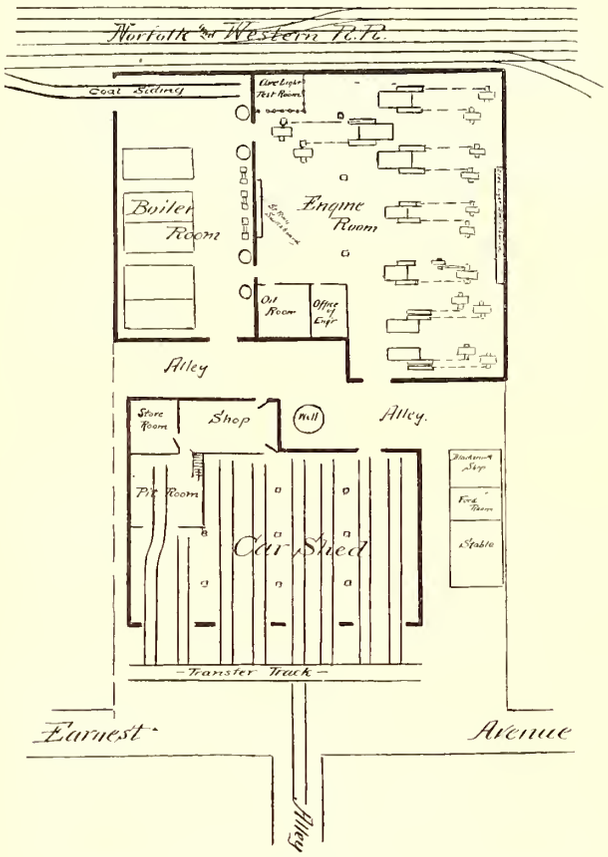


FIG. 5.—PLAN OF CAR HOUSE AND POWER STATION—ROANOKE STREET RAILWAY CO.

work of both the lighting and railway company is done by Secretary McCann and one assistant, the details of operation are kept with the minutest detail. The number of passengers carried during the last fiscal year was 750,000, and the average expense per car mile last year was ten cents, it being brought up to this figure by damages due to a cloudburst. From January 1, 1894, to August 1, the company operated at an expense per car mile of $.0798, this item including all disbursements except for taxes, insurance and interest. Pocahontas coal, costing $2.75 per ton, is used. From January 1, 1893, to January 1, 1894, the maintenance of cars and motors was found to average $.016 per car mile, that of overhead wires, $.0014 per car mile; that for track, $.0053 per car mile.

Transportation of Milk by Electric Cars.

The electric railway at Newburgh, N. Y., has commenced the transportation of milk between the suburban districts and the New York steamboat landing.

Notes from England.

By Our London Correspondent.

The recent publication of the half yearly reports of the London and Liverpool electric railways, and of the Birmingham and Edinburgh cable tramways, has led to quite a lively discussion in some of the English technical journals, as to the merits and demerits of the two kinds of traction. Fresh fuel has also been provided, by a statement having been made on the traction charges for the first year's working on the South Staffordshire electric tramway. The various figures may be put briefly thus: City & South London electric railway: Expenses per train mile, 31.64 cents; receipts, 51.2 cents. Liverpool electric railway: Expenses, 27.04 cents; receipts, 36.2 cents. Birmingham cable tramway: Expenses per car mile, 12.06 cents; receipts, 24.78 cents. Edinburgh cable tramway: Expenses, 10.66 cents; receipts, 21.78 cents. The South Staffordshire electric tramway figures, which include only running charges and repairs (the former embracing wages, fuel, stores, water and gas, and sundries) are given at 8.12 cents per car mile, or about one cent more than the cost on the Birmingham cable line for the same items in the past year.

The trains on the London and Liverpool electric railways each weigh, empty, about thirty-one tons. The cable cars on the tramways cited are of the usual eight wheeled type, weighing from four to six tons each. On the electric accumulator line in Birmingham there has been little improvement, and the expenses still slightly exceed the receipts. The tramway company wishes to install the trolley wire on the route, but the Town Council refuses its sanction. The South Staffordshire figures are interesting as far as they go, because they are the first accounts of expenses of a street railway worked by the overhead conductor in this country. The item of repairs amounts to only 2.16 cents per car mile, and there is no doubt this will be exceeded in future years.

The *Electrical Review* thinks the Liverpool results excellent, and points out that what is required is not a decrease in working expenses, but an increase in receipts per train mile. It also comes to the important conclusion that the poles and wires of the trolley system for street lines must he endured, as it is the only method by which the benefits of electric traction on streets and roads can be secured. After this conversion of an eminently cautious and conservative technical journal, we may hope to see a corresponding change in the attitude of local authorities.

The installation of the cable system on the tramways of Newcastle and Edinburgh still hangs fire owing to various little difficulties, but I learn on inquiry that these are likely to be only of a very temporary nature. Where town councils, as in the case of these two cities, have so large a hand in the matter, any change of importance can only come about slowly.

Much importance is attached to the electric tramway recently opened in the Isle of Man, from Douglas to Laxey. The traffic, however, will be very light in the winter season, though heavy in summer, when holiday makers in tens of thousands resort to the island. For this reason the expenses and receipts of the line will not form a very good basis on which to calculate for a city traffic which is more constant all the year round. The equipment, which is by Messrs. Mather & Platt, seems to be of the best.

There has been a good deal of grumbling among a section of the public in Glasgow regarding the working of the tramways by the Town Council, an arrangement, it will be remembered, which came into force last summer. This, of course, was inevitable, no matter how efficient the management, for every ratepayer thinks the Council ought to suit his particular convenience and ideas. This is one of the evils of municipal tramway working. The Tramway Committee of the Corporation has, however, shown a fair amount of backbone, and if it can only resist pressure which would have injurious effects if yielded to they may get along fairly well. The weekly gross receipts are gradually going up, despite the com-

petition of the omnibuses run by the displaced tramway company, but, of course, no record of the expenses has yet been issued. Nothing is heard of yet of the adoption of electric and cable haulage which was so lavishly promised at one time.

A trial on a somewhat extensive scale is promised of the Lührig gas motor for street cars. The Blackpool, St. Anne's & Lytham Tramways Company, a newly formed body, proposes the construction of a line, eleven miles long, between the towns in Lancashire whose names it bears, and the twenty five cars required are to be worked at a rate of nine cents per car mile run for seven years by the Traction Syndicate, Ltd., which owns the Lührig patent rights. It is estimated that the shareholders will get a dividend of 7 per cent. per annum.

Decision Reversed in the Case of the Detroit Railway Company.

On October 2 the United States Court of Appeals, sitting at Cincinnati, handed down a decision in the celebrated Detroit Street Railway case, unanimously reversing the opinion of Judge Taft of the United States Circuit Court and deciding the case in favor of the company.

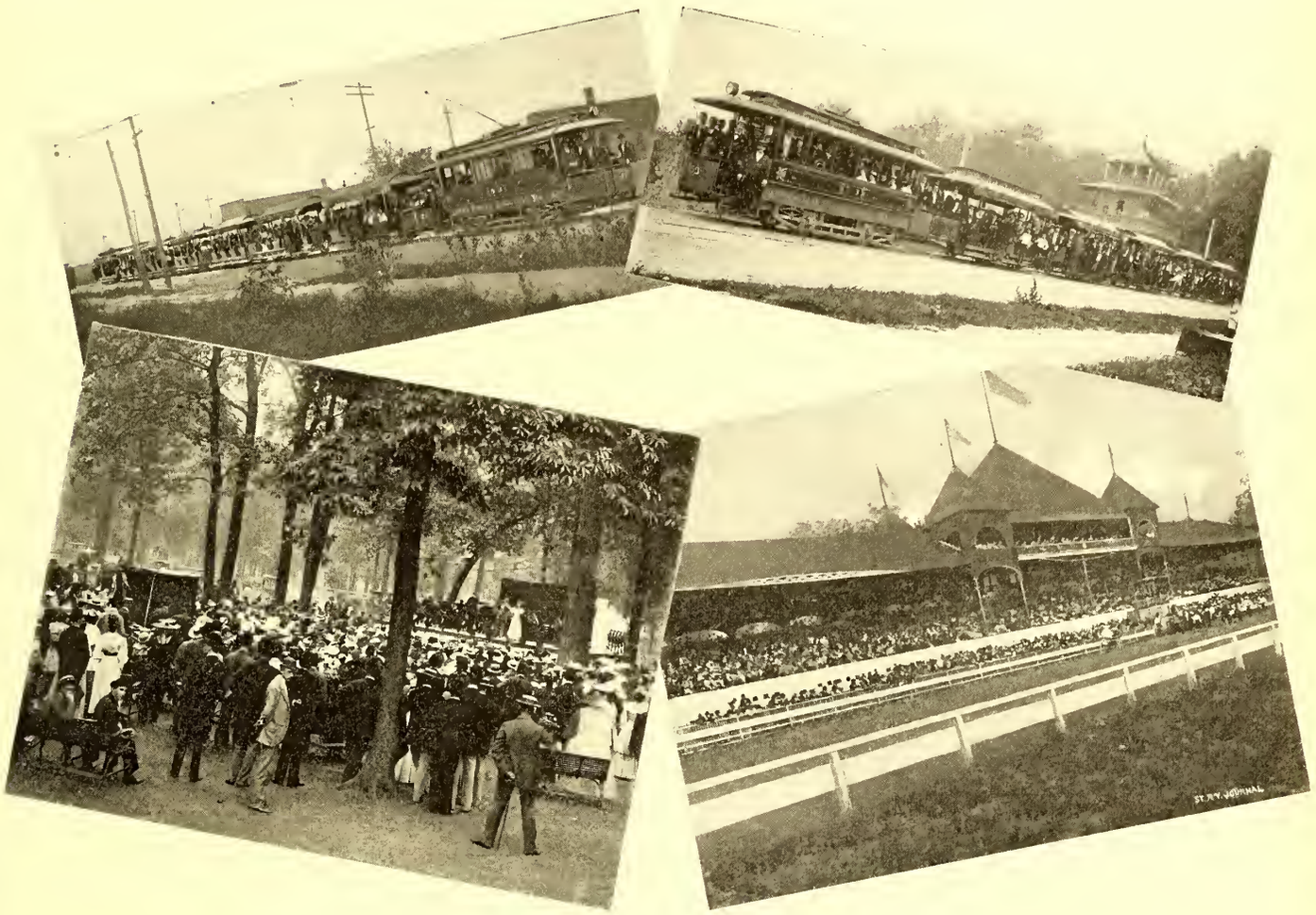
The suit was brought by the city to oust the Detroit Street Railway Company from the streets. The principal point involved was the right of the Detroit Street Railway Company to operate under franchises which ran for a period longer than its corporate existence.

The company's charter expired in 1893, and the franchises extended to 1905. The suit was first begun in March, 1892, and was taken to the United States Court, where Judge Taft decided in favor of the city, declaring the franchises void. The control of the street car lines had in the meantime passed into the control of a new company, the Detroit Citizens' Street Railway Company. The case was appealed to the United States Supreme Court, and was by that body sent to the United States Court of Appeals. Arguments were made before the latter court at Nashville last June.

The property has just passed into the hands of R. T. Wilson & Company, the New York bankers.

Promoting Traffic in Terre Haute.

We present some views herewith of scenes on the Terre Haute Electric Railway during the great light harness race meeting held in that city during September. One view shows a motor car drawing seven trial cars, all of which are crowded with passengers. The estimated number of passengers on the train was 500. The equipment of the motor car consisted of two thirty horse power, No. 12 motors of the Westinghouse type mounted on a Peckham truck. Another view shows the same motor car drawing a train of five loaded trailers from Collett Park, the passengers numbering 400. A view of the Terre Haute race track, on September 14, when Robert J., made 2.02½, breaking the world's record for harness racing, is shown in the engraving in the lower right hand corner of the group.



VIEWS ON THE LINE OF THE TERRE HAUTE ELECTRIC RAILWAY CO.

The Terre Haute Electric Railway Company has paid special attention to the subject of promoting traffic on its lines, and at Collett Park has provided a number of attractions which have added to the revenue of the road. The view shown in the lower left hand corner of the group on this page is from a photograph taken at the park during a Sunday concert by musicians employed by the railroad company.

THE first electric cars of the Fair Haven & Westville Street Railway Company of New Haven, Conn, were put in operation last month. Power is being taken from the power house of the Winchester Avenue Railway Company, and the New Haven Street Railway Company, pending the completion of the company's own power station.

The Poughkeepsie City and Wappingers Falls Electric Railway.

By J. H. Vail.

In the conversion of this road from horse to electric traction, it was deemed advisable, in view of the substantial character of the horse stables and car barn, to utilize the existing buildings. To this end, the old brick horse stable, sixty-three feet square and twenty-five feet high, was remodeled by the removal of the interior studding and beams, and the building of a central twelve inch brick partition. The two rooms formed by this partition wall have been utilized for boilers and engines respectively.

The boiler room contains two 300 H. P. Stirling boilers, and is of capacity sufficient for a duplicate battery. It is floored with brick laid in cement and grouted. In the engine room are two 200 K. W. General Electric multipolar generators, each of which is direct connected to a 300 H. P. Ball & Wood compound, condensing engine. The foundations for these units are of extremely heavy masonry. As in the boiler room, there is here space for duplicating the plant. The condenser, feedwater heater and boiler feed pumps are located in the rear of the engines and close to the division wall. All of the piping is carried in pipe channels below the floor line, the floor being composed of twelve inches of concrete surfaced with an inch of Portland cement. The pipe channels are provided with cast iron covers, set flush with the flooring, this arrangement affording ready and convenient access to any part of the piping system.

The switchboard is built up of black enameled slate slabs of the General Electric panel type. The dynamo leads run beneath the floor in vitrified pipe conduits. In general effect the interior of the power house is extremely pleasing ; the walls are painted in buff, and in the engine room there is a Portland cement wainscoting, capped with a three inch pine nosing. There is an abundance of light and ventilation, and the metamorphosis of the old stable is so complete as to defy detection. The old car barn has been entirely remodeled and largely increased in space and convenience. The roof was raised four feet, an extension 30×90 ft. added, and an entirely new front constructed, containing superintendent's office and waiting room on first floor with large and commodious general offices on second floor, and the storage rooms in the basement. The repair shop is situated in the basement and provision has been made for the comfort of the employes by devoting a suitable room to their exclusive use. The superintendent's office and the waiting room are handsomely finished in paneled cherry wainscoting with ornamental steel pressed walls and a delicately tinted ceiling.

The entire car house is in practically two sections, the longer being 194 ft. in depth and the latter 90. There are six tracks in all, four having direct access to the street, the other two being spurs connected with the Hathaway transfer table which cuts across all six tracks near the transverse center of the building.

Several car pits are provided under each track. A convenient place for coal storage is provided under the west car house, giving ready access to the boiler room. This provides a space for a storage of upwards of 1,000 tons of coal. Berger & Slater executed the mason work, and Isaac G. Manning, of Poughkeepsie, attended to the wood construction.

The track system consists of ten miles of single and double track, laid through the streets of the city. A spur ten miles in length reaches from Poughkeepsie along the Ridge Road to Wappingers Falls and thence to New Hamburg. The heaviest grades within the city limits occur on that portion of the line leading from the steamboat landing on the Hudson River, near the New York Central depot, up Main Street for about one mile. The grades here vary from 5 to 8½ per cent. The track on Main Street is laid with the best ninety pound girder rail, rails and special construction being furnished by the Johnson Company. The remainder of the track is laid with sixty pound and fifty-six pound T rails. The track is bonded throughout with two No. o B. & S. copper wires, riveted in place, all of the electric bonding being performed by the employes of the railway company, under charge of the superintendent.

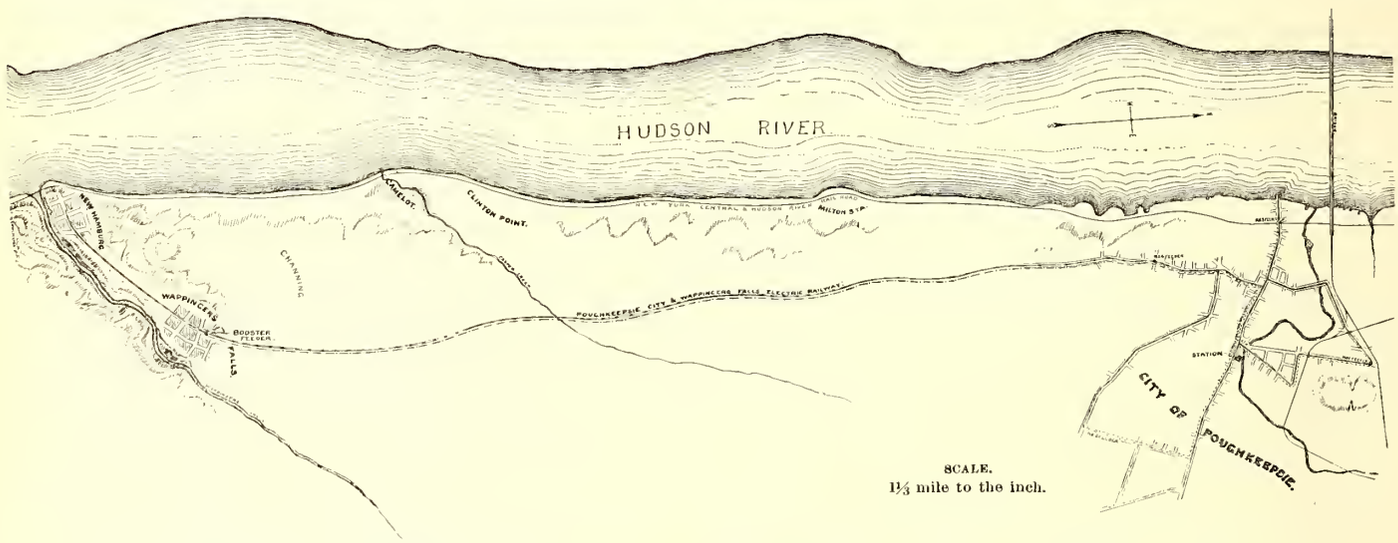


FIG. 1.—ROUTE OF POUGHKEEPSIE & WAPPINGERS FALLS ELECTRIC RAILWAY, SHOWING "BOOSTER" FEEDER.

The line leading from Poughkeepsie to Wappingers Falls is nearly straight in its course, the grades varying from 1 to 8 per cent. Between Wappingers Falls and New Hamburg, where the track leads down toward the Hudson River, the grade is as heavy as 9 per cent

The line construction consists of the usual form of stout, octagonal, hard pine poles with treated butts. These are set up on Main Street and Market Street, the remainder of the poles throughout being round, shaved and painted. Span wire construction is used throughout the city and bracket construction is used on the line leading to Wappingers Falls and New Hamburg. The trolley wire is No. o B. & S., supported by five-sixteenths inch stranded steel span wire. The line material is of the H. W. Johns manufacture.

Feeders of No. oooo B. & S. wire are placed as required for electric distribution within the city limits. An interesting feature of the feeding system is the application of the booster idea to the long distance feeder from the power house to Wappingers Falls. The feeding point is eight miles from the station with a 9 per cent. grade two miles beyond the end of the feeder. By the use of the booster it is possible to properly supply this section of the line through two No. oooo B. & S. wires. The Woodbridge & Turner Engineering Company constructed the line work, while the track construction, including bonding, was under the charge of Superintendent C. M. Davis, of the railway company.

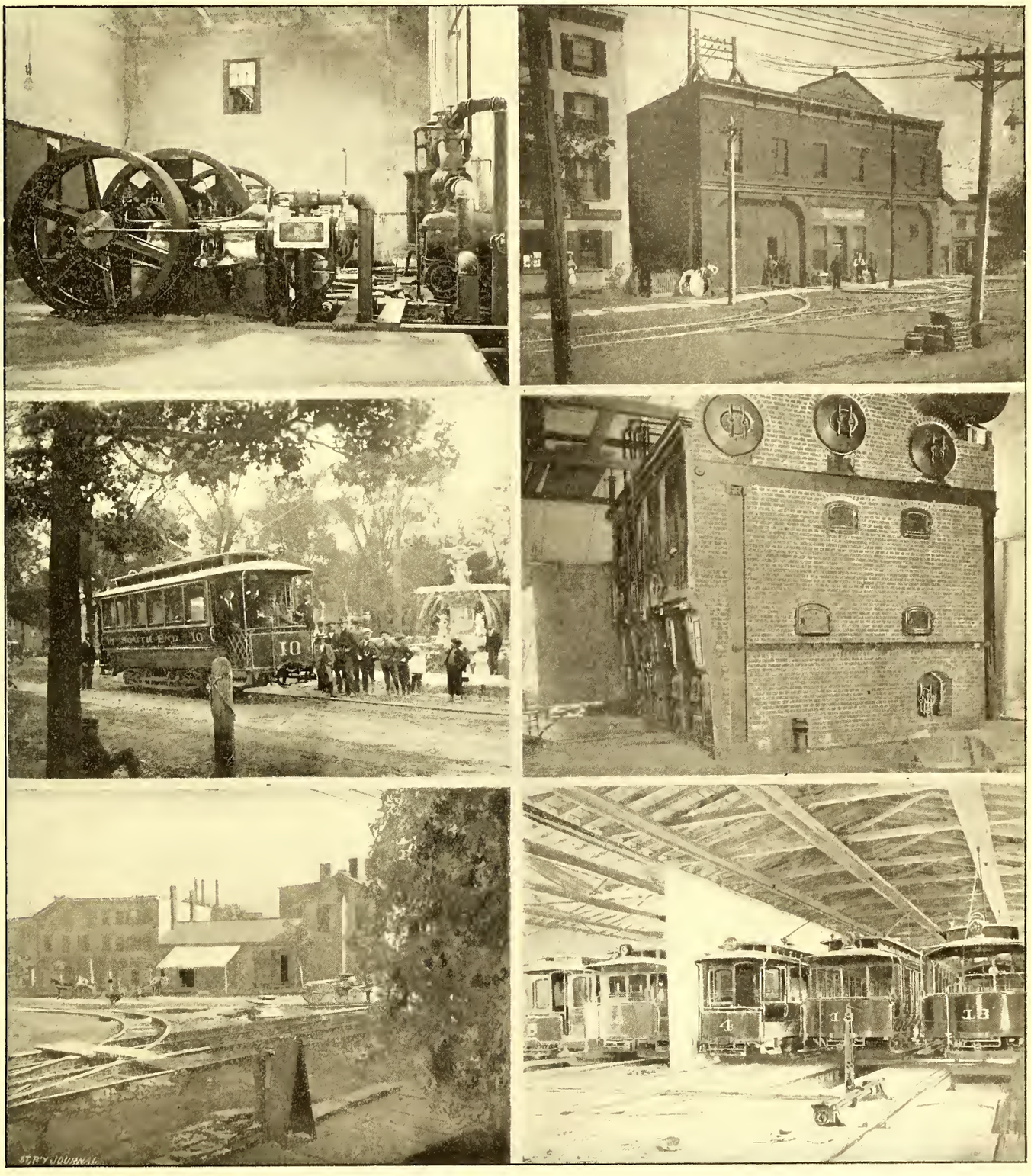
The rolling stock equipment consists of eight closed

motor cars, eighteen feet in length, built by James A. Trimble, of New York; ten open motor cars, thirty feet in length, built by the American Car Company, of St. Louis, Mo., and two closed vestibule cars, made by the latter company. All motor cars are mounted on the latest type of Peckham cantilever truck. The electric equipment of the cars consists of two G. E. 800 motors per car, with type K series multiple controller. All cars are fitted with the Star electric headlights, and all closed cars with the American Car Heating Company's electric heaters.

Several of the views were taken while the construction was under way. Details shown in this way are frequently more interesting than photographs of the completed construction could ever be. Surveys were made by Lawlor & House, civil engineers of Poughkeepsie. The entire engineering supervision of the work has been under the charge of J. H. Vail, chief engineer of the Electrical & Mechanical Engineering & Trading Company, of New York, from whose offices all plans and specifications were issued.

The new electric railway will supplant an extensive passenger and express stage business between Poughkeepsie and Wappingers Falls. It furnishes convenient transportation facilities between the river front and the higher urban localities, such as Vassar College, the Seminary, the Driving Park, the Insane Asylum, the P. & E. R. R. Depot, and the Cemetery. The same accommodations are offered at the New Hamburg end of the line, which reaches down to the river front.

Maj. J. W. Hinckley, the enterprising and energetic president of the railway company has taken great personal interest in the construction of the entire system,



VIEWS ON THE LINE AND ABOUT THE POWER STATION OF THE POUGHKEEPSIE & WAPPINGERS FALLS RAILWAY.

and the citizens of Poughkeepsie will be largely indebted to him, as the means of furnishing in their city a first class electric railway system.

Street Railway Park Attractions at Toledo.

The Toledo Electric Street Railway Company, of Toledo, O., has purchased an extensive grove, comprising about forty acres, in the outskirts of that city. A large number of electric lights, fountains, etc., will be installed here in time for the next summer season. The ground lies on the shore of the lake, and a promenade will be built over the water to a distance of over 700 ft. At the terminus of this pier, a casino 200 × 300 ft. will be built, with a promenade forty-four feet wide at the ends and twenty feet at the sides. The casino will be constructed largely of glass, and when illuminated by electricity will present a very brilliant appeanrace. A large restaurant will be located on the second floor.

No admission fee will be charged, but only those who come on the cars of the electric railway company will be permitted entrance.

The Hartford & West Hartford Horse Railroad Company of Hartford, Conn., has completed a traffic arrangement with the Hartford Street Railway Company, by which the cars of the former company reach the center of the city over the Farmington Avenue Division.

The Peekskill (N. Y.) & Cortland Electric Railway Company was incorporated with the Secretary of State on October 9, with a capital of $150,000. Among the directors are Edgar Peckham, of New York City, Joseph H. Burton, of Kingston, and Wm. D. Southard, of Peekskill.

Trolley Parties in Boston.

The popularity of excursions taken on electric roads in chartered cars has led to the introduction on a number of electric railways of cars designed especially for this service. These are used not only for excursions to points of interest in summer, but also all through the year for special parties to balls, theatres, weddings or similar occasions, and they often provide a not inconsiderable source of income. We illustrate on this page one of two cars, Nos. 924 and 925, recently built for this service on the West End Railway of Boston. As will be seen, they are fitted up in an exceedingly handsome and tasteful style.

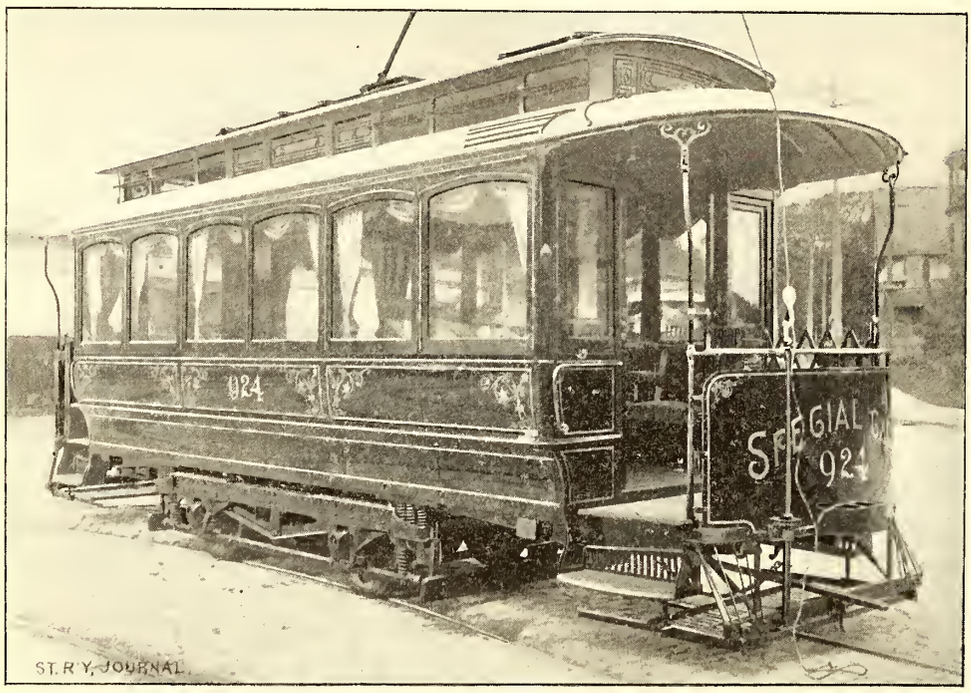


FIG. 1.—PARLOR CAR FOR EXCURSION PARTIES—BOSTON.

The car bodies measure twenty feet in length by seven feet four inches in width, and are fitted with twenty arm-chairs supplied by the Wakefield Rattan Company, of Boston, upholstered in peacock blue brocaded plush. Underneath each chair is a wire hat holder. The cars are finished in mahogany. The doors are double, opening from the center. The outside colorings are black and gold, relieved with crimson in the lower panels. The trucks are painted a dark green.

The car bodies are from the works of J. M. Jones' Sons, of West Troy, N. Y. They are mounted on "West End" trucks built by the Laconia Car Company, of Laconia, N. H. The motors on No. 924 are twenty-five horse power each, furnished by the Westinghouse Electric & Manufacturing Company. Those on No. 925 are twenty-five horse power each, furnished by the General Electric Company. The controlling mechanism of both cars was furnished by the General Electric Company, and electric headlights are used.

FIG. 2.—INTERIOR OF PARLOR CAR—BOSTON.

All Steel T Rail Track Construction in Terre Haute.

In connection with the paper read by R. B. Harrison at the Atlanta Convention on the "T Rail Construction at Terre Haute," the accompanying engravings showing the method of laying the all-steel T rail track in that city will be of interest. The construction is that of the Paige Iron Works Company, of Chicago, using seventy-two pound Shanghai T rail of the Illinois Steel Company.

The type of ties, joints and bonds used are described in Mr. Harrison's paper on pages 696, 697, 698 and 699 of this issue. Each different process in track construction is shown clearly in a separate engraving.

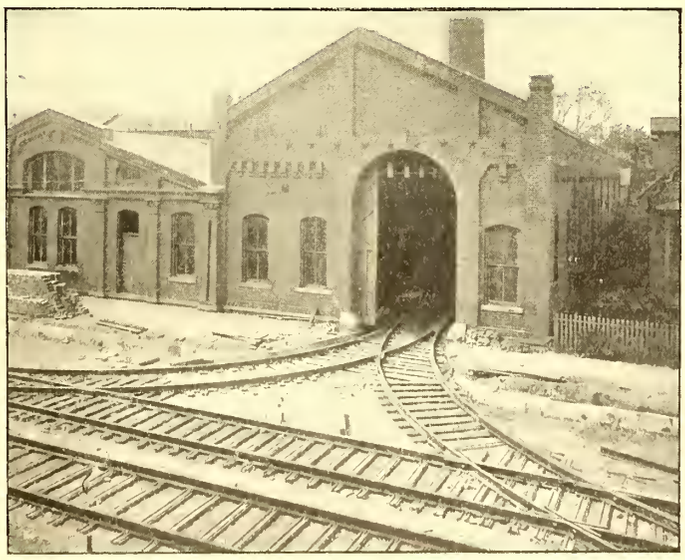
FIRST PROCESS—ROLLING THE ROADBED AFTER EXCAVATION.

SECOND PROCESS—PREPARING TO RECEIVE THE BROKEN STONE—SETTING STAKES.

THIRD PROCESS—LAYING THE FIRST EIGHT INCHES OF BROKEN STONE.

FOURTH PROCESS—TRACK READY FOR TAMPING WITH LAST FOUR INCHES OF BROKEN STONE.

DOUBLE AND SINGLE CURVES AT POWER HOUSE.



Y CURVES AT POWER HOUSE.

The Street Railway System of Bridgeport, Conn.

The Bridgeport Traction Company is the title of a corporation chartered July, 1893, to operate the entire street railway system in Bridgeport, Conn. The company has a perpetual franchise, and is a consolidation of the Bridgeport Railway Company, the East End Railway Company and the Bridgeport Horse Railway Company.

The line of the company at present consists of thirty-one miles. Extensions are being made to Fairfield and Southport, and when completed the system will comprise about forty miles of track. The first electric cars were put in operation on August 23, 1894, and the company now has fifty motor cars in regular service.

The power station is located on Sea View Avenue near Adams Street, and is a substantial brick and iron building measuring 98 × 110 ft. The iron work was furnished by the Berlin Iron Bridge Company, and is of that company's standard construction for power stations.

The engine room is located on the Sea View Avenue side of the building, and is provided with large windows on three sides, affording good light and ventilation. The engine equipment consists of one Providence Greene tandem compound engine, with cylinder dimensions 12 × 20 × 42 ins., belted direct to one G. E. 200 K. W. generator by a two-ply, twenty-four inch wide Palmer belt, and two Watts-Campbell tandem compound Corliss engines, with cylinder dimensions 20 and 38 × 42 ins., direct connected to G. E. 300 K. W. generators. These generators are of the latest eight-pole type, and are provided with their own equalizing switches on the machines, and are run at 100 revolutions.

The switchboard is of marbleized slate and handsomely designed and is conveniently located in the center of the engine room. It is sixteen feet long and eight feet wide, and is provided with standard General Electric appliances and Weston ammeters and voltmeters.

All steam piping and wiring, excepting the live steam pipes, are under the floor. A ten ton traveling crane, built by the Berlin Iron Bridge Company, is provided for conveniently handling the machinery when repairs are needed. Separate jet condensers, of the Watts-Campbell type, are attached to each engine, and are located under the floor between the engine foundations. Condensing water will be taken from a canal to be built in the rear of the power station.

The boiler room is located in the rear of the engine room, and contains eight horizontal, return tubular boilers, arranged in batteries of two each. The boilers are sixty-six inches by seventeen feet each, and were built by the Pacific Iron Works, of Bridgeport, Conn.

VIEWS OF POWER STATION, DURING COURSE OF CONSTRUCTION—BRIDGEPORT TRACTION CO.

The stack is of iron, with brick lining, and is located in the center of the room, between the boilers. It is 100 ft. high, with a ninety inch flue, and was built by the Pacific Iron Works. Coal will be brought direct to the power house by boats, and carried to the boiler room by conveyors. Drew feedwater heaters and Curtis separators are used. The piping is covered with asbestos insulation, supplied by the International Asbestos & Mining Company, of Newark, N. J. Ashcroft gauges and Deane feedwater pumps are employed.

The track construction consists of six inch T and nine inch girder rail, supplied by the Pennsylvania Steel Company, and Wm. Wharton, Jr., & Company, of Philadelphia, and weighing 70 and 90 lbs. to the yard. The rails are spiked directly to ties laid eighteen inches between centers. The trolley and feed wires were supplied by the Bridgeport Brass Company, and are supported by iron and wooden poles. The trolley wire insulators are of the H. W. Johns type, similar to those employed on the Newark & South Orange Railway, and

described in the October issue of the STREET RAILWAY JOURNAL. The span wire is from the Washburn & Moen Company.

The return circuit is constructed in the most substantial way. The bonds consist of two No. 00 wires at each joint, using the General Electric channel pin, and connected to supplementary overhead return feeders, of 500,000 circular mils, at distances of every 1,000 ft.

The cars were built by the John Stephenson Company, Ltd., and the Barney & Smith Car Company. A view of one of the former cars is given on this page. The length of body is 18 ft. 7 ins. and the width is 7 ft., the car being constructed with a high monitor top roof trussed and braced. There are six large windows of double thick French glass on each side, running the full length to the top rail, and all windows are supplied with blinds.

CLOSED CAR—BRIDGEPORT TRACTION CO.

The interior is fitted up in an extremely tasteful style. The ceilings are paneled with bird's-eye maple. The interior trim of the car is ash and cherry, and all metal appointments are of full bronze. The seats and backs are covered with best Wilton carpet, and there are rolling wood mats on the floor. Twin doors are provided at each end of the car, each pair of doors being operated by one movement of the hand, affording the most ample facilities for ingress and egress of passengers, and in hot weather contributing to thorough ventilation. The cars are also provided with electric bells, and push buttons at each side pillar, so that passengers, while seated, can readily signal to the conductor their desire to stop. The interior of car is lighted with combination lamp for both incandescent lamps and candles.

The platforms at each end of cars are large and commodious with corner posts supporting bonnets. They are closed on alternate sides, the open side being supplied with lazy tong or folding gates, so that the danger of accidents in boarding the cars is reduced to the minimum. Trolley boards are provided on the roof with ready means for access thereto.

The bodies are mounted on Brill trucks and are equipped with two G. E. 800 motors. Electric signal bells are provided and Lewis & Fowler fare registers are employed on all of the cars.

The car house is located on Stratford Avenue, between Stratford and Bridgeport, and is a substantial brick building, with a storage capacity for 150 cars.

The company owns a large plot of ground adjoining the power station, and will shortly commence the construction of machine and repair shops, which will be equipped with the latest type of machine tools for making all necessary repairs.

The company has a capital stock of $2,000,000. The authorized funded debt is $2,000,000. Of this only $1,300,000, in 5 per cent. first mortgage bonds, have been issued, and these cover the forty miles of track together with all equipment, real estate and other property of every description. They were sold to Redmond, Kerr & Company, the well-known New York bankers. The financial standing of the company is high and the bonds command a good price, being exempt from taxation in Connecticut. No further bonds can be issued except for new construction, and these only at 75 per cent. of the actual cost of such improvements, as provided by the laws of the state of Connecticut, which are extremely strict in regard to the bonding of railroads, all bonds being issued under the supervision of the Comptroller of the State, at not over 75 per cent. of the actual cost of the property bonded.

The officers of the company are: President, W. H. Heft; vice-president, Elias Ward; secretary, Thomas L. Watson; treasurer, Wm. Sheerer; general manager and superintendent, Andrew Radel.

C. J. Field, as the city's electrical engineer, has had the planning and supervision of the entire work, assisted by Jos. McElroy. Mr. Field was also the designer of the power station of the Newark & South Orange Railway, described in our October issue.

New Car House of the Metropolitan Street Railway.

A car house, claimed to be the largest in the world, will be erected at Seventh Avenue, 50th and 51st Streets, New York, by the Metropolitan Street Railway Company of that city. Running back to power house on Sixth Avenue, the building will be 200 ft. 10 ins. × 618 ft. 1 in., with an average height of 100 ft. The estimated cost of the car house is $1,000,000.

The building, as shown in the engraving, will be four and five stories in height. The five story portion extends back about 100 ft. on the side streets, the remainder being of the four story construction. The structure will be thoroughly fireproof with steel skeleton construction, terra cotta floor, roof arches, partitions, etc. The walls will be of brick faced with iron-speckled brick, and the trimmings will be pink granite, fire-flashed terra cotta, and at certain parts ornamental cast iron.

50TH STREET CAR HOUSE—METROPOLITAN STREET RAILWAY CO., NEW YORK.

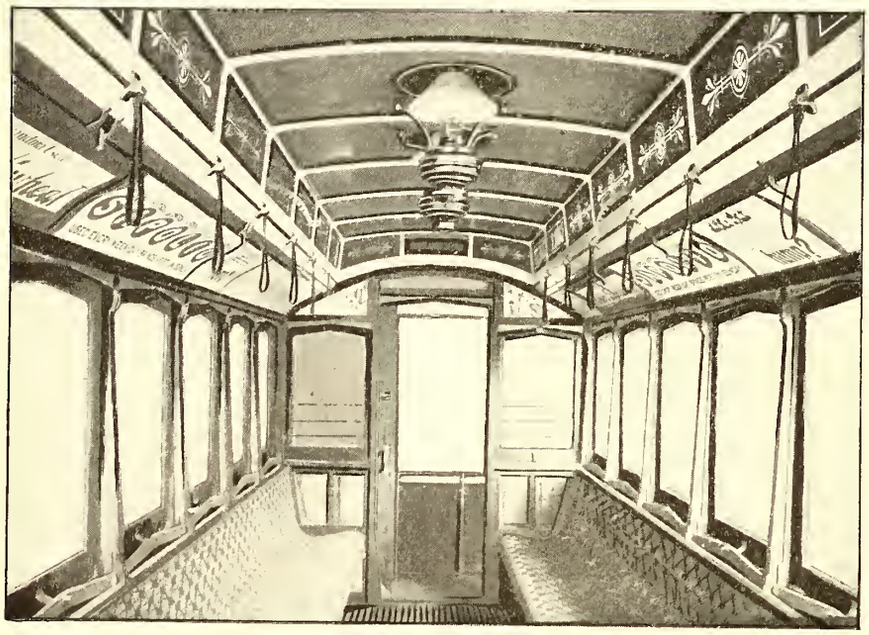
The front portion of the ground floor will be for the accommodation of the Broadway and Columbus Avenue cable cars, receivers' and starters' offices, employes' waiting rooms and the Sixth and Seventh Avenue horse cars. The repair pits will occupy the rear of the building. On the Seventh Avenue front will be located the superin-

tendent's office and offices connected with the operating department of the roads, with entrances on the 50th Street side of the building. The balance of the building will be occupied by employes' reading rooms, store rooms, repair shops, feed mill, feed, hay and car storage. There will be stable accommodations on second and third floors for 1,500 horses, and space for 650 cars. There will be six large cars, two freight, and one passenger elevators, all of most modern and improved make.

The building will be constructed in sections, this course being made necessary owing to the fact that the operation of the roads can not be interfered with. The work of removing a portion of the present structure is now under way. Work on the new building for which contracts have been awarded will commence soon. Forty per cent. of the building will be fully completed by May 1, 1895. The construction is in charge of F. S. Pearson, chief engineer of the company, and A. V. Porter, architect of the Metropolitan Traction Company.

Rebuilding Short Cars.

The Dry Dock, East Broadway & Battery Railway Company, of New York, having decided to change the equipment of one of its lines from short twelve-foot cars, which had been in use for some years, to sixteen and two thirds foot cars, found that there was practically no market for the former cars. Although well built, as the long service on the company's lines shows, the cars were practically unsalable. The company therefore decided to rebuild these cars, extending them about five feet, and as the company has quite extensive car building shops this was possible. The company has just completed the construction of one car under the direction of its master mechanic, C. E. Garey, and an inspection of the car recently made by a representative of the Street Railway Journal showed that the result was an exceedingly handsome and tasteful car. The car is also very interesting from the fact that it includes a large number of novel features, the invention of Mr. Garey.



INTERIOR OF CAR REBUILT BY THE DRY DOCK, EAST BROADWAY & BATTERY RAILWAY CO.—NEW YORK.

The first impression made upon a person entering the car is its extremely light and high appearance. The ceiling of the car is actually lower than many other cars run upon the line, but this effect is secured by employing a light paneled, bird's-eye maple ceiling, painting the inside frieze panels white and removing all straps and rods from the upper part of the car. The register rod is carried under a moulding forming part of the advertising rack frame on one side of the car, and the rod for operating the driver's bell is carried under a similar moulding on the other side. The register and bell are operated from various points in the car by handles. There is no hand strap rail, but the hand straps are hung on small brackets. This prevents any passenger from monopolizing two or three straps at one point.

Another striking feature of the interior of the car is that it is perfectly symmetrical. There are even no end lamps. The lighting of the car is all done by two large Howard lamps of thirty-five candle power each—working power thirty candles—located in the center of the car and giving sufficient light to allow of newspapers being read in any part of the car.

The ventilator deck contains eight lights on each side, four of them opening for ventilation and the other four—two at each end—are immovable and contain the names of the principal streets through which the car runs, in white letters cut in red glass. Over each door and underneath the bonnet there is an *ever open* ventilator, protected by silver wire netting. This remedies a fault in most cars which have ventilators that do not ventilate. The car is provided with seven windows on each side with Gothic heads extending to the eaves of the car, two more on each side than with the twelve foot cars, the pillars remaining the same distance as in the short car.

The interior finish of the car is in mahogany. Many of the trimmings are of especial and attractive design, and a fare wicket of an especially ingenious type is employed. Slats running lengthwise are used on the floor. At the ends the slats are cut off to facilitate sweeping. The exterior finish of the car is quite tasteful, the main panel being of lemon yellow with red trimmings, and the lower panel is white. The car weighs only 4,600 lbs., or or 600 lbs., lighter than the standard sixteen-foot cars of the company. The cost of rebuilding the car is estimated at $500, and the company will probably transform all of its short cars in this way. The wheel base is six feet two inches, and the car is equipped with the Garey brake gear. It is now running on the Cortlandt and Grand Street Ferry branch of the company's system.

Good Cable Records in New Zealand.

The Mornington Tramway Company, Limited, operates two cable lines in Dunedin, New Zealand, one from Dunedin to Mornington, and the other from Mornington to Maryhill. The main line, that from Dunedin to Mornington, is one mile in length (double track). The vertical rise is 450 ft.; the grades traversed are 1 in 6 and the curve radius 250 ft. The length of cable, spliced and running, is two miles ninety-five yards, and the speed of travel is eight miles per hour. The extension line, that from Mornington to Maryhill, is half a mile long (single track). The grade is 1 in 3½; the curve radius 75 ft.; the length of cable spliced and running, 1 mile 143 yds.; and the speed, eight miles per hour. The records made by the four best wearing cables will be of interest. The first on the main line did service during 3 years 4 months and 25 days, running 172,391 miles. The second for the same line was taken out on July 13, 1893, after 3 years 7 months 5 days' service, and 180,234 miles running.

The first on the extension line lasted 2 years 8 months 8 days, running 33,550 miles. The second was taken out on February 8, 1894, after 6 years 2 months 10 days' service, and running 53,752 miles.

The ropes in all four cases were supplied by Geo. Cradock & Company, of Wakefield, England, and, naturally, General Manager Eunson, writes that that they are very satisfactory. The last rope on the main line was afterwards sold to a colliery in New Zealand, for use in an inclined plane railway. Other makes of ropes have been used on these lines with the following records—main line: Rope No. 1; 1 year 4 months 26 days—Rope No. 2; 1 year 10 months 28 days.

The record of Craddock ropes on the Roslyn Cable Tramway Company's line at Dunedin, has also been equally good, as will be shown by the following table of records. Cables No. 4, 5 and 6 were of the Cradock make, and cables 1 and 2 were made up of odd pieces of colliery ropes bought locally.

Cable No.	3	1 year		1 month		3 days.	
" "	4	2	"	2	"	11	"
" "	5	2	"	3	"	6	"
" "	6	2	"	1	"	12	"
" "	7	1	"	6	"	26	"

Rope No. 6, it should be stated, was on during the Dunedin Exhibition, and did exceptionally heavy work.

SOME IMPORTANT EXHIBITS

The general impression of the exhibition of street railway appliances made in connection with the Atlanta Convention was, that it was the best showing that has yet been made. Other exhibitions may have been larger, but none better. Individual exhibits are noticed in the following pages :

The John Stephenson Co., Limited, of New York, was represented at the Convention by D. W. Pugh.

C. R. Vincent, treasurer of the Ball & Wood Company, New York, did the honors for his company at the Convention.

Flood & Conklin, of Newark, N. J., were represented by Messrs. Kuhn and Dick.

A. Whitney & Sons, of Philadelphia, made an attractive exhibit of car wheels and axles.

The Griffin Wheel & Foundry Co., of Chicago, made no exhibit, but was represented by W. F. Newbert.

The Pullman Company made no exhibit, but its representative, W. S. Louttit did some good missionary work.

Levi Dederick, of Albany, N. Y., exhibited a sample of the dual car fender which attracted considerable attention. George Poe was in charge of the exhibit.

The Chapman Valve Co., was represented by E. W. Buss, of Chicago, and made quite an elaborate exhibit of valves of all sizes for power station equipment.

The New York Leather Belting Co., of New York City, was represented by Howard Fairbrother whose headquarters were in one of the Kimball House parlors.

The Baltimore Car Wheel Co., exhibited two large Baltimore trucks, one of which was equipped with G.E. 800 motors, and the other with Westinghouse motors.

The Harris Life Guard was exhibited by H. E. Harris, of Boston, who showed and explained a small working model which was a combined snow sweeper and life guard.

The Lederle-Taylor Co., hydraulic and electrical engineers, whose headquarters are at Atlanta, distributed cards and other literature relating to their engineering business.

The Columbian Hand Strap Co., had an exhibit in connection with that of the Scarritt Car Seat Company, and showed two or three styles of hand straps for street car service.

CONVENTION HEADQUARTERS OF THE STREET RAILWAY JOURNAL.

A CORNER OF THE DAVIS CAR SHADE CO.'S SPACE.

The New Process Rawhide Co., of Syracuse, N. Y., made no exhibit, but was represented by secretary A. C. Vosburgh.

Valentine & Co., of New York, made no exhibit, but were represented at the Convention by their railway agent, G. Fred Collins.

McNamara Brothers, of New York City, distributed as souvenirs some paper weights made of slate which they are placing upon the market.

The Heine Safety Boiler Co., of St. Louis, Mo., distributed literature regarding its boilers. This was done through the company's Southern agent.

The Dreher Manufacturing Co., New York, through its salesman, H. H. Foster, showed samples of its car and motor compound, also lubricating oils.

The Terre Haute Car Manufacturing Co., Terre Haute, Ind., made no exhibit, but was ably represented by D. B. Dean, the Chicago agent for the company.

J. H. Stedman, of Rochester, N. Y., made, as usual, a very striking exhibit of tickets and transfers, a special feature of which was the detective transfer ticket.

The New England Engineering Co., of Waterbury, Conn., exhibited one of its tower wagons, which was kept in practical operation by one of the company's representatives.

The Chicago Electric Truck Co., of Chicago, was represented by Geo. H. Graham, vice-president and patentee, who distributed some fine platinum prints of the Chicago truck.

Morris, Tasker & Co., of Philadelphia, did not make any special exhibit, but were represented by literature distributed by some of their agents who made exhibits in Exhibition Hall.

The Wells-French Co., Chicago, was represented at the Convention by E. F. Carry, Jr., who showed photographs of some handsome street cars that this company has recently built.

The National Lock Washer Co., of Newark, N. J., was represented by R. L. Thomas, and made an exhibit of various sizes of lock washers, from one-quarter to two and a half inches in diameter.

William S. Silver, of William S. Silver & Co., New York, was ex-

tremely liberal with glass writing pens that possessed a novel way of calling attention to their graduated car springs and railway supplies.

The Electric Railway Equipment Co., of Cincinnati, O., was represented by S. J. Wick, who explained to electric street railway men the merits of the steel tubular poles, which this company is manufacturing.

R. W. Hollis, of Atlanta, Ga., showed a two horse power, 500 volt Eddy motor, together with an automatic magnetic cut-out, an automatic, electric elevator controller and a combination D. P. switch and rheostat.

Arthur S. Partridge, of St, Louis, gave out as souvenirs a neat case containing three blue pencils. His general exhibit was made in connection with that of the R. D. Nuttall Company, of which he is the St. Louis agent.

The Safety Clutch Brake Co., of Philadelphia, was represented by E. V. Faucett, of Philadelphia, who exhibited a model, showing a brake outfit with a clutch in the handle, as well as one with the clutch at the platform.

Geo. L. Colgate, of the Colgate Company, New York, talked incessantly about the McIntosh pole paints. Mr. Colgate returned with several good orders in his bosom pocket and pronounces the exposition a perfect success.

The Hale & Kilburn Manufacturing Co., of Philadelphia, showed car seats and car springs with rattan, canvas lined covering, as well as some other styles. Three specimens of the company's well known seats were shown.

E. M. Bushnell, represented the Bushnell Manufacturing Company, of Easton, Pa., who showed both longitudinal and reversible seating for street cars gotten up in various finishes, embracing rattan, plush, leather and carpet.

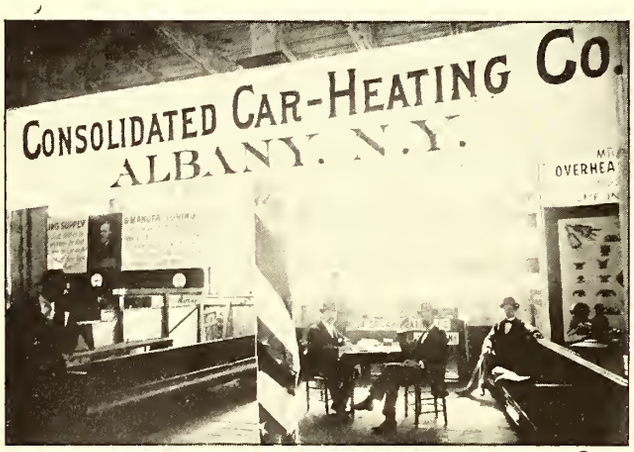


EXHIBIT OF THE CONSOLIDATED CAR HEATING CO., ALBANY, N. Y.

The Storm Manufacturing Co., of Newark, N. J., exhibited a number of its sleet cutting trolley wheels, of which John A. Graham & Company, of New York, are the sole selling agents. The company was represented by C. A. Hoagland.

The Partridge Carbon Co., of Sandusky, O., was represented by Jas. Partridge, general manager, and had on exhibition the self-lubricating motor brushes, of which the company makes a specialty for motors and generators of every type.

The Chicago Raw Hide Manufacturing Co., had a very simple exhibit in the shape of two handsomely finished street car pinions. A number of circulars containing illustrations and descriptions of the company's manufactured articles were distributed.

The Electrical Installation Co., of Chicago, was represented by L. E. Meyers, who distributed printed matter showing the number and extent of the various roads which have been constructed by the company during the past two seasons, aggregating 155 miles.

The Keystone Electrical Instrument Co., of Philadelphia, distributed illustrations and descriptions of its new electrical instruments. both ammeters and voltmeters. The illustrations especially were very conspicuous, owing to their wide distribution about the hall.

Chas. A. Schieren, Jr., was on hand and did the honors for Chas. A. Schieren & Co. All who looked pleasant received a useful souvenir in the way of a handsome note book, nicely bound and having on the cover a view of the Company's big Dixie tannery at Bristol, Tenn.

Fairbanks, Morse & Co., of Chicago, exhibited a Barrett car jack the leading feature of which is that it operates to raise the car whether the lever is raised or lowered; that is to say, it is double action. J. M. Cobb was the representative of the company at the Convention.

The Brooklyn Car Wood & Veneer Works, of Brooklyn, N. Y., was well represented by W. B. Le Van, Jr. This company showed car ceilings, plain and decorated, and wood supplies for cars and car repairs, consisting of beautiful specimens of veneered ceilings and panels.

The Veneer Seating & Church Furniture Co., of Brooklyn, N. Y., exhibited single and double settees, veneered seats and backs, and also side seating for car stations and depots, both in slat and veneer, and also in straight and round corner. W. B. LeVan, Jr., had charge of this exhibit.

The Street Railway Advertising Co., of New York and Philadelphia, through its representative, W. B. LeVan, made an exhibit of specimen advertising cards and racks. This was this company's first convention exhibit, and attracted a great deal of attention from street railway officials.

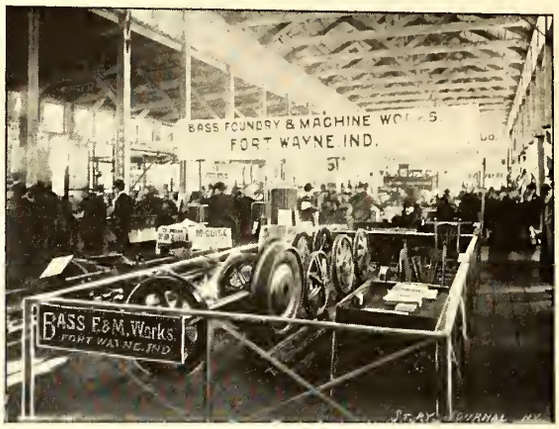


EXHIBIT OF THE BASS FOUNDRY & MACHINE WORKS, FT. WAYNE, IND.

C. E. Garey, of New York City, showed a car door change pocket, which attracted considerable attention. The model shown was handsomely finished, and the merits claimed for it were explained to those who were interested. Literature describing and illustrating the device was distributed.

The Laconia Car Co., of Laconia, N. H., was represented by F. E. Huntress, the Boston agent, who distributed circulars and other literature containing illustrations and descriptions of the company's street cars which are now in use on a number of important roads in various parts of the country.

The Abendroth & Root Manufacturing Co., of New York, made no exhibit, but P. M. McLaren, the well known representative of this company, took an active interest in the Convention, and added many new friends to his already long list. He says the company will have to be in it next time sure.

The Bragg Fender Co., of Albany, N. Y., of which F. A. Bragg, the general manager, was the representative, exhibited a model of of its new fender. The principal feature of this is that it is attached directly to the truck instead of the car, and that any blow which it may strike is cushioned by springs.

The Chas. Munson Belting Co., of Chicago, Ill., owing to the failure of most of its goods to arrive at Atlanta, in time for the exhibition, made only a very small showing compared with what it otherwise would have done. The company showed only a few samples which were in charge of H. E. Skinner, of Chicago.

EXHIBIT OF C. G. SMITH, OF NEW YORK, AND BENEDICT & BURNHAM MANUFACTURING CO., OF NEW YORK.

The Scarritt Furniture Co., of St Louis, Mo., exhibited a number of very handsome car seats, including those in plush, rattan and leather finish. Two long seats were also shown, one finished in plush and the other in rattan. The company was represented by S. G. Scarritt, of St. Louis, and H. O. Nourse, of Chicago.

F. R. Angell, of Chicago, represented the National Malleable Castings Company, which showed several very fine specimens of the malleable castings used in overhead work, also rail braces and chairs and general castings for street car construction. This is the first exhibition of this company at a street railway convention.

The Wadhams Oil & Grease Co., of Milwaukee, Wis., showed samples of curve grease and motor lubricants and graphite axle grease. The company was represented by A. J. Moan, G. A. Wadhams and G. A. Streeter. An aluminum souvenir match box, which these representatives of the company gave out, was in great demand.

The Keller Printing Co., of New York City, exhibited a ticket printing machine, together with samples of tickets used on various roads. Taken altogether, the exhibit was an attractive one. Specimen tickets were given away to those interested. Some of the tickets shown were of special design, and others were those in ordinary service.

Henry E. Lowe, of Macon, Ga., had on exhibition a very novel model of a railway switch operated by a push button on the car, the electric power for the switch being taken from the trolley circuit. The button for operating the switch is located on the car in easy reach of the motorman, so that he can throw the switch by a slight pressure of his foot.

T. C. White, of the Central Union Brass Company, of St. Louis, was showing some electric headlights for which this company is the agent. One of the features of this headlight is that it can be reversed so that the light can be used either on the track or in the car. This headlight was gotten up by Geo. W. Baumhoff, superintendent of the Lindell Railway, of St. Louis.

E. F. De Witt & Co., of Lansingburgh, N.Y., made an exhibit of the DeWitt sand box of the latest improved type in practical operation. This box is of the firm's Common Sense type, and Mr. DeWitt, who was present and in charge of the exhibit, took especial pleasure in showing street railway men that the box would handle small pebbles and even stone, as well as sand.

EXHIBIT OF THE GENERAL AGENCY CO., OF NEW YORK.

W. T. Van Dorn was there in the interest of his firm, Fitzgerald & Van Dorn, of Lincoln, Neb. Mr. Van Dorn showed standard drawbars for electric and cable cars, automatic drawbars for elevated roads of the same pattern that were used for the equipment of the Metropolitan Elevated of Chicago, also one adapted to roads having a sharp incline such as the Kansas City cable roads.

The Benedict & Burnham Manufacturing Co., of New York, exhibited rail bonds made of solid copper in one piece, as well as samples of feed, trolley and magnet wires in various sizes. The exhibit was very handsomely arranged so as to attract attention. Sections of rail were shown with bond wires fitted to them. The exhibit was in charge of E. H. Oswald and J. H. Woodward.

The Stilwell-Bierce & Smith-Vaile Co., of Dayton, O., through its Southern agent, J. W. Taylor, exhibited the Stilwell feedwater heater, the Victor water wheel, Worrell's friction clutches, Stilwell's railroad track jack, the Fitch self oiling device for loose pulleys and clutches, as well as other specialties. Literature treating of these various devices was distributed to the street railway men.

The Western Telephone Construction Co., of Chicago, made an interesting exhibit of its new magneto telephone system, embracing magneto transmitters and receivers and the new switchboard manufactured by this company. All of the apparatus was of elegant design and finish, and was connected up in regular service. The company was represented by Geo. F. Stitch, the vice-president.

R. R. Mitchell, of Robt. Mitchell & Company, Montreal, showed a portable fare box combined with a register and bell. This device is arranged so that the passenger places the fare in the slot of a box carried by the conductor, but the money cannot enter the box without the fare being registered and ringing a bell. It is absolutely impossible to get the coins or fares out of the box without unlocking it.

The Rochester Car Wheel Works, of Rochester, N. Y., exhibited car wheels of the Salisbury iron in Barr contracting chill, from twenty to thirty-six inches in diameter. One wheel, thirty-three inches

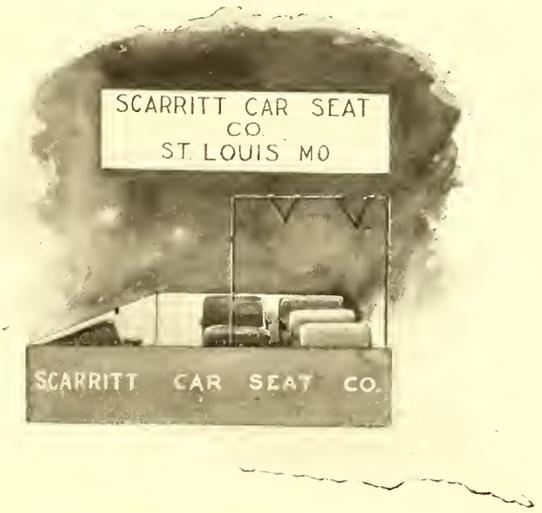


EXHIBIT MADE BY THE SCARRITT CAR SEAT CO.

in diameter, was exhibited, which had made a record of over 10,000 miles, and which showed a loss of sixty pounds of metal due to wear. The company was represented by F. D. Russell and George C. Morse.

The Cutter Electrical & Manufacturing Co., of Philadelphia, exhibited the C.-S. automatic magnetic cut-out, the features of which are so well known that they do not need further description. This cut-out was in practical operation, and the practical tests of it in charge of W. E. Harrington, the company's engineer, attracted considerable attention. The company's Boston agent, C. E. Bibber, was also in attendance.

The Maxwood Brake Shoe Co., La Crosse, Wis., represented by B. E. Edwards, showed a compressed wood brake shoe. The wood for these shoes is treated with a compound, and then subjected to hydraulic pressure of 3,000 lbs. to the square inch. The company claims that it grips the wheel with 25 per cent. less power than an iron shoe, will not wear the wheel and brakes much smoother than an iron shoe.

Charles G. Smith, of New York, had a very nice exhibit of oil and electric lamps, including center lamps, both single and in clusters. Lanterns of various kinds were also shown, globes of various patterns, soldering torches and one or two spools of bell cord in extremely long

EXHIBITS MADE BY THE MATHER ELECTRIC CO. AND WM. WHARTON, JR., & CO.

lengths. The exhibit was very tastefully arranged, and the brass finished and polished goods made it an attractive one. Chas. G. Millen was in charge.

The Guarantors & Liability Indemnity Co., of Philadelphia, was represented by Messrs. Haas & Wilson, general agents for the South. These gentlemen erected a very handsome booth, which was quite popular, owing to the distribution of handsome leather card cases or bill holders. These contained the information that the leading street railways throughout the country are insured with this company, covering the liability of common carriers.

The New York Electrical Works, of New York, was represented by C. W. Van Fleet. The exhibit consisted of a full line of overhead material, embracing circuit breakers, crossovers, hangers and insulation. This company's devices are all put together without the use of solder, using various mechanical methods for accomplishing this purpose. The goods shown were the same as are used as standard by the Brooklyn City Company and several others.

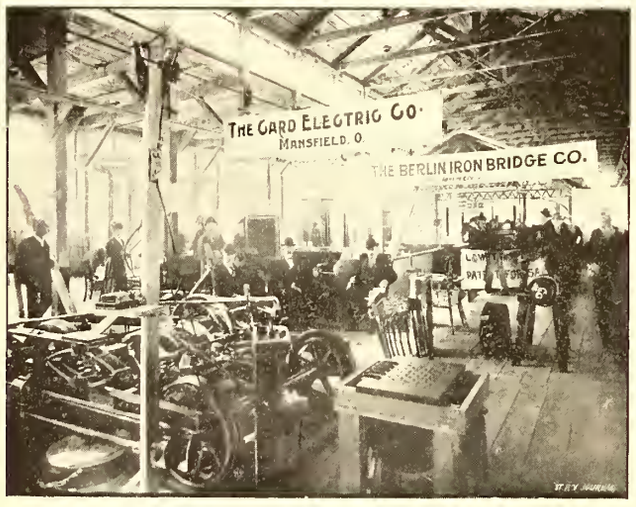
The Leonhardt Pneumatic Safety Car Fender Co., of Baltimore, Md., exhibited a model fitted with its latest type of fender. The company also showed a working model, full size, so arranged that the car to which it was attached could be operated by hand. Tests were

THE OHIO BRASS CO.'S EXHIBIT.

made of it, during the two days of the exhibition, along one side of the hall. The company was represented by its president and manager, William Leonhardt, and its treasurer, N. M. Rittenhouse.

The Vernon Fare Register, was shown at this Convention for the first time by Henry G. Winser, of New York City. Its simplicity of construction, and the fact that it is made under the supervision of practical street railway men, make it a matter of considerable interest to those in attendance. This is the register which accurately counted about 30,000,000 visitors at the Columbia Exposition last year.

The Meaker Manufacturing Co., of Chicago, Ill., was represented by its president, J. W. Meaker, who exhibited portable and stationary registers of two or three types, which are already well known to street railway men because of their wide use on many of the largest systems in the country. Mr. Meaker also took pleasure in exhibiting a new mechanical clip for overhead line use. This attracted a great deal of attention, and was highly commented upon by street railway men.



THE CARD ELECTRIC CO.'S EXHIBIT.

The R. A. Crawford Manufacturing Co., of Pittsburgh, was represented by R. A. Crawford. This company exhibited a full line of its patent fenders. The exhibit was very complete and showed fenders to meet every requirement in connection with street cars, for use in front and underneath the cars. The company has just supplied the Norfolk Street Railway Company, of Norfolk, with pick-up fenders; also the Paterson, Passaic & Rutherford, and several other roads.

The General Agency Co., of New York, which is the selling agent of George C. Dressel & Company for the "Dragon" headlights, had a very handsome exhibit consisting of beautifully finished headlights of various patterns, set off to good advantage by potted plants and ferns. The exhibit included various types of oil and electric headlights manufactured by the company. Jos. R. Ellicott, the president of the company, was at the Convention, and was highly pleased with the results of his exhibit.

The Jewell Belting Co., of Hartford, Conn., showed a section of three-ply Jewell railway dynamo belt, which had transmitted 1,140 H. P. at a speed of 5,200 ft. per minute. In addition to this, samples of bell cord for street railway cars were shown, as well as Jewell dynamo belt dressing and cement. Attention was also called to the fact that the company had in operation at the plant of the Georgia Electric Light Company a forty-eight inch belt. The company was represented by C. L. Tolles.

Joseph Pomeroy, represented the firm of Pomeroy & Fischer, of New York, who exhibited a full line of the celebrated Nobles & Hoare's English varnishes, and colors for street car use. They also showed a change pocket in brass, which is applied to the front stile of car doors for facilitating the collection of fares on the front platform without opening the car doors. This is a patent of C. E. Garey, master car builder, of Dry Dock, East Broadway, & Battery Street Railroad, New York City.

President Stanwood, of the Stanwood Manufacturing Company, of Chicago, of course, was on hand shaking hands with old friends and talking Stanwood steps to new comers. The exhibit of this company consisted of steps in use on the exhibition car of the Jackson & Sharp Company and of the Sperry Electric Railway Company, and, in this way, fully demonstrating by practical use the superior advantages of the well known Stanwood step which is now in use on over half the roads in the country.

The Consolidated Car Heating Co., of Albany, N. Y., made, as usual, a creditable exhibit of electric car heaters. The company was represented by James F. McElroy, its consulting electrician; E. F. Smith, general Western agent, and H. N. Ransom, of the electrical department. A number of heaters were shown, connected in place under

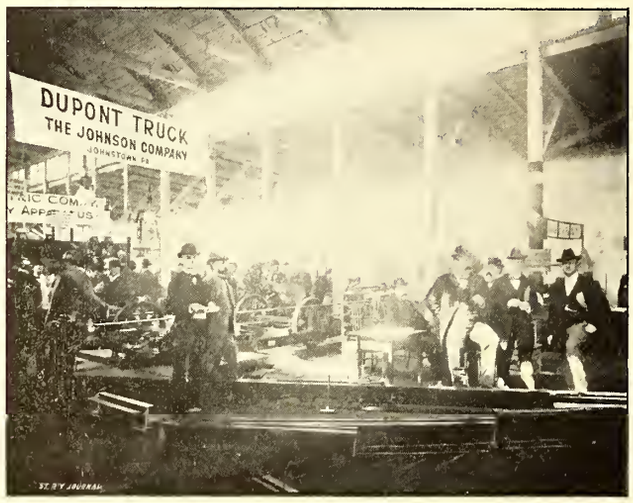


EXHIBIT OF THE JOHNSON CO.

the car seats, and some were shown in operation on a table, where they could be closely inspected. The switches, etc., used in connection with the heating system were also shown.

The Wallace Electric Co., was represented by its secretary, Max A. Berg. Among the specialities exhibited by this company, were Robinson's patent trolley wheel, Fletcher's rapid transit switch and the Paulson rail bond caps, of which the latter were distributed among those in attendance as souvenirs. The pamphlet distributed by Mr. Berg was gotten up in a very neat and attractive manner, and contained cuts and description of the various railway specalities, manufactured and sold by the Wallace Company.

The Hartford Woven Wire Mattress Co., of Hartford, Conn., was represented, as usual, by H. E. Evans. The types of car seats which this company makes are so well known that they need very little description. Among the seats shown at the Convention this year, were one or two of a new pattern which have been very satisfactory in regular service. The leading features of these seats are that they are easily cleaned, that a car equipped with them is also readily cleaned, and that they occupy a minimum amount of space.

The Davis Car Shade Co., of Portland, Me., made a very nice exhibit which was in charge of that well known veteran, C. M. Fuller, assisted by L. P. Hicks. This company showed a section of steam car containing various styles of shades, also a full sized section of an open car fitted with waterproof curtains. These shades have been adopted by the Philadelphia Traction Company, of Philadelphia, the West End, of Boston, Buffalo Street Railway Company, and many other roads which have given the strongest testimonials in their favor.

Linburg, Sickel & Co., of Trenton, N. J., were represented by J. Linburg and J. R. McCardle. They had on exhibition one of the Trenton trolley wagons, which was illustrated and described in our October issue. This attracted the attention of all the street railway men who are interested in the construction and repair of overhead trolley lines. The feature which excited the most interest was that which permitted the top of the wagon to be extended so as to allow the passage of a car on the track without interference from the wagon.

The Mather Electric Co., of Manchester, Conn., was represented by Thos. C. Perkins, vice-president. This company had en-

gaged large space and intended to make an elaborate exhibit of its new multipolar railway generator, but the company got so far behind with its orders that it was obliged to ship the apparatus which was intended for this exhibit, and the time being so short, it was unable to duplicate the exhibit. Mr. Perkins reports that his company has on hand orders sufficient to keep the factory busy for the next three months.

The Stirling Co., Chicago, made a very interesting and novel exhibit, showing a working model under steam and pressure. The model, having glass heads, enabled one to see the interior working of the Stirling boiler in actual operation. It attracted a great deal of attention, and it was the universal verdict that the circulation was marvelous. Many remarked that they had learned more of the generation of steam in ten minutes as here shown than they had in ten years of theory. Thomas Deegan, the secretary of the company, had charge of this exhibit.

The Central Electric Heating Co., of New York, showed three styles of its American car heater, styles A, B, C, designed for different types of cars. The company has equipped over 200 roads with its heaters, and has just closed a contract for the entire system of the north side of Chicago, and reports having three times as many orders as at this time last year. The heaters on exhibition were connected up and shown in actual operation. The company was well represented by Edward B. Wyman, manager, assisted by R. S. Jerome and Sydney Hoch.

The Fuel Economizer Co., of Matteawan, N. Y., was represented by B. Pearson. The company showed a case of specimen castings of

ONE FEATURE OF THE PENNSYLVANIA STEEL CO.'S EXHIBIT.

pipes for its economizers, each pipe tested up to 350 lbs. pressure per square inch. The smoothness and perfection of these castings were commented upon by every one familiar with this class of work. E. Green & Son, Manchester, England, the patentees of these economizers, have been awarded gold medals at all the exhibitions since 1851, including the Antwerp Exposition, where they were awarded the gold medal and first honor.

The St. Louis Register Co., of St. Louis, was ably represented by J. W. Allison, vice-president, and Gustav Rein, superintendent. This company had on exhibition a combination register for cars with an open and a closed compartment, such as are used in the extreme West. Also a combination register for use on double deck cars, a register that will record two fares, or a fare and a transfer, was another feature of this exhibit. The company claims to be the pioneer in exposing the mechanism of street car registers, and showed some handsome models with the works in full view.

The Michigan Electric Co., of Detroit, Mich., was well represented at the Convention by its president, Jos. E. Lockwood, who made a very attractive and creditable showing of "Michigan" overhead material, including a full line of switches, pull-offs, crossovers, insulators, etc. In addition to this, there was shown a "Michigan" signal light for electric cars, which is intended to be attached to the trolley base, and has been in use on the Detroit Citizens' Street Railway for over a year. Mr. Lockwood provided visitors with a very handsome little catalogue describing his apparatus.

H. J. Wightman & Co., of Scranton Pa., were represented by H. J. Wightman. This company showed an automatic block signal for electric railways, and also a full line of overhead material. The signal exhibit was arranged and connected up electrically to work as if in practical operation. The signal is operated by the passing of the trolley over a contact device which lights up or extinguishes lamps placed in boxes for this purpose; the danger signal is red and the clear signal white. This system is in operation on the lines of the Middletown & Goshen Traction Company, Middletown, N. Y.

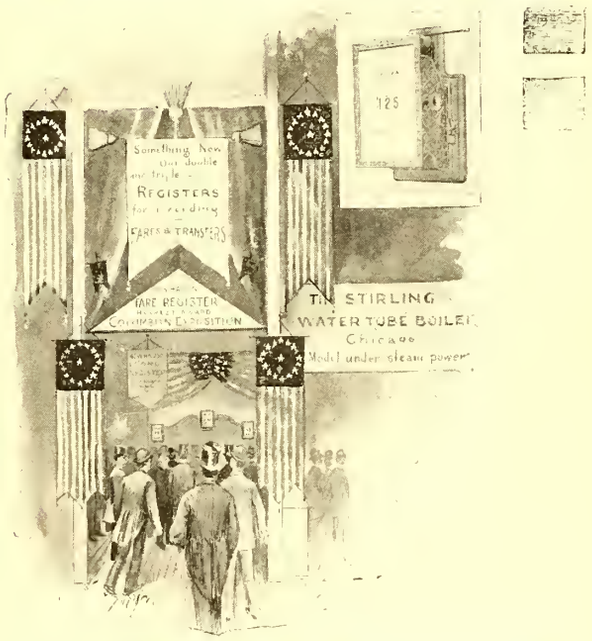
The Ohio Brass Co., of Mansfield, O., showed a full line of type W overhead construction material, also the Jewell trolley sling, Spillman trolley ear, the pneumatic quick-break switch, a full line of motor bearings, the reversible and adjustable track broom holder, the Ohio trolley, Wood's flexible pole bracket and other specialties. The large

THE CREAGHEAD ENGINEERING CO.'S EXHIBIT.

sample board on which was displayed many of the company's specialties was tastefully and elegantly gotten up. The company distributed a magnificent souvenir, illustrating the various devices used in electric street railway work and manufactured solely by them. C. K. King officiated.

The Adams & Westlake Co., of Chicago, was represented by L. E. Gray, of Chicago, and Geo. A. Cushing, of New York. Samples were shown of Acme curtains for open street cars, shades for car windows, Bessemer sheet steel headlights and Emery platform gates. The curtains for car windows and open cars attracted considerable attention. It was stated that, although the patent on this style of curtain was granted only about nine months ago, more than 10,000 of them have since been sold. The principal feature of the platform gate is the ease with which it can be operated by one man only. Various styles of leather hand straps were also shown.

The Sterling Supply & Manufacturing Co., of New York City, made a very creditable exhibit of fare registers, sand boxes, and fenders, which are this company's specialties. The exhibit was very tastefully designed and contained among other decorative features, a large oil painting of Mr. Benton, who is now in the employ of the



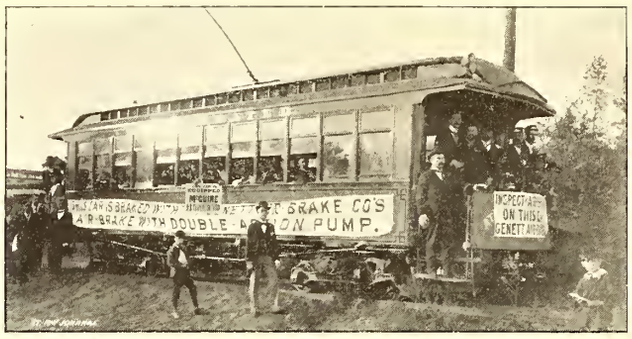
ONE VIEW OF THE NEW HAVEN CAR REGISTER CO.'S EXHIBIT.

company, and who built the register twenty five years ago, used on the Third Avenue road in New York, and who designed the Sterling register now used on the Broadway line. Sterling sand boxes and fenders attracted no less attention than the registers. The company was represented by J. H. Carson, John B. Benton and J. J. Kennelly.

The Young Lock Nut Co., of New York, was represented by R. D. Stewart. This company exhibited its gravity nut lock and the Brownley injector, the Wrought Iron Bridge Company's flexible bracket for trolley lines, the Brownley brake shoe and the Technic

Electrical Works' rail bond. The gravity nut lock and rail bond are well known to street railway men. The flexible bracket has been adopted by several Ohio roads. The new brake shoe is cast with recesses for the purpose of disposing of the dirt and grit. The injector possesses the novelty of having no valve, and is claimed to feed at a lower boiler pressure, and with hotter water than any injector on the market.

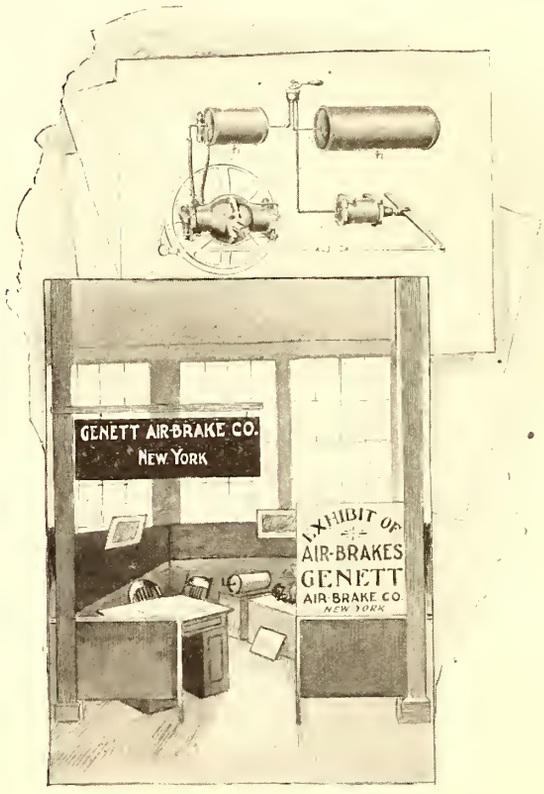
The Allen Electric Supply Co., Philadelphia, was represented by E. H. Allen. The company is just introducing a new trolley base,



CAR FITTED WITH GENETT AIR-BRAKE.

which possesses some good and novel features. It operates perfectly at any angle and will hug the roof of the car closely, when going under bridges and low structures, without changing the tension of the trolley springs or affecting them in any way, and consequently not increasing the pressure on the trolley wire. The springs are enclosed within metal tubing which thoroughly protects them from the weather, snow or sleet. Mr. Allen also represented the Car Equipment Company, of Philadelphia, which manufactures and handles a full line of railway supplies.

The Creaghead Engineering Co., of Cincinnati, O., exhibited overhead line material of every description, including frogs, crossovers, switches, insulators, etc. Bonds and splices were shown, and on a



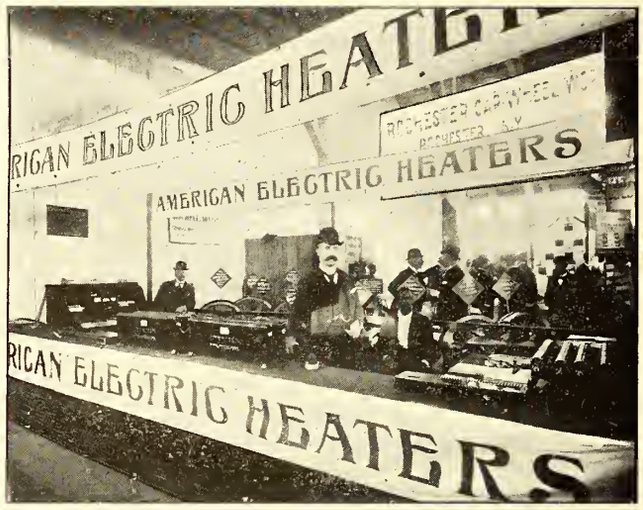
THE GENETT AIR-BRAKE CO.'S EXHIBIT.

large show board were exhibited photographs of construction work in various parts of the country, which has been done by the company. Samples of Day's Kerite wire, trolley wheels, etc., were also included in the exhibit. The principal feature, however, was a flexible pole bracket, of which the Creaghead Company is now making a specialty. This bracket attracted considerable attention, and no opportunity was lost by the company's representative, G. R. Scrugham, for explaining its merits.

The Bass Foundry & Machine Works, of Fort Wayne, Ind., exhibited one pair of rubber cushioned wheels on axles, and rubber cushioned and cast iron wheels, as well as axles, both hammered iron and hammered steel. It was the intention to have a pair of rubber cushioned wheels which have been in service, and made a mileage of between 125,000 and 150,000, miles at this exhibit, but they failed to arrive in time. These wheels are still in good condition, and will add several thousand more miles to their record. The Bass Company has just opened its new foundry at Lenoir, Tenn., and will fill orders promptly for the Southern country direct from those works. P. F. Leach was the representative.

The Dorner & Dutton Manufacturing Co., Cleveland, was represented by W. A. Dutton, and John S. Pugh. The company exhibited its solid forged motor truck, No. 25, in the exhibit of the Walker Manufacturing Company. This truck was equipped with two of the company's thirty horse power, spring mounted motors connected up and operated with a device arranged to show the effect of rough track and uneven rail joints. The truck was painted a rich maroon striped in silver. This truck was equipped with the company's quick acting brakes, illustrating the action of both truck and motors, under various conditions of load. The company also showed a Shehan's patent spring car wheel of which it is the manufacturer.

The Georgia Equipment Co., Atlanta, Ga., showed the Allen line material, consisting of a full line of overhead material, trolley wheels, harps and bases. The company also showed samples of the Johnston rail bond, specialties of the R. Woodman Manufacturing & Supply Company, Boston; headlights manufactured by the Wheeler Reflector Company, Boston; the Beacon Vacuum Pump & Electric Company's incandescent lamps; the Hubley Manufacturing Company's line of goods, the Medbery overhead line material, Empire Electric Insulation Company's insulated cloths, Wood's patent platform gate, made by the Bliss Manufacturing Company, of Pawtucket, R. I., a number of Eddy motors, and several other specialties belonging to the street railway field, of which they are the agents in Atlanta.



CENTRAL ELECTRIC HEATING CO.'S EXHIBIT.

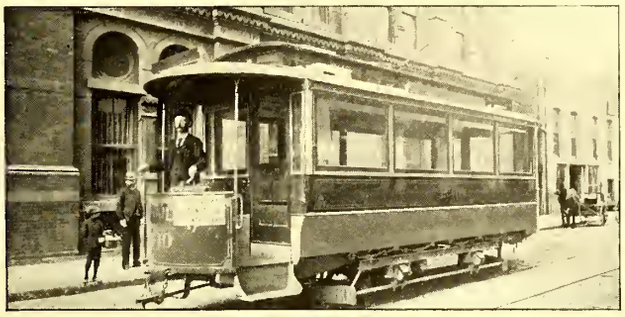
The Berlin Iron Bridge Co., of East Berlin, Conn., sent as representatives John M. Field and J. C. Murphy. The exhibit of this company was one of the most unique and striking in the exhibition hall. The company showed, on a small scale, a steel power station for electric roads, the station being 20 × 20 ft., and twenty-four feet high, the construction of this model being a miniature reproduction of the railway power house. It had a steel trussed roof covered with galvanized corrugated iron, lined with Berlin patent anti-condensation roof lining, the whole supported on steel posts. The work of construction was in charge of Mr. Murphy, and was done in a very fine manner. The exhibit attracted a good deal of attention, and received much favorable comment.

The International Register Co., of Chicago, was represented by Manager A. H. Englund, and made a very interesting and complete display of its portable and stationary register, including a specially made machine for several large street railway companies. The company also showed, for the first time, its new numeral form stationary register. This machine is an exact duplicate of the company's well-known portable register and is extremely simple and complete. One of these machines was exhibited with the mechanism exposed, showing every part entering into its construction. The company also showed samples of its stationary register dial and pointer. All of these machines were finished with aluminum tubes and presented a very fine appearance on the show board.

The R. D. Nuttall Co., of Allegheny, Pa., showed a full line of overhead material, including every variety of switches, crossovers, trolley hangers, insulators, etc., as well as trolley wheels and a complete trolley outfit, including base, pole, harp and wheel. The company was represented by its various agents, including the Standard Railway Supply Company, of which Garson Meyers is president, of Chicago; Arthur S. Partridge, of St. Louis; Chas. N. Wood, of Boston; Chas. A. Cooagna, of Cincinnati, and Chas. J. Mayer, of Philadelphia. In the same space, the Standard Railway Supply Company, of Chicago, exhibited "Standard" stoves and "Gilt Edge" steel gongs. Nuttall gears and bearings were also shown, and new catalogues were given out to street railway representatives.

The Fiberite Co. and the Mason Electric Co., Chicago, kept open house in parlor 24, Aragon Hotel. A very large and complete exhibit, particularly of the Medbery overhead material, was shipped from the

factory, but failed to reach Atlanta until after the close of the Convention. This was alike disappointing to the companies and to the delegates who were very anxious to examine the material that has been adopted by such a large majority of the leading traction companies. Mr. Mason was constantly in attendance, entertaining his many friends and in explaining the advantages of the Medbery material. A number of very satisfactory trial orders were booked, and notwithstanding the failure to make a display, the opinion of a great many managers was in favor of making the Medbery the standard for overhead construction.



BARNEY & SMITH EXHIBITION CAR.

The Pennsylvania Steel Co., of Steelton and Philadelphia, was ably represented by Edmund N. Smith, treasurer; Jno. F. Ostrom, sales agent; Chas. S. Clark, Boston agent; Mason D. Pratt, engineer; and Chas. Reinoehl. This company showed various sections of girder and T rails placed in a pyramid, embracing the principal sections or forms now in use. Also samples of the Pennsylvania Railroad steam crossing, with the improvements made by the Pennsylvania Steel Company, samples of built T and girder rail work, including frogs, switches and entire crossing, and samples of curved rails. The leading features of this company's exhibit was the solid cast steel frogs, switches and mates of nine inch construction. This work has been adopted by several of the leading roads in this country. Samples of rail braces, tie plates and brace tie plates were also shown.

The Lewis & Fowler Manufacturing Co., of Brooklyn, N. Y., made an exhibit of the Lewis & Fowler improved register in a very handsome finish of nickel and gold. The rim of the register was nickel plated. The Acme car jack was shown, and a number of orders for it were taken, among which was one from one of the Atlanta roads. In addition to these, the company exhibited the Lewis & Fowler improved pattern stoves, finished with nickel plated box. The company was represented by Geo. S. Whipp and Frank A. Morrell, of Brooklyn. Mr. Whipp stated that he had done a good business at the Convention. He reports having sold either at the Convention, or immediately preceding, three Lewis & Fowler sweepers for Carbondale, Pa., one sweeper for Scranton, Pa., as well as sweepers for Norwalk, Waterbury, New Britain, New Haven and Hartford, Conn.

Chas L. Cornell, of Hamilton, O., made a very interesting exhibit of an electric soldering iron for street railway repair shops. The iron is adapted to be joined in series with the incandescent lamps which light the shops or car barns. This is the first time these irons have been shown in public, although they have been in use in the Hamilton car barns for some time. The device is extremely simple in construc-

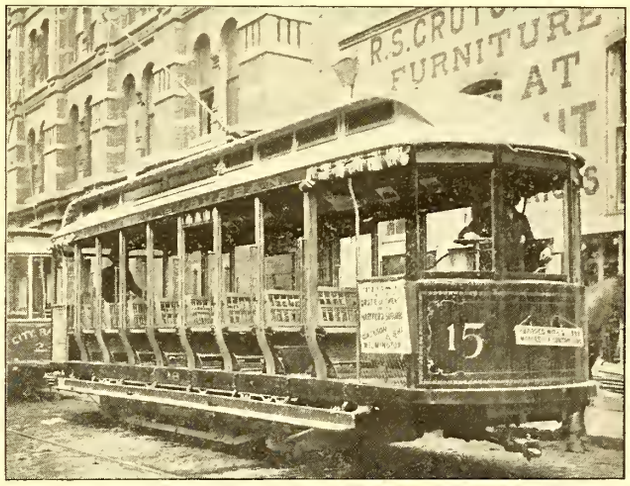
BARNEY & SMITH EXHIBITION CAR.

tion, and can be used by any ordinary employe. Mr. Cornell also exhibited an arc headlight for trolley cars, to be used in series with the main lamps which light the interior of the car. This lamp has never before been put on the market, although twenty of them have been in successful operation, by the Hamilton & Lindenwald road, for the past eighteen months. This company reports that the expense of operating them is less than the cost of chimneys for oil lamps.

The Card Electric Co., of Mansfield, O., was represented by Reid Carpenter, president, Geo. F. Card, electrician, and Jno. F. Card, superintendent. This company exhibited its thirty-five horse power. single motor equipment and its seventy horse power, double equipment designed for interurban roads, and mounted on the Fulton Truck & Foundry Company's Imperial truck. It also showed a single motor controller and a new series parallel controller with its double equipment. This company showed for the first time its pneumatic quick throw switch for heavy currents. Another special feature of this company's exhibit was a commutator turning device, for turning off commutators without removal from the machines. This is the company's first exhibit at a street railway convention, and the representatives all expressed themselves well pleased with the attention shown their display.

The Burrowes Car Shade Co., of Portland, Me., was represented by John W. Baker. The exhibit showed inside curtains for street and steam cars, as well as for use on coaches and steam boats. The company showed a cabinet with two inside curtains of very handsome design, one showing the waterproof "Oakette." The exhibit also included a cabinet containing five shades of various styles. Another, and perhaps the most important feature, was the section of an open street car showing the "Oakette" patent open car shades. This shade is claimed to be a decided improvement over the cloth shades in common use, being waterproof and much more durable. A new feature of this is the metal shield which adds considerably to the appearance as well as strengthening it. Many new features of curtain goods, of patterns controlled exclusively by this company, added interest to this very handsome exhibit.

The Graham Equipment Co., of Providence, was represented by Chas. O. Lenz, the secretary of the company. This company reserved space and had counted on making quite a display, but failed to get the equipment for its exhibit there in time. It, however, had eight trucks in service on the Atlanta Traction Company's lines. The company expected to have some of its new snow plows on exhibition, showing the improved method of keeping the track open during severe storms without extra crew or motor equipment. This new plow occupies but



JACKSON & SHARP EXHIBITION CAR.

seventeen feet in the car shed, and is always ready for service. One of these plows was in service all of last winter for the Lehigh Traction Company, of Hazleton, Pa., and a letter from its engineer, A. E. Hess, indicates conclusively that it was efficient in storms in which the snow gathered from fifteen to twenty inches in depth, working much more expeditiously than a sweeper, particularly for country lines.

The Taylor Electric Truck Co., of Troy, N. Y., was represented by Jno. Taylor, manager of the company, and exhibited its Taylor improved single truck and the Empire state radial truck, also the anti-heating Eureka metal lined bearing. The trucks shown were the Taylor Company's latest types, embodying the Master Car Builders' standard, which is universally used in steam railway practice. Mr. Taylor says that from his conversation with street railway managers at the Convention, the general opinion was that in construction, the Taylor single and double trucks were the only ones shown incorporating steam railway track construction, which has proven in practice to be the most economical and durable in electric street car service. Mr. Taylor expressed himself as very appreciative of the attention given him and his exhibit by the street railway managers. This truck is fully described and illustrated elsewhere in our columns.

The Niles Tool Works, of Hamilton, O., made a very handsome exhibit of machine tools, including a twenty-four inch engine lathe, a thirty-six inch car wheel borer and a hydrostatic car wheel press. This press, shown in the illustration, will take in wheels up to thirty-six inches in diameter. It is tested up to a pressure of 100 tons before leaving the works. The cylinder is made of the best cold-blast iron, and lined with copper, the lining being well burnished in the cylinder. The ram is eight inches in diameter, and has an eighteen inch stroke. The pump has a single plunger, three-quarters of an inch in diameter. Each machine is furnished with pressure gauge, lock-up safety valve, relief valve, returning weight, tank, etc. It is particularly adapted to pressing wheels on and off axles, such as used for street railroad cars, and it offers exceptional facilities for replacing worn wheels quickly, thereby keeping the car out of service the minimum length of time.

The Genett Air Brake Co., of New York, exhibited the first air brake made for surface roads, and the style of pump formerly operated. In addition to this, the standard pumps, which are waterproof and entirely enclosed, were shown, as well as an assortment of eccentrics. Car

No. 60, a thirty-two foot heavy car, formerly in use in steam road service, was in operation on one of the Atlanta roads, and was fully equipped with the Genett air brake system. This special car was considered a very difficult one to brake, and the hand brake had already proven insufficient. Testing gauges, showing the compression, were used, and an air whistle, which attracted considerable attention, was also a part of the Genett Company's exhibit. The company was represented by E. J. Wessels, general manager, George S. Lee, master mechanic, and O. A. Burter, assistant. The company's new catalogue, which is an unusually neat and attractive one, was distributed for the first time at the Convention.

EXHIBITION BOARD OF THE H. W. JOHNS MANUFACTURING CO.

W. E. Haycox, president and general manager, and Frank A. Rogers, special sales agent, did the honors for the Fulton Truck & Foundry Company, of Cleveland, and Mansfield, O. This company exhibited a single steel truck "Imperial," which had an improved life guard and "Perfect" under-truss with springs over journal boxes, and improved brake rigging. The exhibit also embraced one of the company's new pattern, maximum traction, double steel trucks "Imperial," which also was equipped with the improved life guard and special swinging brake, particularly adapted for very long car bodies. An improved track cleaner was another feature of this exhibit. This cleaner will adjust itself so as to clear irregular paving next to the rail. The company also showed one of its hydraulic motor lifts for handling either motors or car bodies, particularly adapted for raising and lowering motors. The Troy sand box is another specialty of this company, and was also shown. The company had a very pretty model of its single steel truck "Imperial" on exhibition in the main reading room of the Aragon Hotel. This model perhaps attracted as much attention as anything at the exhibition.

The Falk Manufacturing Co., of Milwaukee, was represented by Albert Hoffman. This company exhibited a new patented trolley wheel and also a specimen cast rail joint. The wheel is made of a special soft cast steel and by a new process which gives the metal the malleable quality of brass or bronze, the metal being cast in this condition and not malleableized. One of the prominent features claimed for this wheel is that it will not blister, form a groove or form an arc. The company guarantees the bushings of its wheels to run 7,000 miles without any repairs. Wheels are now in use that have already run 9,000 to 10,000 miles, and are still giving satisfaction. The rail joint shown by this company is a new departure in joints, and makes a practically continuous rail. To make the joint, the company uses a portable cupola for melting the metal, which is poured in the mould around and in the joint. This metal possesses the rare quality of uniting with the rails quite the same as if welded. The company has already contracted to introduce this new process on three miles of track for the Citizens' Railway Company, of St. Louis. Mr. Hoffman did a big business at the Convention.

The Jackson & Sharp Co., of Wilmington, Del., was represented by Job H. Jackson, president of the company, and by Geo. E. Pratt, contracting agent. The company had on exhibition two cars, one open eight seat vestibule, which is an entirely new feature, Atlanta thus having the credit of first having it running in its streets. The feature of the car is the vestibule ends, and the curtains on the sides coming clear to the floor, thus forming, when closed, protection against storms. The car is mounted on the Peckham truck, and equipped with G. E. 800 motors. The closed car is an eighteen foot body finished in mahogany, plate glass, and upholstered seats covered with plush. The windows are equipped with roller curtains, with a patent device of the Jackson & Sharp Company, which permits the curtains to remain in any position desired. The car has extra wide platforms and is painted a rich maroon and cream. It is equipped with Stanwood steps, sand boxes and everything to make it complete. It is mounted on the McGuire truck, and equipped with Westinghouse apparatus. Both cars have been in the service of the railway company in Atlanta, and been used for conveying the city and railway officials to different points of interest in and about the city. The company has built nearly 300 cars within the past eight months, and duplicate orders are constantly being received.

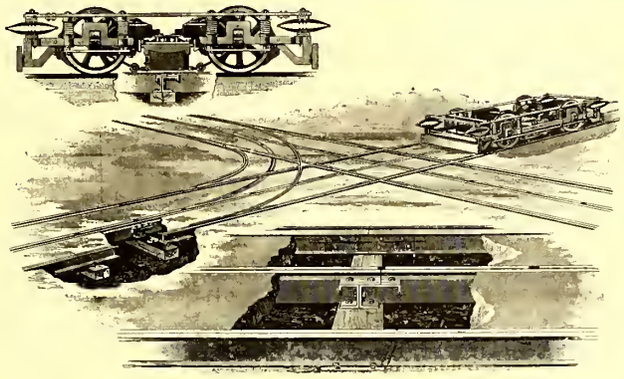
The Johnson Co., of Johnstown, Pa., owing to the fact that it has a large Southern business, with headquarters at Atlanta, made a good showing at the Convention. The exhibit included the guarantee track construction which the company insures for a given percentage. This consists of nine inch deep special work, with frogs, switches and mates, and is intended to increase the life of the points. These plates were made of steel treated with the Harvey process, and were bedded in babbit metal, so arranged that they can be removed and new ones substituted, without disturbing the street pavement. In addition to this special work, rail sections were shown, one of which was ten and a half inches deep. Alongside of it, on the same board, were shown old specimens, which were formerly in general use, which were less than half as high as the modern types. Besides the rail exhibit, the company showed the Dupont truck. The special feature of this truck is the ease with which the wheels can be removed. The truck frame is made of solid steel bars, and, although of very massive construction, does not weigh more than other trucks of the same strength and durability. The company was represented by Daniel Coolidge and E. B. Entwisle, from Johnstown; W. W. Kingston and Eugene Thomas, of the Atlanta office; Maj. H. C. Evans, of New York; A. S. Littlefield, of Chicago; E. O. Evans, of Boston; O. C. Evans, of Cincinnati, and W. E. Boughten, of Philadelphia.

EXHIBITION BOARD OF THE H. W. JOHNS MANUFACTURING CO.

Jas. F. McLaughlin, of Philadelphia, captured every one's attention with his exhibit at the Kimball House, where he had on exhibition a large model of his newly devised method of distribution of the current for propelling street cars electrically by means of a buried conductor. The method of distribution consists of a main tube of cast iron of the same height as the rail, made in sections of fourteen feet each, which are bolted on the ties midway between the track rails. In the center of this tube is placed the main line conductor which is an iron rod, the cross section of which is dependent upon the amount of power used. This rod is continuous, and carries the current, it is insulated from the iron tube by a bituminous cement. The current is distributed to the car motor by means of the surface sectional conductors, in conjunction with a flexible controlling device mounted between the two car motors. The controller carries two collectors in the form of flat metal wheels, which are in constant contact with the sectional surface conductor. The electrical connection is made, the inventor claims, without the use of switches, magnets or automatic devices, the method as yet being kept secret, awaiting the granting of additional patents. The inventor claims that there is no possibility of "grounds" or short cir-

cuits between the rails and the surface conductor, for the reason that there is no current in the conductor except the section directly under the car. Mr. McLaughlin and his associates say they will be ready, in a short time, to equip roads with this device, at a less cost than with the overhead system.

The New Haven Car Register Co., was well represented by F. Coleman Boyd, vice-president, and John S. Bradley, secretary. Samples were shown of an entirely new idea in the line of registers, which consisted of an appliance for registering three different denominations of fares or two fares and a transfer. This machine is arranged to ring



McLAUGHLIN'S CONDUIT SYSTEM.

with the rod device arranged in a very simple and complete manner, or with cord, either in combination or by use of cords alone. In addition to registering the different denominations of fares separately, it also totalizes each of the denominations separately. The resetting of the register to o and of the number and direction of the train trip and also the locking of the machine so that no fares can be rung up during the conductor's absence, is all accomplished by the operation of one knob. The company also manufactures double machines on the same plan arranged for two fares or one fare and a transfer. The machines exhibited were finished in bronze, nickel and antique copper and were all handsomely designed. The Atlanta Consolidated road has just adopted this company's machines such as were shown on exhibition. They were also on exhibition cars of the Jackson & Sharp, Brill and other companies. The exhibit shown here was in part the exhibit made at the World's Fair, where this company received the highest and only reward for stationary fare registers, this exhibit having, of course, all the latest improvements added, and created universal admiration. Did you get one of those pretty inkstands they were so liberal with?

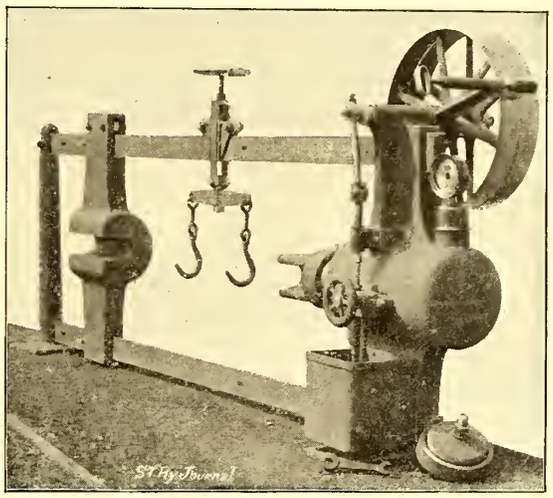
The McGuire Manufacturing Co., Chicago, exhibited in the hall one pair of adjustable traction trucks which were sold to the Atlanta Consolidated Street Railway Company and go at once into service. The Columbian car heater was shown for cars having either seats placed lengthwise or crosswise. These are of the self-feeding type, are supported above the seat without cutting or injuring the car, are of unique and ornamental design, and constructed with a ventilated jacket

EXHIBIT OF THE NILES TOOL WORKS.

which admits of passengers sitting in actual contact with the case without burning or indeed any discomfort. The company took several orders at the Convention, and has received orders up to the time of the Convention for over 500 stoves. The company had in operation one pair of adjustable traction trucks under a thirty foot closed car body; also a Columbian truck with three-quarters elliptic springs which was equipped with the McGuire Company's new air brake for electric cars. This new air brake was in operation on one of the Atlanta Consolidated Street Railway Company's cars and is one of a lot ordered by this company. The brake was in constant use during the Convention and attracted favorable comment from the street railway men. The company also had in operation an A 1 suspension truck under the closed, eighteen foot exhibition car of the Jackson & Sharp Company, which was much admired for its simple and substantial appearance and easy riding quality. The company was represented by W. J. Cooke, vice-president, and J. A. Hanna, sales agent of the Philadelphia office.

William Wharton, Jr., & Co., Incorporated, of Philadelphia, Pa., were represented by Powell Evans, from the Philadelphia office. Their exhibit consisted of track material, showing rail sections, chairs and brace tie plates, special work on broken main line, crossovers and branch-offs, also a derailing switch for steam railway crossings. A Columbian transfer table, of the company's make, was also shown. A marked feature of this exhibit was brake shoes, representing patterns in use on various railways all over the United States, samples from manufacturers, and an exhibit of the company's own make of shoes. This company is very much interested in producing the highest and best grade of shoes as regards material, and in bringing about the general adoption of a satisfactory pattern as regards shape. It manufactures shoes of the various materials now in demand, and of all patterns to fit the various styles of trucks and wheels. One of the favorite types of shoes shown at the Convention is made of medium soft cast iron, with four wrought iron lugs inserted, representing about 20 per cent. of the frictional face of wrought iron. This type of shoe is widely used, and has an enormously increased life over all cast iron shoes, and at the same time causes no more wear on the wheel than a shoe made entirely of cast iron. Another point in connection with this type of shoe is that it holds the wheel very strongly, and makes it very safe and easy for the motorman. The company's wooden face shoes are now becoming widely known, and are at present used on over fifty railways in this couutry.

The H. W. Johns Mfg. Co's exhibit was exceptionally tasty, and attracted well merited attention. The prevailing color of the exhibit was white, thus throwing the various samples into contrast with their surroundings. The columns supporting the framework surrounding



NILES TOOL WORKS CAR WHEEL PRESS.

the space were covered with asbestos manufactured by the company. Two large, conspicuous sample boards and numerous loose samples afforded an easy examination of the display of overhead trolley line insulating materials, including the frogs, switches and rail bonds furnished by this company. A model very nicely exhibited the application of the Grauten rail bond in practice. Attention was drawn to the economical and practical qualities of the "H. W. J." "Perry" and Philadelphia mechanical clips. This material, as well as the various samples of vulcabeston controller pieces, bushings, commutator rings and field magnet spools was fully described in the new October price list, issued previous to the Convention. The vulcabeston steam packing and asbestos pipe coverings were much in evidence and contributed materlally toward the decoration of the exhibit. The company presented as souvenirs buttons made of moulded mica bearing the inscription "Atlanta A. S. R. A. 1894, H. W. Johns Mfg. Company" which were worn by the delegates and others in attendance during their stay. The company was well represented by W. F. D. Crane in charge of the company's electrical department in New York, Mr. Henry G. Issertel and W. H. Gould, also of New York, and Mr. J. W. Perry, manager of the electrical department of the company's branch house in Philadelphia. These representatives were ably assisted by Mr. E. Hatch, secretary of the Johns-Pratt Company and Mr. Herbert Luscomb of Hartford. (See illustrations on page 740).

The Barney & Smith Manufacturing Co., of Dayton, O., had on exhibition two cars, both eighteen feet inside, with four windows to each side with stationary sash, polished plate glass and curtains with Burrowes fixtures. One of these cars belonged to a lot for the Cincinnati Street Railway Company. It had double automatic doors at both ends, and square vestibules of the Cincinnati pattern at motorman's end only. The interior finish of this car was natural cherry handsomely hand carved throughout. The seats and the backs were upholstered with Barney & Smith patent springs, and covered with crimson mohair plush. The exterior was painted in a pleasing light yellow, relieved with a neat ornamentation. The smoothness and beauty of the finish attracted much attention. The other car was one of a lot of forty for the City Railway Company of Dayton, O. This car had also four windows of polished plate glass on each side, and had a round vestibule of the Barney & Smith pattern at the motorman's end. This vestibule feature attracted special attention, being constructed with sliding

curved sash and glass, thoroughly protecting the motorman and giving him a clear view in every direction. This car had double automatic doors at the vestibule end, and a single door at the rear and placed to one side of the center, thus affording easy passage to and from the car without having to push through a crowd on the platform. This car was also finished in natural cherry and the carving was of special design gotten up by the designer of the Barney & Smith Company. The seats and backs of this car were constructed in a similar manner to those of the car for Cincinnati. The covering was of old green mohair plush. Both cars were mounted on Barney & Smith pattern trucks with equalizer coil springs and half elliptic body springs. These trucks have a spring base of thirteen feet, and are provided with an extension brace for long cars. These cars were used to carry the crowds to and from the circus grounds of the Barnum & Bailey circus on the first day of their arrival, and stood this severe test in a manner that reflected great credit on their construction. The cars were both equipped with Barney & Smith sand boxes, drawbars and steps. The company was represented by A. M. Kittredge, superintendent, and J. M. Hopkins, contracting agent.

Flood & Conklin, of Newark, N. J., presented delegates with a neat little stamp box.

Carleton & Kissam presented to the street railway men a very handsome paper knife, which was in great demand.

The Charles Munson Belting Co. presented a very handsome vest pocket memorandum book with a leather cover.

Charles A. Schieren & Co. gave away a handsome little memorandum book of vest pocket size, bound in leather back and edge, with celluloid cover.

The H. W. Johns Manufacturing Co. called attention to its exhibit of vulcabeston and other materials by a moulded mica button, intended for the lapel of the coat.

The Jewell Belting Co. presented delegates with a souvenir morocco case, for paper currency, similar to the one which the company has before presented as a souvenir.

The John Stephenson Co., found plenty of demand for a very serviceable steel tape, which was given away as an advertisement of its business, and as a souvenir of the Convention.

William S. Silver & Co., distributed a large number of glass fountain pens, inside the hollow glass handle of which was placed a small card calling attention to the various supplies which they handle.

The New York Electrical Works, represented by C. W. Van Fleet, gave a little button made of insulating material, such as is used in the overhead material supplied by the company for street railway use.

The Washburn & Moen Manufacturing Co., of Worcester, Mass., presented to some of those present a neat paper weight made of a section of steel rail, in the center of which was shown a joint made by the Keithley rail bond.

Arthur S. Partridge, of St. Louis, presented three blue pencils in a neat pasteboard case, for the use of street railway men in writing out orders for the street railway supplies for which Mr. Partridge is agent, and which are enumerated on the pencil case.

McNamara Brothers, of Fairhaven, Vt., presented as a souvenir a paper weight made of a sample of slate such as they furnish for switchboard purposes. On the bottom of this paper weight was also a card of the Buyers' Reference Company, of New York City.

The Sterling Supply & Manufacturing Co., of New York City, gave away a new style of blotter in the shape of a roller, on the ends of which were represented the face of the Sterling register, while the handle contained a brief mention of the other goods which the Sterling Company manufactures.

The Scarritt Car Seat Co., through Mr. Nourse, caused considerable excitement by the little "Coons in the Hole" puzzle which he distributed at the Convention Hall. It took many of the delegates several hours to find out that it was only necessary to spin the little box in order to solve the puzzle.

The Guarantors Liability & Indemnity Co., of Pennsylvania, presented a very handsome souvenir pocketbook, made of morocco, calling attention to the company's business, its various offices and agents, and the fact that the leading street railways throughout the country were insured in this company.

The Peckham Motor Truck & Wheel Company distributed a very handsome appropriate souvenir in the shape of a folded morocco book for holding paper money. On the inside, which was of light colored leather, was stamped in prominent shape an illustration of one of Mr. Peckham's street car trucks.

The New Haven Car Register Co. gave away one of the most attractive souvenirs of the occasion. It consisted of a handsome two bottle inkstand and pen tray, at the back of which was a shield containing a print of the latest type of New Haven register. In addition to this, the company also presented a very serviceable paper weight, containing on one side a bronze print of the New Haven register, and on the other side a heavy plate mirror. Both of these souvenirs were much sought after by delegates.

The Sperry Electric Railway Company's Exhibit.

"Pass C. B. Fairchild on Sperry car running between hotels and Convention Hall. This pass carries the privilege of examining equipment and electric brake of Sperry Electric Railway Company.

"By L. H. Rogers, general manager."

The above kind invitation meant an examination of a very interesting exhibit, and one which was decidedly attractive to a large number of delegates. The Sperry motor and flexible clutch have been often described, and nothing further need be said here of its peculiar advantages. The electric brake, however, deserves more than a passing mention, because of its importance to those operating electric railways. While the idea of using the stored energy of a moving car to destroy its own momentum is not new, Mr. Sperry's special application embodies many features of practical interest and value. The peculiar "feather bed" effect of electric braking was illustrated over and over again on the grades of the Consolidated Company's lines, and it was the universal verdict that, for emergency use, the Sperry electric brake certainly had many pronounced advantages over the hand brake.

Walker Manufacturing Company.

The exhibit of the Walker Manufacturing Company at the Exposition entrance, was one of the finest and most interesting that the delegates have had the good fortune to examine in the recent history of the Association. The Walker Company has, for many years past, taken prominent stand among the cable railway builders and designers of the country, and its recent electric railway work is the result of a determination on the part of its managers to acquire a reputation in this larger field equal to that gained in its cable department.

The company's factory being especially designed for the production of heavy machinery, we naturally find a large dynamo prominent in the exhibit. It is a beautifully designed machine, its curves being not only lines of beauty in themselves, but representing a high degree of mechanical strength and electrical and magnetic efficiency. The frame is cast in two parts, the lower carrying the armature bearings and an outside pulley bearing, together with one yoke and two pole pieces, while the upper half consists of a second yoke with its two pole pieces, which is firmly bolted to the body of the machine. The armature is

THE WALKER MANUFACTURING CO.'S EXHIBIT.

of large diameter and low resistance, and has a cooling surface so large as to enable the machine to stand an overload of 50 per cent. without injury. The company exhibits only belt driven generators, but builds in addition several types of direct connected steam generators.

The special point of interest to visitors was not, however, the generators, excellent though these were. The motor truck exhibited by the Walker Company embodies so many new features of value to street railway operators that their attention was concentrated upon this—one of the most promising motors of the present day. The first thing to be noticed by the spectator was the form of a burly negro, visible over the heads of the crowds surrounding the exhibit, dancing up and down apparently on air, but really on a flexibly suspended motor on the truck. This flexible suspension differs from that of other companies, in that the axles have to directly support little more than the weight of a U frame, at the ends of which the motor is swiveled at its center. The forward end of the motor is spring supported, the flexible springs resting on the truck frame, while the rear end is also supported, the flexible springs being carried in the U frame. In consequence of this peculiar method of support, it is claimed that both the "sledge hammer blow" and the "inertia blow" at the rail joint are greatly lessened, and the life of the track and of the cars prolonged. The motor itself is simple in design, many of the best features of other motors being found in its construction.

The series multiple controller was also on exhibition and is remarkably simple in design, its chief feature of novelty being the method of dividing up the destructive spark occurring at certain changes of position by means of a "series break," the result being that the most rapid movement of the controller, when current is on, fails to produce more than a slight and entirely harmless spark.

The company's printed matter was exceptionally complete. A handsome catalogue on "Direct Current Power Generators," another

on "Electric Railway Equipment," and another containing excellent "Rules and Tables on Electric Railway Work," were valuable and interesting for reference. Small pamphlets describing the fine machine shops of the company, and its Hoosick Falls railway installation, together with commendatory letters from the West Chicago Street Railroad Company, Lemuel William Serrell and others, were also distributed. The company was represented at the Convention by Professor S. H. Short, its electrician, and by Wm. H. Bone, General Manager, H. McL. Harding, Eastern agent, B. N. Barr and James Atkinson, Central agents, Frank Kohler and Edward Kohler, Western agents, and R. N. Baylis, who was in charge of the exhibit.

The Peckham Company's Exhibit.

The two fine motor trucks exhibited by the Peckham Motor Truck & Wheel Company did not arrive at the Convention until Thursday, owing to unusual and most vexatious delays in transit, and many of the delegates therefore missed the opportunity of seeing this most interesting exhibit. It is not often possible to examine the General Electric and Westinghouse motors mounted on trucks of the same general type, but specially adapted for their individual peculiarities, so close together and so intimately as was the case with the Peckham exhibit.

The general impression given by the Peckam motor trucks was one of solidity and strength—a strength sufficient to carry any burdens which might be placed upon them. This impression is largely due to the use of "cantilever bridge truss" construction, by which it is claimed that great strength is gained with the least weight of material. At the same time, the Peckham trucks appear to the casual observer to be almost made up of springs, so carefully is this most important condition of "perfect flexibility" provided for.

The Westinghouse motors, which were of the latest type, were suspended from longitudinal channel bars running *over* the motor and resting on the truck frame through spiral springs—a neat and ingenious device. The General Electric motors were fastened to the truck by means of the peculiar and well known methods of support devised by the General Electric Company.

The Sperry car, exhibited at the Convention, was also mounted upon Peckham trucks which had been specially adapted by the Peckham Company for the single motor equipment advocated by the Sperry Company, including the flexible clutch, electric brake, etc. The elegant car body exhibited by the Jackson & Sharp Company was also mounted on a Peckham truck, and these two cars, in service, were fine illustrations of the smooth and easy riding possible with well devised and flexible trucks.

The company was ubiquitous at the Convention through Mr. E. Peckham, president; Mr. W. E. Cooke, engineer, and Mr. W. H. Wilkinson, superintendent.

GENERAL VIEW OF PECKHAM MOTOR TRUCK & WHEEL CO.'S EXHIBIT.

The General Electric Company.

The General Electric Company was prominently located at the Convention, and its exhibit was arranged with the taste and skill for which the company and its predecessors have always been noted. The principal exhibit was, in a sense, the street railway system of Atlanta itself, on which a large number of the company's motors and dynamos are in service. Such of the cars of the Atlanta Consolidated Street Railway Company and the Atlanta Traction Company as were equipped with the latest General Electric apparatus, were indicated by means of prominent signs on the cars.

GENERAL ELECTRIC CO.'S EXHIBIT.

In the exhibition hall ample opportunity was afforded the delegate for a close and critical examination of the company's apparatus in every department of its street railway business. The G. E. 800 motor was shown, both complete and dissected, together with a partially wound armature, separate armature coils and a complete, as well as a dissected commutator, separate gears, pinions, etc. The "Form K." controller was also much in evidence, its special feature being the magnetic blowout principle, by means of which the destructive spark inside the controller box is reduced to a minimum and, in fact, almost completely destroyed. The rheostatic controller for single motor car equipment, known as "Form K R" and which has the same style of cylinder, blowout and contact fingers as the K controller, was also shown. All of the General Electric devices for the handling of electric arcs, including switches, fuses, lightning arresters etc., involve the magnetic blowout principle. The most recent form of the trolley base was exhibited, the changes from the type shown at the Milwaukee Convention being comparatively slight.

Among the most interesting exhibits, were the fine station switchboard sections in the center of the General Electric space. They included a 400 ampere generator panel, a 1,000 ampere generator panel, and a "total current" panel fitted with one 5,000 ampere Thomson recording wattmeter and one 5,000 ampere Weston ammeter, one 1,200 ampere feeder panel with lightning arrester, two 1,200 ampere feeder panels of different types, a 750 voltmeter on bracket and a 600 ampere equalizing switch pedestal. The generator and feeder panels are made of various capacities to suit different plants, and are so designed and proportioned that they may be installed side by side in any number, and readily interconnected so as to form a complete, fireproof, accessible, compact and handsome switchboard. Another illustration of the value and efficiency of the magnetic blowout principle, was shown in a 3,000 ampere fuse box, together with a fuse blown at the Kent Avenue Brooklyn, station, on 4,400 amperes at 550 volts. When the destructive effect ordinarily accompanying the blowing of fuses at 500 volts is considered, as well as the enormous current flowing in the circuit above referred to, this clearly ruptured fuse seems to be an unanswerable argument for the magnetic blowout.

Samples of underground feeder tubing, and models of junction boxes and taps clearly showing the ingenious principles first devised

by Mr. Edison for underground work, were prominent in the exhibit. The company issued a special pamphlet devoted to the application of the three wire system to street railway lines.

In the department of line appliances, the company lays special stress on the advantage of having the tongues and runways of frogs, crossing, etc., in the same horizontal plane as the trolley wire, and it has designed its material with a view to resisting the tendency to bending produced by offsetting the trolley wire below the line of the frog pans. V, right hand, left hand and drawbridge frogs and adjustable crossings were shown, the latter designed for any angle from 30 to 90 degs. In the flexible bracket suspension, the shock of the trolley striking the ears is avoided. The additional advantage of double insulation is another feature of this device. It is made for one and a half or two inch pipe, and for all sizes and forms of wooden or iron poles.

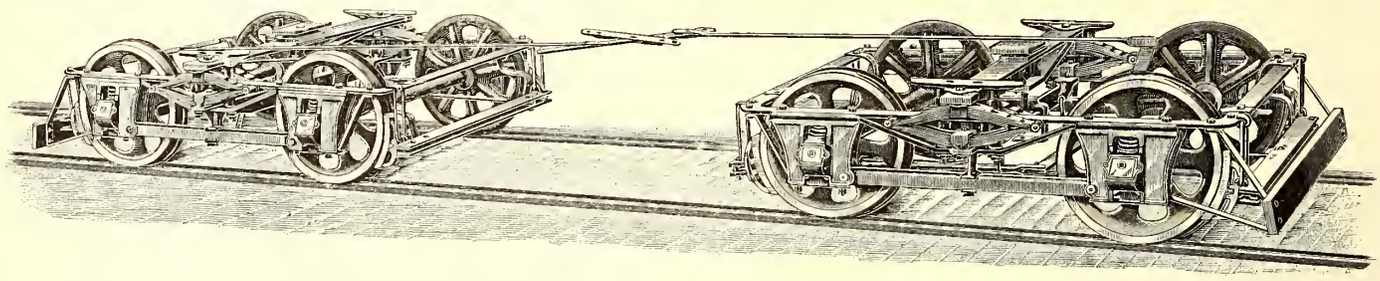
Ten "Thomson '93" arc lamps were shown, connected in series and operating from the railway lines. These lamps are especially designed for use in car houses, power houses, or wherever it is desirable to light from the 500 volt circuit. In addition to the wattmeter on the total current panel board, a portable one was shown, designed for testing a moving car, and so supported in the case that it is protected from vibrations and reads as accurately as if mounted on a solid foundation.

Pamphlets and circulars of the General Electric Company were distributed at Convention Headquarters at Machinery Hall and elsewhere, as follows: "Standard Apparatus for Electric Railway Service," "Electric Underground Tubing for Railroad Feeders," "Three Wire System for Electric Railways," "Form 'K' Generator Panels for Electric Railways," "Feeder Panels for Electric Railways," "Supply Material Catalogue No. 7,504," "Thomson '93 Railway Arc Lamps," "Thomson Recording Wattmeters."

The company was represented at the Convention by W. J. Clark, general manager railway department, and A. K. Baylor, from the New York office, J. R. Lovejoy, W. B. Potter, H. C. Wirt and G. E. Hoffman, of Schenectady, T. P. Bailey, of Chicago, H. J. Crowley, of Philadelphia, Geo. Rosenthal, of St. Louis, F. M. Kimball, of Boston, and H. H. Corson, of Nashville.

Empire State Radial Truck at the Convention.

The continual change necessary in electric street railways to meet the increased requirements of the service is exemplified in the changes made within the past few years, in the cars employed on the roads.



THE EMPIRE STATE RADIAL TRUCK.

The ordinary sixteen foot body horse cars were deemed ample at first to meet all requirements, but as travel increased eighteen foot, then twenty foot, and later twenty-one foot and twenty-two foot cars were found necessary. As the majority of electric railways have curves of from thirty-five foot to forty-five foot radius, the wheel base of the trucks could not be lengthened proportionately, with the length of the car bodies. In consequence a large number of electric street railways are to day using cars with an overhang so great, that when the rear platform of a closed car is loaded, or the two rear seats for smokers in an open car, the strain on the motors is unevenly distributed. The rear motor endures all the weight and strain of propulsion, while the forward motor is spinning the wheels and grinding them away without moving the car.

The use of trailers gives an additional carrying capacity, but are not generally liked by street railway managers or by the public, while requiring the expense of an additional man.

For some time double trucks have been used under long cars, as a solvent for the difficulties referred to before, and various forms are now on the market. We show in the cut a new double truck for long cars made by the Taylor Electric Truck Company, of Troy, N. Y., and called by its makers the Empire State radial truck.

As can be plainly seen this truck is simple in its construction, using the old and tried principles of steam railway truck construction, having two independent sets of springs, the set over the journal boxes to overcome the shock and pound on rail joints, switches, etc., and the car body riding on full elliptic springs, thus insuring easy riding, while no shock can be transmitted to the car from the roadbed. As the frame is constructed of steel solidly riveted together, using the Master Car Builders' standard jaw and journal box, and the journals running in anti-heating bearings, they are absolutely safe to run forty to fifty miles per hour, and on large curves about 75 and 100 ft. radius, it is not necessary to slow down the speed, thus saving time and power.

The brakes are the simplest form of levers, can be adjusted in five minutes time to take up all wear, and are arranged to equalize so that the pressure is applied to all wheels at the same time; thus the car can be stopped as easy again as a single truck, as the brakes are applied uniformly on the eight wheels in place of four wheels.

In the use of these trucks it is advised that the motors be placed on the inside axles, as with any dirt or snow on the rails, the forward wheels will cut and clean it away, leaving the train clear for the rear driving wheels. With the peculiar form of attaching the motors, all the weight is put upon the driving wheels, thus obtaining such traction that a car mounted on these trucks can readily ascend a 13½ per cent. grade. The wheels are the same size, and by having all the axles turned and key seated, when the drivers are partially worn out, the idle wheels can be transferred to take the place of the drivers, thus insuring longer life for the wheels. The car body rests on a center plate and radiates from a kingbolt, and the truck can freely curve without any undue wear or strain on flanges of wheels, and with absolutely no danger of climbing the rails.

The trucks are constructed with a short wheel base, thus enabling them to curve around thirty-five foot radius curves. Any of the present form of motors can be attached, and can be examined and repaired without in any wise disturbing either the car body or any part of the truck.

The Empire State radial truck is now in practical operation on several leading roads, and giving complete satisfaction, so that it is no experiment. It is especially adapted to suburban lines, and can successfully carry double deck or observation cars. The wheels and axles and all wearing parts are interchangeable with the single trucks, made by the Taylor Electric Truck Company. The Taylor Electric Truck Company, fully warrants the Empire State radial truck, as being of the best material thoroughly and substantially built, the springs made of the best crucible spring steel, and tested to meet all requirements of the severest service, and all parts made and put together in a first class workmanlike manner.

Westinghouse Electric & Manufacturing Co.

The affairs and interests of the Westinghouse Electric & Manufacturing Company, of Pittsburgh, Pa., were looked after at the Convention by W. C. Clark, general agent, Pittsburgh; W. F. Zimmerman, assistant general manager New York; C. A. Bragg, manager of the Philadelphia office; B. F. Stewart, manager of the Chicago office; G. Pantaleoni, manager of the St. Louis office; D. A. Tompkins, manager of the Charlotte office; A. J. Wurts, E. H. Heinrichs, J. A. Rutherford, J. R. Gordon, W. S. Brown, and other gentlemen from the home office in Pittsburgh.

There were two distinctive features of the company's representation of apparatus, an exhibit of its machinery in practical service, and a special exhibit in the company's headquarters at the Aragon Hotel, of some experiments demonstrating the principles upon which is based the Wurts system of protecting lines and apparatus against lightning.

The principal feature of the operating machinery was the great 700 H. P. generator directly connected to a compound, condensing Corliss engine in the station of the Atlanta Consolidated Street Railway. This machine, running at eighty revolutions, produces a current of about 1,000 H. P. This direct connected apparatus was started up the day before the Convention convened, in the presence of an assembly of invited guests, a baby son of Joel Hurt, president of the Consolidated Company, having technically opened the throttle to set things in motion. When young Master Hurt had performed his duty, Chief Engineer Elliott took things in hand, and under his skillful guidance, the immense machine was put into full operation without a hitch or trouble of any sort, the great fifty ton wheel gaining its momentum rapidly and smoothly. Besides the generator there were two 400 H. P., belted generators in the same station. These had been doing the work before the big machine was started.

About fifteen cars in Atlanta are equipped with Westinghouse motors and five new equipments, which had just arrived, were exhibited at the Convention Hall.

The exhibit in parlor 164 was purely technical. With the necessary apparatus, brought from Pittsburgh, A. J. Wurts made some unique experiments, illustrating the principles upon which is based his system of protection against lightning. He showed that a discharge could be made over a surface with far greater ease, and therefore over a far greater distance, than over an air space. Based upon the discovery of this fact, he has invented a lightning arrester to discharge over a surface, but so constructed that no arc can form. He also showed by experiment that the tendency of cumulative charges to discharge was more than erratic as to the location along the line where the discharge was likely to take place. Sometimes, with a tremendous charge, there are points where, nevertheless, there is little or no tendency to discharge. Therefore with one arrester that might by chance be at some neutral point a most destructive charge might not be in the least interfered with until it had destroyed a lot of apparatus and done

other damage. Mr. Wurts has devised a system, and invented a series of appliances, and has developed a knowledge of the action of cumulative charges, and by the application of all of these together it is claimed the possibility of damage is reduced to practically nothing. The importance of such a development is very much emphasized by the necessity of better protection than has been heretofore possible in cases of long distance transmission and very high pressure currents. If Mr. Wurts' appliances and system accomplishes what is claimed for them, then he has done an important service to all users of electrical apparatus. Mr. Wurts lays stress upon the statement that his appliances and system may both together be of little service unless they are intelligently applied with a knowledge of the very numerous peculiarities of the actions of disruptive discharges. It is to the task of discovering and classifying these peculiarities that Mr. Wurts has devoted his time now for several years, both in the laboratory and in the study of plants in practical operation. Some of the results of his study have been incorporated in a lecture which he delivered by invitation before the American Institute of Electrial Engineers. He has been awarded by the Franklin Institute the John Scott legacy medal for his discoveries in electrical science, and for his inventions.

Exhibit of the Paige Iron Works.

One of the largest exhibits at the Convention was that of the Paige Iron Works, of Chicago, whose exhibit occupied 1,200 ft. of space in the center of the Exhibition Hall. This company exhibited special track work, such as switches, frogs, curves and crossings made of both girder and T rail. The feature of the exhibit was a section of track using a seventy-two pound Shanghai T rail made by the Illinois Steel

EXHIBIT OF TRACK CONSTRUCTION BY THE PAIGE IRON WORKS.

Company, of Chicago, placed on Daniel steel ties with broken stone concrete foundation and brick paving, illustrating the "all-steel track" construction of the Terre Haute Electric Railway, of Terre Haute, Ind., and conclusively demonstrating the practicability of T rail for paved streets.

In connection with this Terre Haute work, the Paige Iron Works showed the Wheeler suspension rail joint, which is also used by the Terre Haute Company. A clever device for a three-way switch was also exhibited. This is a device for accomplishing the switching to any one of the three tracks without danger of derailment. Two styles of steam and street railway crossings were also shown. One of these devices was so constructed as not to disturb or affect the steam road in any way, and yet provides a perfect, easy riding crossing. The company has furnished a number of cities with this same T rail construction in various weights of thirty pounds upward. The girder rail switches shown are similar in construction to those furnished the Chicago City, Chicago General Electric, and, in fact, most of the Chicago roads.

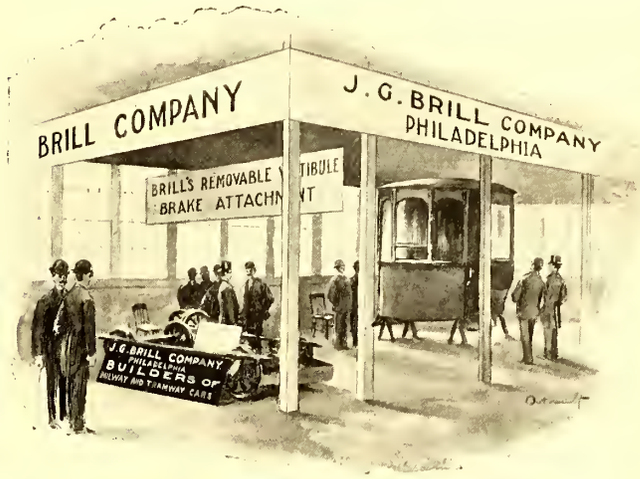
This company also showed views of cable work done for the West Chicago, one view showing a piece of special cable work recently made for the West Side Company, of Chicago, for its tracks on Washington Street near the tunnel, where they change from the West Side to the State Street cable. The company was represented by Mr. A. W. Paige, president, and Mr. E. S. Nethercut, engineer.

The Local Committee.

The thanks of the attendants at Atlanta are certainly due the local committee for the care paid by them to all present. No effort was spared by these gentlemen to make the time of all pass agreeably, and we cannot speak too highly of their work. William W. Kingston, Ernest Woodruff, Eugene P. Thomas and S. A. Trawick were particularly assiduous in attending to the wants of the delegates.

The J. G. Brill Company's Exhibit.

The J. G. Brill Company, the well known car and truck makers of Philadelphia, made one of its characteristic exhibits, both inside and outside the exhibition hall. There were in operation on the tracks of the Atlanta Consolidated Street Railway Company three elegant and



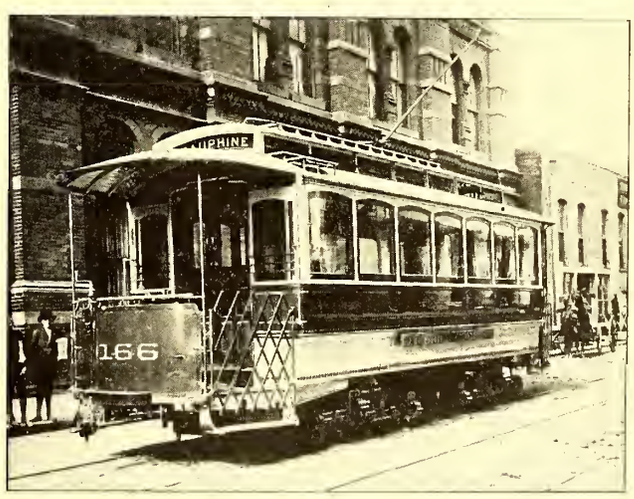
GENERAL VIEW OF J. G. BRILL CO.'S EXHIBIT.

entirely different types of motor cars. All attracted considerable attention, notably the Coronado railroad car, built by the Brill Company, for Coronado Beach, Cal., and which is shown in the accompanying illustration. This car is called a combination car, combining open and closed features. The finish is elaborate and beautiful. The woodwork is in solid mahogany, hand carved, the ceiling is decorated in transparent green, and the seats and backs are handsomely upholstered. This car attracted especial attention, and finds its place in cities where there is a uniformity of climate, like those in lower California or other Southern states.

Another car represented in operation was a twenty foot motor car, mounted on Brill's well known Eureka maximum traction trucks. The ease of riding of this car was its notable feature, and as the Brill Company is constructing some 200 odd cars of this same pattern for the New Orleans Traction Company, it is unnecessary for us to say that its type is popular and is approved by the best street railway operators. It is an unusually handsome car, and up to Brill's high standard of excellence.

Another car shown by Brill was a beautiful eighteen foot motor body, finished in mahogany and handsomely upholstered, this car being mounted on Brill No. 21 B independent rigid truck. The car carried many delegates to and from the Convention Hall, and a most favorable universal impression was created as to the style and workmanship displayed by the builders.

The Brill electric sweeper, equipped with Westinghouse motors, was on exhibition at the hall, and on the track where current could be optained to show its working qualities. The manner in which it made the dust fly from the crowded roadbed, and to about eighteen feet outside the rail line, created the impression that it would handle a snow storm and drifts to best possible advantage.



BRILL EXHIBITION CAR.

Inside the Convention and Exhibition Hall the Brill Company made a prominent and attractive display. There was on exhibition a framework consisting of an end of a car, two windows, and platform. On this framework were mounted all the appliances which could be called for by any railroad. A movable vestibule, Brill track scrapers, Brill rotary gong, Brill life guard, Brill sand box, Brill ratchet brake lever, and brake windlass, Brill gates, radiating drawbars, etc. The impor-

tance of this exhibit was brought home to the delegates with peculiar force, as they were thus able to examine in one spot all of the many improvements that can be applied to electric cars, according to the demands of service. There was also on exhibition a Brill car jack, the Eureka maximum traction truck, and the Brill No. 21 B truck, on which we will not dilate, as their many good qualities are well known.

The Brill parlor at the Aragon was an important evidence of the company's presence as it was occupied incessantly by the many friends of the Brill Company who were anxious to pay their respects to Jno A. Brill, the genial vice-president of the company, and his corps of assistants, Samuel M. Curwen, Wm. H. Heulings, Frank E. Randall, Western selling agent, Geo. M. Haskell, Eastern selling agent, and M. E. Curwen.

The Sterling Supply & Manufacturing Company.

The two most important desiderata in street railway operation, from a stockholder's standpoint, are undoubtedly as follows:

1st, to secure all the money paid as fare by passengers, and,

2d, from these receipts to keep as much as possible for dividends; in other words, not to pay out any more than is actually required for the operation of the road.

All unnecessary expenses of operation are a direct loss to the stockholders.

To assist street railway managers in securing these *sine quâ non* of success is the object of the Sterling Supply & Manufacturing Company of New York. The use of this company's register insures the former result, and the adoption of the Sterling standard fender will prevent the introduction of that often very considerable item of expenditure—the sums paid out in damage suits for accidents to persons. It is this last item that often makes the difference between a surplus and a deficiency, and decides the question as to whether a road shall be a financial failure or not to its owners.

The Sterling register has a national reputation in being the design of John B. Benton, the pioneer in the register business, whose fundamental patents for stationary registers are the property of the Sterling Company. Some of these registers have been in daily use on the Third Avenue Railway, of New York City, since 1875, showing an excellent record for durability and efficiency. The Sterling numeral registers have also been in use on the Twenty-third Street Railway for ten years, and in a slightly different form have been adopted as standards on the Broadway Cable Railway, of New York, and the New Orleans Traction Company.

Among its recent sales of registers the company mentions a large order from the Columbia Railway Company, of Washington, D. C., also one from the Metropolitan Traction Company, of New York, for the equipment of all the cars of the Columbus Avenue line of that company. The company has also received a number of additional orders from Yonkers.

The Sterling fenders have shown an equally high record in practice. The Third Avenue Railway Company, of New York, early adopted them as standard for all of its cable cars, and the results secured on that line have been of a most satisfactory character. The fender has never yet failed to do its duty in preventing a person from getting under the wheels of a car.

The investigation of the engineers of the Broadway line on the fender question covered a long period, and that the same device was adopted by them speaks volumes for its merits. The conditions on Broadway are particularly arduous, as our readers well know, and any device adopted there is only put in service after a most rigorous investigation of all existing types of apparatus.

A description of the Sterling Company's business would not be complete without mention, also, of its well known sand box. This naturally accompanies the employment of a fender, since the ability to stop a car within a specified time is almost, if not quite, as important, as to guard persons from the car wheels. The Sterling sand box is also used on the Broadway line, New York, as well as upon a number of other prominent railways, and its peculiar arrangement permits the certain delivery of sand on the track under all conditions whenever the lever is operated.

This company has recently published a handsome circular descriptive of the Sterling register, sand box, fender and other appliances which it manufactures. The catalogue is illustrated by handsome engravings, and is attractive in appearance.

Newspaper Men at the Convention.

The street railway and electrical press was well represented at the Atlanta Convention. THE STREET RAILWAY JOURNAL had a very handsome booth, tastefully decorated with bunting and potted plants, and located in the most conspicuous position on the floor of the Exhibition Hall. A view of it is given on page 733. The *Electrical Review* had a neatly arranged and attractive space, and was represented by C. W. Price and J. G. Tuckerman. The *Electrical World* representatives were W. J. Johnston and M. J. Sullivan. W. F. Collins was the only representative of the *Western Electrician*, and T. C. Martin, of the *Electrical Engineer*, both of whom, however, received a hearty welcome from their numerous friends. *Electricity* was distributed under the direction of B. E. Greene. *Electric Power* was represented by H. A. Foster, the *Electrical Age* by W. T. Hunt, and *Electrical Industries* by E. L. Powers. The *Street Railway Review* had three of its men—H. H. Windsor, H. J. Kenfield and J. Boyd—in attendance, and *The Car* was looked after by the same number, Messrs. Vandegrift, Douglass and Nagle. The representatives of the STREET RAILWAY JOURNAL were Jas. H. McGraw, C. B. Fairchild, Edward Caldwell, H. W. Pool, W. H. Taylor, J. B. Bennett and R. F. Outcault.

The Modemann Fender.

Some particulars of the Modemann fender, of which the United States Street Car Fender Company, of New York, is the manufacturer, have already been published in the STREET RAILWAY JOURNAL. This fender has recently been subjected to a number of severe tests on the line of the Atlantic Avenue Railway Company, of Brooklyn, N. Y., and it has given there the best of satisfaction. The object of the company was to subject the fender to as nearly the same conditions as would be met with in service as possible, and that the results secured proved the undoubted efficiency of the device was the unanimous opinion of the large gathering of street railway men who were present at the test.

The trials made were with persons, not dummies, and with both men and women, and the tests were made at full speed. None of the persons experimented with was connected with the company in any way, one being the reporter of a New York daily paper, and the other a man who had become interested in the operation of the fender from an examination of it.

When in operation the fender runs within two and a half inches of the ground. It consists of a light but exceedingly strong frame provided with a catch net, the end of the frame carrying a rubber roller, The fender collapses at forty pounds resistance, breaking the fall of person who is caught up by it, thus avoiding the shock which would inevitably occur if the victim should fall on a rigid fender or on the ground. As a result it has been found that persons caught by it are hardly bruised.

Another important feature of the fender is that on each side there are extensible wings which, when the fender collapses, project for nearly two feet on each side of the platform, preventing the person caught from being struck by the steps of the car or from falling from the fender. When in the ordinary position these wings hang down on either side and are entirely out of the way.

Another important feature of the fender is that if desired it can be folded up against the platform, occupying no room in the street. This is the position in which it is carried on the rear platform of the car, or when the car is in the car house. If desired, the fender can be lifted entirely from the end of the car.

The fender is so arranged that it can be easily adjusted to any make of car.

The Darrach Automatic Duplex Car Fender.

The Darrach automatic duplex car fender has been designed to pick up persons from the ground in all positions, lying as well as standing, and its operation on the line of the Consolidated Traction Company, of New Jersey, has been very satisfactory. The fender consists of three parts, viz., the fender proper, supporting frame and drop guard.

The fender proper is a strong, light frame, projecting in front of the car thirty inches, and is made of spring tempered, seamless steel tubing which supports a gang of flat steel springs. The lower bar is provided with a row of rollers to facilitate its passage over a fallen person. They ride five inches from the ground. A strong web belt passes in front of the lower turn or nose of the sofa springs, secured by an offset spring in such a manner that the belt is held with strong tension about two inches in front of the sofa springs.

The fender is attached to the supporting frame and to the car by a hook and hinge device and balance springs. It weighs about fifty pounds, and can be easily and quickly transferred by one man. The supporting frame is made of steel tubing and malleable iron castings, is attached to the car sills, and reaches from the truck frame to the front end of the sills.

The structure of the drop guard is a very important feature of the device. It is a steel frame, hinged to the supporting frame at the rear end, supported by two spring latches which hold it parallel to and about six inches above the track.

Above the drop guard, resting on the frame, are two spring levers which give it a quick impulse to the fall of the drop guard when it is unhooked, and also constitute an instantaneous lock that holds it firmly on the track. The front edge of the drop guard is a steel rope extending from track to track, locked in the ends of the steel frame. On this steel rope are a gang of flat steel springs which extend backward twenty inches to a rear portion of the frame.

The elasticity of the steel rope and the flexible steel springs cause the drop guard to slide freely over cobble stones and adapt itself to irregular surfaces, and when a body may be partly below the plane of the guard it will deflect, thus securing more ease and certainty of passing under a fallen person, without bruising or sliding him. This action is aided by the flexibility of the springs, which reduces the angle and brings the person somewhat in contact with the ground through the spaces between the springs. The balance of friction thus preserved keeps the person stationary while the drop guard is passing under him.

If a person is struck while in an upright position, the canvas belt, supplemented by the action of the springs behind it, provides such an elastic contact that it is nearly impossible to bruise or break a leg. A person so struck is thrown toward the car, and falls upon the elastic "sofa," the spring back of which protects from any hard blow on the car. If a person is struck while prostrate, the rollers cause the fender to rise and pass lightly over him, without scraping or pushing. This lifting action unlocks the rear drop guard which instantly falls to the ground and is locked, as described.

The motorman may release the drop guard by pressing a pin with his foot, without conflicting with the automatic action. The inventor is S. A. Darrach, of 693 Broad Street, Newark, N. J.

New Electric Railway Equipment.

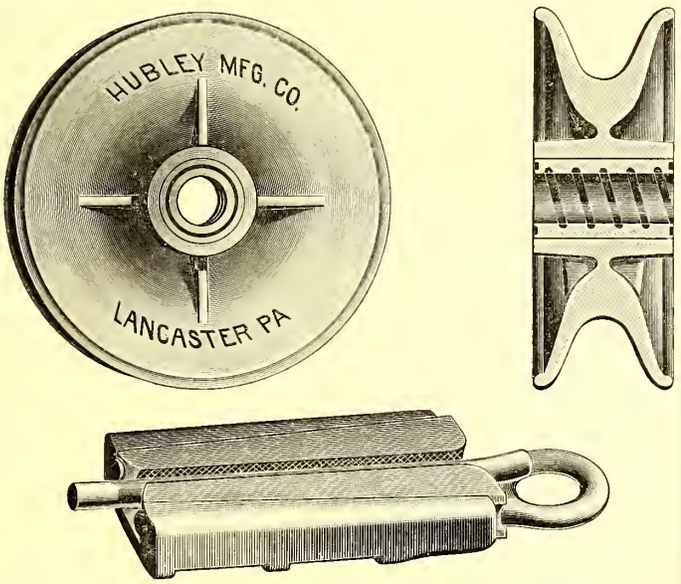
The trolley wheel shown in section in Fig. 1 on this page has recently been put on the market by the Hubley Manufacturing Company, of Lancaster, Pa., and is attracting much attention. The edges of the wheel are protected by a bead to give it greater strength and prevent it from cutting and otherwise injuring the overhead fixtures or wire. The wheels are designed to give a longer service than any other wheel on the market, are made of special high grade bearing bronze, and the metal is placed in the direction of wear. The spokes are so arranged as not to allow the edge to drop off in case it should be worn through. The hub has a large diameter, having a good contact with the springs, and is fitted with the best anti-friction bushings.

In the harps are combined the two essential qualities of lightness and strength. They are made of the best malleable iron and high grade bronze, both having steel shanks. The sides are made with the crescent section, and offer a rounded surface and prevents catching or cutting of the overhead fixtures.

The Hubley Manufacturing Company is also bringing out a full line of overhead material, using the celebrated Medbery insulation. The company's line of ears, straight line, anchor, feeder and splicing ears, are all of new design, and are all both light and strong. They are made to solder on or to hammer on, a feature which is being demanded by a number of managers on large roads.

The company is the sole manufacturer of the Cope come-along, shown in Fig. 2. This has been greatly improved, and a ring is now introduced at the end instead of a hook, as in the old form, making them much stronger. The jaws are slightly curved on their bearing surface, and have a checked grooving instead of being straight and having a filed grooving in the old form. This ensures a firmer grip on the trolley wire and is less liable to drop.

The Hubley Manufacturing Company is rapidly coming to the front, and is occupying a prominent position among its competitors in the electrical field. Its new plant is located a mile from the center of Lancaster, on the Pennsylvania Railroad, branches of which lead into the works. With the company's iron and brass foundries employing nearly 100 moulders, the machine shops, grinding, polishing and plating buildings and warehouses, all equipped with new machinery of the latest and best patterns, and employing over 300 hands, the company has one of the most complete and best appointed plants in the state. On account of the company's rapidly increasing business, however, it has been found necessary to erect at once a new foundry building which will give employment to nearly 100 more moulders, and also a large two story building for manufacturing purposes.



FIGS. 1 AND 2.—HUBLEY TROLLEY WHEEL AND COME-ALONG.

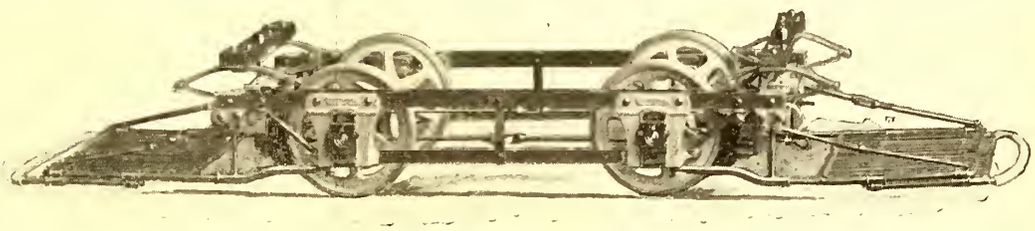
In the company's construction department several large contracts are on hand. Among the most important may be mentioned the contract for forty-three miles of electric railway for the Pennsylvania Traction Company, and a fifty mile telephone line and the equipment of an electric lighting plant of 1,000 lights capacity.

A Review of the Industrial Press.

An important department in the "Engineering Magazine," and one which promises to be of great value, was started in the October issue of that periodical. It consists in the extension of the plan of publishing an Index to Current Periodical Literature, which formed an important feature of the magazine. This is to be continued, but in addition, short abstracts of leading articles which have appeared in the technical papers during the preceding month will be given, classified under different department headings, giving in this way a review of technical progress.

The Bragg Fender.

We present herewith an engraving of a truck equipped with a new type of fender, manufactured by the Bragg Automatic Car Fender Company, of Troy, N. Y. A model of this fender was shown at Atlanta, and constituted one of the most interesting exhibits made there. The strong points of the fender are as follows: It can be attached to the truck and made independent of the car body, thus allowing it to run as close to the surface of the street as the character of the paving will permit.



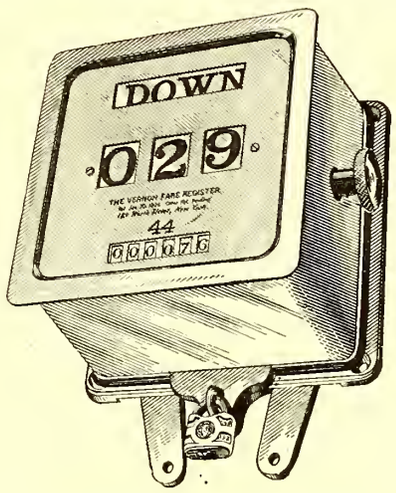
THE BRAGG FENDER,

Its action is entirely automatic, requiring no attention on the part of the motorman. The height is quickly and easily adjusted, and the fender can be quickly applied to any truck without changing anything on the latter; it can also be adjusted to extend out or in, as desired. The patent is a very broad one, and covers the basic flexible frame.

The Vernon Fare Register.

The Vernon counting register was used at Chicago at the Columbian Exposition last year at all of the gates to record the admissions, and at the Ferris wheel. Its accuracy was officially approved, and the company has testimonials from the Fair authorities in its favor.

The Vernon fare register is an adaptation of the Vernon counting register. Fifty of these registers have been in operation for some time on the line of the Consolidated Traction Company, of New Jersey, and David Young, the general manager of that company, speaks highly in its favor. The machine is accurate in operation and simple and substantial in construction. All parts are interchangeable. It is provided with double levers by which it can be actuated independently from either side. It is positive in action, and steel gearing is used. It is manufactured by S. M. Balzer, of 75–79 Center Street, New York.



THE VERNON FARE REGISTER.

Charles Scott Spring Company.

The Charles Scott Spring Company, of Philadelphia, reports a large increase in its business. To meet the demand for its products, this company has found it necessary to purchase the property adjoining its works, and is now erecting a handsome addition, having a frontage of 130 ft. on Germantown Avenue; 120 ft. on Canal Street and 43 ft. on New Market Street. This new shop will be devoted entirely to the new manufacture of elliptical springs, increasing the capacity of the company to a total of nearly 3,000 tons per annum. The capacity of the company's spiral spring plant is about 5,000 tons.

The company does not confine itself merely to the manufacture of springs for steam and street railroad cars, but is a very large manufacturer of trolley stand, brush holder, motor and sash springs.

A visit to these works is full of interest. The company has recently appointed F. A. Lawson & Company, of San Francisco, Cal., its agents for the Pacific coast.

Some New Corporations.

Baltimore, Md.—A certificate of incorporation of the Clifton Park Passenger Railway Company was recorded October 3 at the secretary of state's office at Annapolis. The incorporators are Winfield J. Taylor, Alfred J. Ulman, James H. Smith, Davies Murdoch, Frank N. Hoen, Rober S. Carswell and Eben B. Hunting. The capital stock is $50,000. The northeastern terminus of the road is on the Hartford Turnpike Road opposite the main entrance to the Clifton Park, and the southern terminus at or near the intersection of North Street with North Avenue, with the right to construct branches.

Bethlehem, Pa.—The Bethlehem & Nazareth Electric Street Railway Company was incorporated October 11, with a capital stock of $100,000. Charles Brodhead, of Bethlehem, is the president of the company, and other stockholders are A. C. Borhek, Albert Brodhead and Abraham S. Schropp, all of Bethlehem.

Fanwood, N. J.—The New York & Philadelphia Traction Company has applied for a franchise for the operation of its road. The company has also applied for similar franchises in North Plainfield, Dunellen, Bound Brook, Raritan and East Millstone.

Fort Smith, Ark.—Preliminary operations have been commenced on an electric street railway here.

Ironton, O.—The Ironton Street Railroad, Electric Light & Power Company has been incorporated, with a capital stock of $100,000.

Jersey City, N. J.—Permission has been granted to the Jersey City, Harrison & Kearny Railroad Company to lay tracks on the new bridge over the Hackensack River. The company has also been granted permission to lay a double track between Harrison & Kearny and to erect poles with overhead appliances to operate cars with electricity.

Kansas City, Kan.—The Kansas City Traction Company has been chartered to construct a street railroad in Wyandotte County. The road will be fifty miles in length. The capital stock is $1,000,000. The directors are Bird S. Colen, of Brooklyn, N. Y.; W. J. Smith and W. H. Lucas, of Kansas City, Mo.; C. W. Trickett, Frank D. Hutchings and C. F. Hutchings, of Kansas City, Kan.

Minersville, Pa.—A special committee of the Borough Council has been appointed to report on the form of an ordinance granting certain rights which will give the town an electric railway system.

Newburgh, N. Y.—Articles of incorporation for the Orange Lake & Walden Electric Railroad Company were executed in this city October 8. The incorporators are Benjamin Norton, of Brooklyn; H. R. Newkirk, also of Brooklyn, B. B. Odell, Jr., Col. William D. Hickey and Major W. H. Weston, of Newburgh. The new road will be a continuation of the Newburgh & Orange Lake Railway, and will terminate at Walden, a village twelve miles from here.

Niagara Falls, N. Y.—The construction of the Niagara Falls, Whirlpool & Northern Railroad, along Main Street to Devil's Hole, is nearly completed.

Oneonta, N. Y.—Considerable interest is being shown in the matter of building the electric railroad between Oneonta and Richfield Springs. Wm. Walker, of Carbondale, and W. B. S. Paul are interested.

Peekskill, N. Y.—Articles of incorporation have been filed for the Peekskill State Camp & Mohegan Railroad Company. The capital is $175,000. Among the directors are Frederick C. Beach, Edward B. Gallagher and George F. Kunz, of New York; John B. Westbrook, of Peekskill, and Gardner D. Hiscox, of Brooklyn.

Reimer City, Pa.—The Williams Valley Street Railway Company was incorporated October 16, with a capital stock of $100,000, to construct an electric railway from Reimer City, Schuylkill County, Pa., to Lykens, Dauphin County, Pa. Philip Porter, of Girardville, Pa., is the president of the company, and other stockholders are C. A. Barnhard, Moses Mervine and George C. Kachel, all of Girardville.

Springfield, O.—Consents and franchise have been secured for an electric railway between this city and Xenia. The power house will be located at Yellow Springs, where there will be a park of 300 acres. The line will be twenty-one miles in length. James W. Neff, of Yellow Springs, Green County, is interested.

Wilmington, Del.—The Wilmington & Gordon Heights Street Railway has been put in operation. The new road is about two miles in length, and will be operated in conjunction with the City Railway Company, of Wilmington.

Windham, N. Y.—An electric railroad project is being agitated here, to connect with one of the several railroads near.

Personals.

Mr. Frank S. DeRonde, of the Standard Paint Company, of this city, was married October 11.

Mr. David Newbold has been elected president of the Eckington & Soldiers' Home Railway Company, of Washington, D. C.

Mr. Frank Pierce, of the Pierce & Miller Engineering Company, met a sad bereavement last month through the death of his wife.

Mr. G. V. Onderdonk has taken entire charge of the affairs of the Vose Spring Company, as its general manager, Mr. Guibert having retired from the company.

Mr. E. E. Downs has resigned his position as general manager of the Kalamazoo Street Railway Company to build and operate the Battle Creek Street Railway, of Battle Creek, Mich.

Messrs. M. K. Bowen, Superintendent, and Mr. Hovey, master mechanic of the Chicago City Railway Company were in New York last month and made a pleasant call at our office.

Mr. George Kissam, of Carleton & Kissam, who has been in Europe for the past three months, has returned on the "Teutonic," and attended the Convention at Atlanta in the interest of his firm.

Mr. A. N. Connett has resigned his position of chief engineer of the Baltimore City Passenger Railway Company, and has accepted a similar position with the Metropolitan Railroad Company, of Washington, D. C.

Mr. Jno. C. N. Guibert, who was connected with the Vose Spring Company for twelve years, has retired from that company, and is about completing arrangements to represent, as manufacturers' agent, another large spring manufacturer.

Mr. W. A. H. Bogardus, has resigned as general manager of the Brooklyn Heights Railway Company, of Brooklyn, N. Y., owing to ill health, and has accepted the position of secretary and treasurer of the company. No successor has as yet been appointed.

Mr. John S. Pugh, whose face and figure are well known to street railway men throughout the South and East, has recently severed his connection with the Baltimore Car Wheel Company, in order to become the Eastern agent of the Dorner & Dutton Manufacturing Company, of Cleveland. Mr. Pugh entered the street railway field many years ago, having been apprenticed by his father to the John Stephenson Company in 1872. In 1885, he formed the firm of Pugh & Russell, manufacturers and dealers in street railway supplies, and this firm later on became the general selling agents of the Stephenson Company. A large and profitable business was built up, but the firm was dissolved in 1888, and Mr. Pugh entered the service of the Baltimore Car Wheel Company, in whose interests he has labored faithfully and with ability until this year. Messrs. Dorner & Dutton are to be congratulated on securing the services of a gentleman who has the technical ability and wide practical experience of Mr. Pugh.

JOHN S. PUGH.

Mr. Frank A. Rogers, representative of the Fulton Truck & Foundry Company, of Cleveland, O., is well known to the trade through his long connection with the street railway and electrical interests. Mr. Rogers was born in 1855, and was educated in the public schools of New York. He then entered the employ of the American Sewing Machine Company, in which he continued from 1871 to 1882, as salesman and collector, and later as general manager of the company's district office at Cleveland. In 1882 Mr. Rogers became engaged with the Brush Electric Company, of Cleveland, working in the shops as foreman of the arc lighting department until 1886. At the termination of this shop practice he was appointed sales agent of the company, and continued in this capacity until 1890, when he entered the service of the Short Electric Railway Company as sales agent. His work with this company, in whose employ he has remained until recently, has been in a high degree satisfactory, and his faithfulness and sense of personal honor have been always appreciated by his business associates. His present connection with the Fulton Truck & Foundry Company is one which can hardly fail to be advantageous to all concerned.

FRANK A. ROGERS.

New Publications.

Catalogue of Electric Railway Equipment and Supplies. Published by the Western Electric Company, of New York and Chicago.

A very handsome catalogue has recently been issued by the Western Electric Company, devoted to the electric railway department of this extensive company. The work of the Western Electric Company in electric lighting and railway service, as is well known, has been kept at a high standard, and customers are certain of securing apparatus which will give satisfaction. The list of supplies dealt in by this company is most complete, and embraces all varieties of equipment.

Equipment Notes.

W. D. Hoffman, agent of the Buckeye Engine Company, of Boston, Mass., has removed to Room 92, Hathaway Building, 620 Atlantic Avenue.

The Lodge & Davis Machine Tool Company, of Cincinnati, O., has closed a contract with the Toledo Bicycle Works for a complete equipment of machinery for new works of the latter company.

Charles J. Bogue, of New York, is making a specialty of the rewinding of street car motor armatures. He has excellent facilities for this class of work. Billings & Spencer drop forged bars are used.

The Stanley Rule & Bevel Company is installing a system of cars and tracks at its works at New Britain, Conn., and has selected for this purpose the narrow gauge system of the C. W. Hunt Company, of New York.

The Ball Engine Company, of Erie, Pa., has recently sold to the Freeport Electric Railway, of Freeport, Ill., a 150 H. P. engine, and to the Camden Horse Railway Company, of Camden, N. J., two 350 H. P., vertical compound engines.

The Mica Insulator Company, of New York, is meeting with great success in the sale of micanite for commutators. Micanite seems to avoid many of the objections met with in the use of sheet mica, and is most convenient to employ, as it is supplied in a large number of forms.

The Childs Manufacturing Company, of New York, has recently opened an office at 95 William Street, and is placing on the market insulating and preservative paints and compounds for the use of railway and electrical companies. W. H. Childs claims for these paints a superior quality.

The Scarritt Car Seat Company, of St. Louis, Mo., has established an agency in Boston, and for its agent has secured the services of the genial secretary of the New England Railroad Club, Francis M. Curtis, who will proclaim the excellence of the Scarritt seats to all inquiring friends. His office is located at 103 Milk Street, Boston.

The Sterling Supply & Manufacturing Company, of New York, has just sold 120 sets of its well-known sand boxes to the Consolidated Traction Company, of Jersey City, and seventy-five sets of Sterling fenders, seventy-five sets of sand boxes to the Broadway road, New York, as well as a complete register equipment for the new cars of the Broadway line.

The Consolidated Car Heating Company, Albany, N. Y., has recently received, as a result of competition tests, orders to equip with its electric heaters and temperature regulating switch, 100 cars belonging to the Nassau Railway, Brooklyn, N. Y., the Allentown & Lehigh Valley Traction Company, and the Yonkers Railway, all of which are operated by the well known Johnson syndicate.

The Coe Brass Manufacturing Company, of Torrington, Conn., is increasing its boiler equipment, and has almost completed a new boiler house. In this building the company is to use boilers designed by the Bigelow Boiler Company. The Coe Company will handle its coal from the storage to the boiler rooms by an equipment of narrow gauge cars and track, designed and manufactured by the C. W. Hunt Company, of New York.

The American Fuel Economizer & Engineering Company, of New York, who, as mentioned in our last issue, supplied the economizers for the Delaware Street power station, of the Electric Traction Company, of Philadelphia, was also contractor for the induced air draught used in that station, the contract including installation of stack and flues with connections. The company's economizers are four in number, each with 560 pipes.

Morris, Tasker & Company, Incorporated, of Philadelphia, Pa., have been made sole manufacturers of the Duggan patent adjustable pipe bracket. These brackets are made of wrought iron pipe, and are claimed to be the best and simplest form of bracket that is manufactured. They can be purchased direct from the manufacturers, Messrs. Morris, Tasker & Company, or from the Burnham & Duggan Railway Appliance Company, of Boston.

The Berlin Iron Bridge Company, of East Berlin, Conn., will furnish the iron roof trusses for the new city armory, at Pawtucket, R. I. The new power house for the Bridgeport Traction Company, Bridgeport, Conn., consisting of a dynamo room and a boiler room, will be of iron and brick—composite construction—and was designed and built by the same company. The dynamo room will be controlled by a traveling crane, furnished by the Berlin Company.

The Link-Belt Machinery Company, of Chicago, mentions among its recent sales for its standard water tube safety boilers, by the Link-Belt Machinery Company, Chicago, the following: To the Plainwell Church Furniture Company, Plainwell, Mich., 100 H. P.; to the Mutual Electric Light & Power Company, Chicago, 600 H. P.; the Pittsburgh High School, Pittsburgh, Pa., 250 H. P.; the Institute for Feeble Minded, Pittsburgh, Pa., 800 H. P.; and the Detroit Chamber of Commerce, Detroit, Mich., 300 H. P.

A. Langstaff Johnston, chief engineer of the Hestonville, Mantua & Fairmount Passenger Railway Company, of Philadelphia, Pa., and who was also chief engineer of the New Orleans & Carrollton Railway, of New Orleans, La., during the electrical equipment of that railway, writes us that the design of the station and car house of the latter railway was prepared by him and erected by the Berlin Iron Bridge Company, and that the work was not all done by one firm, as mentioned in our Souvenir issue. Full particulars in regard to this station and car house, as well as the novel power house hoist, were published in the STREET RAILWAY JOURNAL, for May, 1894.

The Partridge Carbon Company, of Sandusky, O., reports that its business has been excellent. The users of the well known Partridge self-lubricating brushes seem to be well satisfied with them. The company tells us that a number of improvements are being made in the brush, and that it will still continue to head the list in quality, and as a saver of time, labor and expense. In a test recently made with other brushes the Partridge, in all points, proved better, wearing one-quarter longer, kept the commutators in better condition and did not spark. The lubrication is quite an advantage, as the brushes need not be boiled in grease of any kind before being put in service.

The Siemens & Halske Electric Company's factory, in Chicago, was destroyed by the great lumber fire in that city August 1. The company made a lease with the Grant Locomotive Works August 11. It commenced moving into the new works August 15; it finished and shipped the first generator, built entirely at the new factory, October 15. Every available tool in the new works is now in operation, and many of the tools which were destroyed in the fire have been duplicated, so that from now on the company is in position to finish one direct coupled generator each day. These few simple facts indicate the dauntless spirit of the company, and it is certainly, to-day, in a better condition for competition in the electrical field than before the fire.

The Jonson Engineering & Foundry Company, of New York, has put on the market a dynamo changing switch, which is manufactured for all capacities. The blades and clips are made of tempered copper, the handle and block are of hard rubber, and the base of marble and slate. The company has recently supplied a dynamo changing switch of 300 amperes capacity, to be used with a voltage of from 1,000 to 1,500 on the circuits of the United Electric Light & Power Company, of New York. This type of switch is used exclusively on all the switchboards in the stations of this company. The company also supplies fuse blocks, short circuiting blocks, double pole jaw switches, and arc pole windlasses.

H. C. Bruner, of Pontiac, Ill., calls attention to a new brick filler which he is manufacturing. This filler takes the place of wood, and will readily commend itself to the railroad man on account of its durability, as its life is claimed to be much longer than that of any other filler. This brick in manufactured in any shape to fit the concave of any rail. By using moulded brick, a level payment can be maintained flush with the top of the rail. Low joints can be very readily got at, as it is only necessary to remove a very few bricks, whereas in using a wooden filler, a long piece of pavement has to be removed before the repairs can be made. Mr. Bruner reports the sale of 550,000 filler bricks to the Chicago City Railway Company.

The Buffalo Progressive Lumber Driers, of Buffalo, N. Y., are well and favorably known by all Americans interested in wood industries, and their sales also extend to many foreign countries. They are unsurpassed for drying lumber in any form. Special study of the different kinds and sizes of lumber to be seasoned is made by the manufacturers of these driers, and the various apparatus are designed with reference thereto. The Buffalo Forge Company, Buffalo, N. Y., recently received an order for a large outfit to be shipped to Reval, Russia, for drying veneers. The parties buying the outfit have tried various plans of seasoning this material with very unsatisfactory results, but after investigating a plant previously installed by the Buffalo Forge Company, were so well pleased with that outfit, that they found it unnecessary to look further.

The Consolidated Car Heating Company, of Albany, N. Y., in order to meet the demand for the Pope light, has added considerably to its plant, and is about to manufacture lamps for compressed oil gas and fittings on a large scale. The compressed gas plant of the latest pattern recently erected shows most excellent results, 17,600 cu. ft. of gas of fifty candle power, having been obtained from 160 gals. of oil, that is, 110 ft. per gallon, whereas the usual make is somewhat under ninety feet. The Consolidated Company is preparing to notify railway men from all over the country to witness an exhibit of Pope lighting apparatus at Albany, carrying out a similar plan to that it established in 1892 with reference to steam heating apparatus, when special trains were run hourly to Troy, and return during two days, and many prominent railway officials from all parts of the country and Canada were present to observe the operation of the Sewall coupler and commingler storage systems. The Consolidated Car Heating Company has recently closed a most important contract for heaters, and will supply the entire equipment of the Steinway (N. Y.) Railway Company. The company has closed a contract with the Fair Haven & Westville Railroad, of New Haven, Conn., for the equipment of its cars. The Union Railway Company, of Providence, R. I., which awarded a large contract to this company, has recently increased its order. The company has also closed a contract for the equipment of sixty cars with the Nassau Electric Company, of Brooklyn, N. Y.

The Laconia Car Company, will ship in a few days two twenty-foot vestibuled cars to the Paterson, Passaic & Rutherford Street Railway, Paterson, N. J., that are models in every respect in material and workmanship. Every foot of lumber used in construction of cars by this company is always thoroughly dried, and in the best possible condition. The oak used is second growth New Hampshire wood, unequaled in quality. The sills are made from Oregon pine, which by Government test shows higher tensile strength than Southern pine, while it is nearly one-third lighter. The company carries a very large stock of this timber. All parts are put together with screws, and every

joint carefully imbedded in glue. Especial attention has been given to render the support of the platforms firm and enduring. The finish is solid selected mahogany, and all trimmings are solid bronze. Especial care has also been taken in painting, with a view to produce permanent results. These cars will be a sample of the quality of work that will be turned out by the company, and no expense will be spared to make them of the highest grade in every particular. The company has had running all summer on the Brooklyn City Railroad, of Brooklyn, N. Y., four open cars, being the portion of an order for twenty-five, delivered before the fire, that show how their work stands under heavy traffic. The cars are numbered 1,600 to 1,603 inclusive. With the low manufacturing cost and excellent facilities in every department, the company can compete with all. The selling agent for the company is F. E. Huntress, whose office is at No. 8 Olive Street, Boston.

The Dreher Manufacturing Company, of New York, manufactures a railroad car grease known as Dreher's railroad car compound, which has been used extensively for the past six years on steam surface railroads for car axle lubrication, more than eighty steam surface railroads have used this grease in car axle boxes with the best of results. The company has testimonials in its possession from about forty of these railroads, the others being satisfied with the grease, but objecting to giving written testimonials. Most of these testimonials are of an extraordinary nature, the officials giving them admitting the grease to be far superior to anything of the kind they have ever used. There is probably no company in the grease business that can produce any such number and character of testimonials from steam railroads. The immense number of trolley lines that have been constructed during the past few years, decided the company to make its grease suitable for use in trolley car axle boxes, and during the past year the Dreher grease has been employed in car axle boxes with the very best of results. When the company first went into this market, the managers state that the trolley lines everywhere were having trouble with hot boxes on their fast runs, but they have yet to receive the first complaint from any company which has used the Dreher grease properly. The Dreher Company also manufactures an excellent motor grease, and a full line of cylinder, engine and dynamo oils, and will guarantee a certain per cent. saving to any company which will contract for oils. The company's grease has been used on railroads all over the United States, Canada, Mexico, and any number of foreign countries, and has always given the best of satisfaction. Although this grease has been sold to more than eighty railroads, the company has never lost the business of a railroad on account of the quality of the grease.

List of Street Railway Patents.

U. S. Street Railway Patents Issued September 11, 1894, to October 9, 1894, Inclusive.

September 11.

Electric Railway System—Charles S. Bradley, Avon, N. Y. No. 525,690.

An electric system of transmitting power, comprising a plurality of alternating current generators organized to impose on line currents of different frequency, distributing lines supplied thereby, and alternating current motors adapted to be connected with any of the several distributing lines.

Combined Brake and Electric Switch for Street Railway Cars—George Brown, Long Island City. N. Y. No. 525,782.

A combined automatic brake and electric switch adapted to gradually increase or decrease the current, and means for applying or releasing the brakes and actuating the switches successively at the same movement.

Trolley Pole Connection—Maurice R. Mahon and John M. Crane, Newark, N. J. No. 525,789.

The combination with the trolley pole and socket of an electric car, of a frame adapted to connect with said socket, and having a hollow bridge, and an arm connecting with said pole and pivotally secured to said holder and working in said bridge.

Electric Railway—Herbert E. Rider, New York, assignor to Adolph Falck, same place. No. 525,864.

A conductor comprising a tread portion of a metal having high conductivity, and a supporting portion consisting of a central web, supporting flanges extending on either side of said central web at the lower edge thereof and tread holding flanges extending on either side of said central web at the upper edge thereof, said tread holding flanges being upwardly curved so as to form a shallow groove, within which the tread portion of the conductor is supported, whereby a large contact surface for the current collector upon the highly conductive portion of the conductor is provided.

Trolley for Electric Railroads—Edward Dawson, Terre Haute, Ind. No. 525,886.

The combination, with a socket adapted to be secured to a trolley pole, of two brackets secured to the said socket and provided with screw threaded bosses at their upper ends, and a hollow pin screwed upon the said bosses and forming the bearing for the trolley wheel.

Switch Operating Device—George A. Fulford, Providence, R. I., assignor of one-half to Stephen C. Howard, same place. No. 525,892.

The combination with brackets secured to the car, of an actuating rod removably supported in said brackets and having a handle, and a wheel furnished with a thin edge rotatably mounted at the lower portion of the rod.

Fender for Street Railway Cars—Alfred J. Hollingsworth, West New Brighton, and Joseph A. Weaver, New York. No. 525,902.

This fender consists of folding side bars and detachable cross bars and detachable net.

Conduit System for Electric Railways—William G. Creighton, Chicago, Ill. No. 525,945.

A track rail, a separate plate forming a conduit therewith and having a grooved portion overhanging the rail, and a slot closer in the groove and adapted to rest upon the rail edge.

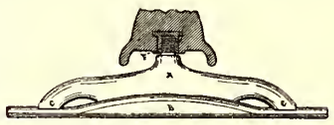
Car Fender—Samuel A. Darrach, Newark, N. J., assignor to the Darrach Car Fender Company, same place. No. 525,977.

A car fender composed of two sets of springs jointed together, of a swinging brace for keeping one set of the springs distended, and a scoop hinged to said fender.

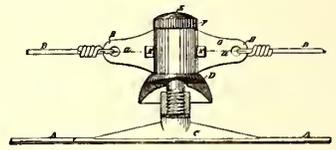
September 18.

Bond for Electric Railways—Dwight D. Book, Brooklyn, N. Y. No. 526,142.

A rail bond for electric railways comprising a bond plate electrically connected with the rail provided with upwardly extending holes to facilitate connection with the bond conductor.



NO. 526,422.



NO. 526,704.

Trolley Wire Finder—Edward Gale, Peoria, Ill. No. 526,183.

The combination of the trolley pole and wheel with a guard or finder, mounted on the pole near the wheel; said guard having mounted thereon revoluble sleeves extending laterally beyond the vertical planes of the sides of the wheel, and being movable vertically with relation to the wheel.

September 25.

Conduit for Electric Railways—David F. Graham, Springfield, O., and William P. Allen, Chicago, Ill., assignors of one-third to Oliver S. Kelley, Springfield, O. No. 526,392.

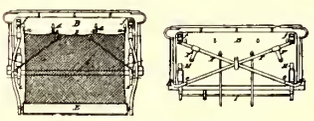
This is a slotted conduit with hinged plates below said slot, and adapted to contact in a line substantially under said slotted opening and provided with upturned corners. A moving contacting device having beveled edges is adapted to enter between said plates. Switching devices are connected to said plates, whereby a forward movement of the contacting devices elevates said plates and establishes an electrical connection from said feeding wires to the conductors.

Bracket for Trolley Wires—Leroy S. Pfouts, Canton, O. No. 526,408.

The combination of a pole, provided with a fixed right angle arm, provided with a yoke, and a pivoted trolley wire supporting arm.

Trolley and Feed Wire Bracket—Leroy S. Pfouts, Canton, O. No. 526,409.

The combination of a pole provided with a pivoted feed wire arm, having attached thereto a trolley wire supporting arm, both of the arms located at right angles to the trolley and feed wires.



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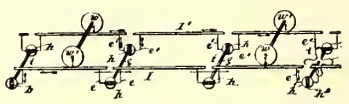

NO. 526,963.

Trolley Wire Hanger—Irvin B. Walker, Sioux City, Ia. No. 526,422.

A trolley wire hanger constructed of a single piece, and having a central lip grooved upon its upper surface for the reception of the wire, the ends of said hanger extending longitudinally beyond said lip and over said wire and being grooved upon their under edges.

Cable Car Grip Slot Brake—James T. Marlin, Kansas City, Mo., assignor of one third to Alfred Baker, Kansas City, Kan. No. 526,453.

In a cable car grip, slot brake, the combination with the grip, of levers carried by the framework, arms depending from said levers through the grip slot, and friction plates carried by said arms, so that when said center piece is elevated a sufficient distance, said friction plates will engage the slot rails.

Closed Conduit for Electric Railways—Charles D. Tisdale, Boston, Mass., assignor to himself, and John D. Gould, New York. No. 526,468.

An electrical conduit, formed of the flexible tube, the main conductor arranged at the bottom of the tube, the auxiliary sectional conductor placed on the top of the tube and provided with contact pins extending downward into the tube and provided with collars within the tube.

Register for Street Cars—William D. Forbes, Hoboken, assignor, by mesne assignments, to Horace B. Miller, trustee, Montclair, N. J. No. 526,567.

A register having a case, and a flanged rim graduated to form an annular dial in combination with a rotary disk, inclosing the front of the case and carrying a pointer to co-operate with the annular dial.

TESTING INDICATOR FOR ELECTRIC RAILWAY CARS—Theodore Stebbins, Boston, Mass. No. 526,644.

An indicator for testing electric circuits, comprising an indicating instrument, an electric switch having a series of contacts connected with the parts of the circuit or apparatus to be tested and with the terminals of the indicating appliance, and switch connections for placing the terminal of the indicating instrument, either in connection with a suitable source or current or with the ground at pleasure.

OCTOBER 2.

TROLLEY WIRE HANGER—John J. Green, Boonton, N. J., assignor to the Loando Hard Rubber Company, same place. No. 526,704.

In a trolley hanger supporting devices consisting of parts struck from sheet metal, and formed so as to be adapted to conjointly engage the trolley wire supports.

TROLLEY SPRING—Julius L. Hanson, United States Army. No. 526,705.

The trolley spring made up of two similar clasp springs having their spiral bends interlocked, and the ends of their members oppositely connected.

TROLLEY GUARD—Henry J. Tanner, Lynn, assignor of one-half to Harry Fairfield Hamilton, Boston, Mass. No. 526,756.

A trolley head, with a yoke of balls or wheels which meet above the trolley wire for the purpose of retaining the trolley wheel on the trolley wire, and which are separated by the pressure of the trolley wire upon them when the said wire enters and when it leaves the space inclosed by the retaining devices and the trolley wheel.

CONDUCTOR SWITCH—George H. Benjamin, New York, assignor to the firm of Siemens & Halske, Berlin, Germany. No. 526,850.

In an electric railway, the combination with a main track and an adjoining switch track; of working conductors for each of said tracks, one of said tracks having a sectional conductor normally out of the plane of the conductor of the other track, but adapted to be brought into line with the adjacent sections of the conductor of its own track, and close the gap therebetween.

CAR FENDER—Ambrose J. B. Berger, Higham, Mass., assignor to the Steel Cable Engineering Company, of Maine, No. 526,851.

A car fender consisting of a platform pivoted to the car and normally held above the track, combined with a hooked dog pivoted above said platform, a flexible sustaining connection secured to the platform, and adapted to be engaged by the hook of said dog, a latch to normally engage said dog, a removable pin depressible in the car floor, and connections between it and the latch, depression of said pin tripping the latch and thereby permitting the dog to turn upon its pivot and disengage its hook from said platform connection.

CAR FENDER—William L. Shockley, Colorado Springs, Colo. No. 526,949.

This is a vertically swinging, spring depressed fender hung beneath the car, with a revoluble, vertical shaft mounted on the car platform, and a cable and lever connection between said shaft and the fender, whereby the fender may be raised.

CONDUIT FOR ELECTRIC RAILWAYS—Michelangelo Cattori, Rome, Italy. No. 526,963.

In an electric railway, the combination, with two corresponding adjacent sections of each of the conductors, of a rotatable circuit closer having a surface made partly of an insulating and partly of a conducting material, and stationary contact pieces adapted for continuous sliding contact with the said surface of the circuit closer, and connected to the said adjacent sections of the conductors, the said contact pieces and the insulating and conducting portions of the circuit closer being so arranged relatively to each other that the adjacent sections of one conductor are connected when the corresponding sections of the other conductor are disconnected, and *vice versa*.

CAR FENDER—Robert Raphael, Brooklyn, N. Y., assignor to William J. McKelvey, same place. No. 527,004.

This is a car fender composed of brackets adapted to be secured to the bottom of a car, downwardly inclined guides formed on these brackets, a cradle constructed to engage the guides, and means for causing the cradle to move on the guides.

OCTOBER, 9.

CABLE STOP MECHANISM—Edwin Neil, Newark, N. J. No, 527,069.

An extra or idle cable is located in the conduit with the working cable, and is connected at the power station with means for shutting off the power from the working cable.

ELECTRIC LOCOMOTIVE—Nicolas J. Raffard, Paris, France, assignor to the Thomson-Houston Electric Company, of Connecticut. No. 527,126.

The electric motor is supported from the axle through spring supports allowing of relative movements due to vibrations of the parts. The part driven by the motor and surrounding the axle is out of direct or rigid contact therewith, and a flexible driving connection is provided between such part and the axle.

CONDUIT SYSTEM FOR ELECTRIC RAILWAYS—William A. Butler, New York, assignor to John Gilmore Boyd. No. 527,265.

In an electric railway system, a contact box consisting of an inner closed stationary shell having a conductor arranged therein, extending therefrom and adapted to be connected with the lead of an electric circuit, an exterior shell capable of rocking about the inner shell, a contact arm carried by the inner shell and adapted to be moved into contact with the conductor therein, and a conductor extending through and carried by the outer shell and mechanically and electrically connected with the contact arm of the inner shell.

LIFE SAVING GUARD FOR CARS—Louis E. Dubois, Toronto, Can. No. 527,270.

A spindle is pivotally connected to the car, a balance connected to the spindle, a framework rigidly connected to the ends of the spindle, a netting secured to the framework and to the car, a lever operates the spindle, and a switch mechanism provided adapted to cut on or off the current to the motor of the car, operated by the respective movement of the lever.

CONDUIT ELECTRIC RAILWAY—James E. Toole, Northumberland, Pa. No. 527,301.

The conduit is composed of two similar parts, each having an inwardly extending base and an inclined side, the inwardly extending base portions being spaced apart to form a drainage solt and provided at intervals with ribs which cross said slot.

TROLLEY WIRE SUPPORT OR HANGER—Sam C. Woodhead, Philadelphia, Pa. No. 527,355.

A series of revoluble supports or hangers are supported by the overhead system whereby when said trolley wire has become broken or cut, the said supports or hangers will prevent the same from falling to the ground.

We will send copies of specifications and drawings complete of any of the above patents to any address upon receipt of twenty-five cents. Give date and number of patent desired. THE STREET RAILWAY PUBLISHING COMPANY, HAVEMEYER BUILDING, NEW YORK.

Some Press Comments on our "Souvenir Edition."

"The Souvenir number of the STREET RAILWAY JOURNAL, is indeed a brilliant achievement, and is printed in high class style."—*American Banker.*

"The Souvenir number of the STREET RAILWAY JOURNAL is an indication of the substantial character of trade journalism."—Providence *Sunday Journal.*

"The *Electrical Review* extends its hearty congratulations to the STREET RAILWAY JOURNAL, both for the success it has attained in its chosen field and on the production of a supurb special number."—*Electrical Review.*

"THE STREET RAILWAY JOURNAL, this city, has celebrated its tenth anniversary by issuing a beautiful Souvenir number as a supplement. It contains many portraits and illustrations of officials, etc. It certainly shows progress and enterprise."—*Empire of Finance and Trade.*

"In artistic design and execution, this Souvenir issue of the STREET RAILWAY JOURNAL, is above criticism. We have seen no such pretentious and artistically executed work, as is this in the line of trade journalism. This issue is a credit to American journalism."—*Age of Steel.*

"We are compelled to congratulate the STREET RAILWAY JOURNAL, on its Souvenir number issued this month. Its illustrations are of a high order. Everything about the JOURNAL indicates energy and success. It is a pleasure to have such well edited periodicals come into our office."—*Daily Financial News.*

"The STREET RAILWAY JOURNAL has issued a handsome Souvenir number in connection with the Thirteenth Annual Convention of the American Street Railway Association held in Atlanta, Ga., October 17, 18 and 19. The book contains 122 pages of text principally descriptive of Atlanta, Chattanooga and other large Southern cities, well illustrated by photographic reproductions and printed on heavy wood cut paper. The whole is a fine specimen of trade journalism."—*Railroad Gazette.*

"THE STREET RAILWAY JOURNAL publishes a splendid Souvenir edition this week that is a magnificent advertisement for Atlanta and the South. Atlanta, as the place of holding the Convention has, of course, the most conspicuous place in this edition. There are illustrations of men and buildings in Atlanta executed in the finest style of the engraver's art. * * The whole paper is a magnificent journalistic production, and reflects credit on the STREET RAILWAY JOURNAL."—*Atlanta Journal.*

"THE STREET RAILWAY JOURNAL this year renewed its custom of distributing to those attending the Convention a Souvenir edition which was a model of artistic and typographical excellence. Filled with interesting and appropriate matter, handsomely illustrated and printed on heavy paper, it will undoubtedly be preserved by many present as a reminder of one of the most successful and enjoyable meetings ever held by the Association. The JOURNAL is to be congratulated on the fine appearance of this souvenir number."—*Electrical World.*

"Our esteemed and always excellent contemporary the STREET RAILWAY JOURNAL has issued a beautiful decennial number, in honor of its tenth anniversary, and of the Atlanta meeting of the American Street Railway Association. It contains a sixteen page article on Atlanta, a ten page article on the Association, a thirty page article on the street railway systems of the Southern cities, and a twenty page article on the history of the street railway industry. All of these are handsomely illustrated—containing over 400 illustrations, among which are more than 125 portraits of street railway men. Altogether it is one of the finest examples of technical and trade journalism ever seen."—*Electrical Engineer.*

QUOTATIONS OF STREET RAILWAY STOCKS.

ALBANY STOCKS AND BONDS.—Corrected by Spencer Trask & Co., Bankers and Brokers, corner State and James Streets, Albany, N. Y., Oct. 19.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Albany R. R. Co	100	1,000,000	Q Feb.	1½	1890	117	117½
Watervleit Turnpike & R. R. Co	100	240,000	.....	...	1863	3	.....

BONDS.	Date of Issue	Amount Out-standing.	Interest Paid.	%	Principal Due.	Bid.	Ask'd
Albany R. R. Co., 1st Mort	1865	40,000	J. & J.	5	1905	101½	.....
" " " 3d Mort	1875	28,500	J. & J.	7	1895	101½	.....
" " " 4th Mort	1880	11,500	M. & S.	6	1905	100	.....
" " " 5th Mort	1888	50,000	M. & S.	5	1913	101	.....
" " " Consol Mtg	1890	350,000	J. & J.	5	1930	103½	.....
" " " Debenture	1891	200,000	M. & N.	6	1901	111	.....
Watervliet Turnpike & R. R., 1st Mort	1889	350,000	M. & N.	6	1919	112	114
Watervliet Turnpike & R. R., 2d Mort	1889	150,000	M. & N.	6	1919	111½	113

BALTIMORE STOCKS AND BONDS.—Corrected by Hambleton & Co. Bankers, 9 South Street, Baltimore, Md., Oct. 19. Stock quotations are prices per share,

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Balto. City Pass. Ry. Co	25	2,500,000	Sem-an	4	.....	70¾	70½
City & Suburban Ry. Co	50	3,000,000	.....	1	.....	47	50
Central Pass. Ry. Co	50	300,000	.....	...	.....	68	70
Balto. Traction Co. (Cable)	25	5,000,000	Quart.	1	.....	15¾	16¼

BONDS.	Date of Issue	Amount Out-standing.	Interest Paid.	%	Principal Due.	Bid.	Ask'd
Central Pass. Ry	1882	250,000	J. & J.	6	1912	110	112
" " " cons. mort	1892	500,000	.....	5	.....	111½	112
City & Sub. Ry. Co. gen. mort	.....	2,000,000	J. & D.	5	1922	109	109¼
Balto. Traction Co. (Cable)	1889	1,500,000	M. & N.	5	1929	109	109½
Balt. Trac. Co., No. Balt. Div	1892	1,750,000	J. & D.	5	1942	104	104½
" " "	1891	1,250,000	M. & S.	6	1901	103	103½
City Pass. R. R. Co	1891	2,000,000	"	5	1911	113½	114

BOSTON STOCKS.—Corrected by R. L. Day & Co., 40 Water Street, Members of Boston Stock Exchange, Oct. 19. Stock quotations are prices per share.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
West End Pref	50	$6,400,000	J. & J.	4	1887	82½	83
West End Com'n	50	9,085,000	J. & J.	3	1890-1892	53	53⅛

BROOKLYN STOCKS AND BONDS.—Corrected by C. E. Staples & Co., 215 Montague Street, Brooklyn, O t. 19. Stock quotations are per cent. values.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Brooklyn City R. R. Co	10	6,000,000	Q.—J.	2	.....	.....	167
Brooklyn Traction Co., pref	100	3,000,000	.....	...	1893	65	.....
" " common	100	6,000,000	.....	...	1893	16	.....
Coney Island & Brooklyn R. R. Co	100	500,000	Oct. 1.	4	.....	.....	150
Long Island Traction Co	100	30,000,000			1893	12	.....

BONDS.	Date of Issue	Amount Out-standing.	Interest Paid.	%	Principal Due.	Bid.	Ask'd
Broadway R. R. Co	.....	350,000	J. & J.	5	6 m. notice	100	.....
Brooklyn Traction Co	1893	3,000,000	.. ..	...	.....		
Coney Island & Brooklyn R. R. Co., 1st bonds	.....	300,000	J. & J.	5	Jan. 1909	103	.....
Coney Island & Brooklyn R. R. Co., certificates	.....	300,000	J. & J.	6	July, 1894	100	.....
South Brooklyn Central R. R. Co., 1st	.....	125,000	F. & A.	7	Aug. 1897	.....	107
South Brooklyn Central R. R. Co., 2d ..	.....	150,000	F. & A.	6	July, 1941	100	.....
Brooklyn City R. R. Co., 1st	.....	3,000,000	J. & J.	5	July, 1916	112	115

CHARLESTON STOCKS AND BONDS.—Corrected by A. C. Kaufman, Charleston, S. C., Oct. 22. Stock quotations are prices per share.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Charleston City Ry. Co	50	$100,000	J. & J.	0	.....	.....	73
Enterprise Ry. Co	25	250,000	.....	...	.....	.....	5

BONDS.	Date of Issue	Amo'nt Out-stand-ing.	Inter-est Paid.	%	Principal Due.	Bid.	Ask'd
Charleston City Ry. Co	.....	100,000	J. & J.	6	1915	.....	.....
Enterprise Ry. Co	.....	50,000	J. & J.	5	1906	.....	.....

CHICAGO STOCKS AND BONDS.—Corrected by William B. Wrenn, 108 LaSalle Street, Chicago, Ill., Oct. 23.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Chicago City	100	$9,000,000	Q.—J.	3	.....	318	320
Chicago Passenger	100	1,000,000	A. & O.	2½	.....	160	.....
North Chicago City	100	500,000	Q.—J.	7⅛	.....	500	.....
North Chicago Street	100	5,500,000	J. & J.	4	.....	256	257
West Division City	100	1,250,000	Q.—J.	8¾	.....	625	.....
West Chicago Street	100	13,189,000	Q.—F.	1½	.....	131⅝	135½

BONDS.	Date of Issue	Amount Out-stand-ing.	Inter-est Paid.	%	Principal Due.	Bid.	Ask'd
Chicago City	.....	4,619,500	J. & J.	4½	.....	101½	101¾
Chicago Passenger	1883	400,000	F. & A.	6	1903	109½	.....
North Chicago City, 1st mort.	.....	500,000	M. & N.	6	1900	105	.....
" " "	.....	1,850,000	M. & N.	4½	1927	100¼	100½
North Chicago Street 1st mort	.....	2,413,000	J. & J.	5	1906	.....	103½
West Chicago Street	.....	4,100,000	M. & N.	5	.....	102⅞	103¼
West Chicago Street, Tunnel	.....	1,500,000	F. & A.	5	.....	100	101½
" " " Deb. 6's	.....	2,000,000	J. & D.	6	.....	102	102½

CINCINNATI STOCKS AND BONDS.—Corrected by Geo. Eustis & Co., Bankers and Brokers, 26 West Third Street, Cincinnati, Oct. 19. Stock quotations are per cent. values.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Cincinnati	50	$8,250,000	Q.—J.	5	.....	106¾	107⅛
Mt. Adams & Eden Park	50	1,600,000	Q.—J.	5	.....	106¾	107¼
Mt. Auburn Cable	100	300,000	.....	...	.....	.....	.....
Cin. Inclined Plane Ry	100	500,000	.....	...	.....	60	65
" " " Pref.	100	100,000	.....	6	.....	98	99½
Cin. Newport & Cov. St. Ry.	100	3,000,000	.....	.	.....	22½	23½

BONDS.	Date of Issue	Amount Out-stand-ing.	Inter-est Paid.	%	Principal Due.	Bid.	Ask'd
Cincinnati St. Ry	.....	50,000	J. & J.	7	July, 1895	101½	104
" "	.....	50,000	J. & J.	7	July, 1896	104	106
" " extended	.....	100,000	J. & J.	4	.....	99¼	100
	.....	150,000	J. & J.	5	.....	100¾	101¼
Mt. Adams & Eden Park	.....	50,000	A. & O.	6	July, 1895	101	103
" " "	.....	50,000	A. & O.	6	July, 1900	107½	110
" " "	.....	100,000	A. & O.	6	July, 1905	110½	111½
" " 10-20's	.....	200,000	J. & D.	6	Je. '94-1924	102½	.....
" " Cable	.....	280,000	M. & S.	5	Mar. 1906	105	105½
Cin. Inclined Plane Ry	.....	125,000	J. & J.	7	July, 1899	107	108
" " " "	.....	300,000	J. & J.	6	Jan. 1914	105	106
Mt. Auburn Cable	.....	200,000	J. & D.	5	June, 1907	.....	90
" " 5-20's 2d	.....	100,000	A. & O.	7	Ap. '93-1908	.....	.....
S. Covington & Cincinnati	.....	250,000	M. & S.	6	Mar. 1912	114	115
S. Cov. & Cin. 2d Mort. gold 6's	.....	250,000	J. & J.	...	1932	113½	114⅛

CLEVELAND STOCKS AND BONDS.—Corrected by W. J. Hayes & Sons, Bankers, Cleveland, O., Oct. 19.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
The Cleveland Electric Ry. Co.	100	12,000,000	.....	....	1893	49	50
The Cleveland City Ry. Co	100	8,000,000	.....	....	1893	58	59

BONDS.	Date of Issue	Amount Out-standing	Inter-est Paid.	%	Principal Due.	Bid.	Ask'd
The Cleveland Electric Ry. Co.	1893	2,000,000	M.—S.	5	1910	100	102⅛
" " City " "	1893	2,349,000	.....			100	102

DETROIT STOCKS.—Corrected by CAMERON CURRIE & Co., Bankers and Brokers, 82 Griswold Street, Detroit, Oct. 19.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Fort Wayne & Belle Isle Ry. Co.	100	$250,000	.....	...	.....	200	.....
Detroit Citizens Street Ry. Co.	100	2,000,000	.....	...	.....	.....	100
Wyandotte & Detroit River Ry.	100	200,000	.....	...	.....	100	110

HOLYOKE STOCKS.—Corrected by J. G. MACKINTOSH & Co., Bankers, Holyoke, Mass., Oct. 19.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
Springfield Street R. R. Co.....	100	1,000,000	J. & J.	4	.....	200	225
Holyoke Street R. R.....	100	250,000	J. & J.	4	.....	200	225
Northampton Street R. R.....	100	50,000	.....	...	.....	125	150

LOUISVILLE STOCKS AND BONDS.—Corrected by ALMSTEDT BROS. Stock and Bond Brokers, 510 West Main Street, Louisville, Ky., Oct. 19.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Louisville St. Ry. Co., pref...	100	$2,000,000	A. & O.	5	Jan. 1891	87	88
Louisville St. Ry. Co., com....	100	4,000,000	.....	...	Jan. 1891	35	36

BONDS.	Date of Issue	Amount Outstanding.	Interest Paid.	%	Principal Due.	Bid.	Ask'd
Louisville St. Ry. Co., 1st mort	1890	6,000,000	J. & J.	5	1930	102½	103½
Louisville City Ry. Co. Cons.	1884	1,000,000	J. & J.	6	1909	116	117
Central Passenger Ry. Co....	1888	400,000	M. & N.	6	1908	116	117
New Albany St. Ry. 1st Mort.	1888	150,000	J. & J.	6	1913	85	90

NEW HAVEN STOCKS AND BONDS.—Corrected by H. C. WARREN & Co., Bankers and Brokers, New Haven, Conn. Oct. 19. Stock quotations are prices per share.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
F. Haven & Westville R. R. Co.	25	$600,000	J. & J.	4	.....	45	47
New Haven & W. Haven R. R. Co	25	.....	.....	...	.....	...	.....
New Haven & Cent'lle H. R. Co.	.....	.....	.....	...	.....	.....	.....
Hartford & Wethersfield Horse R. R. Co.....	100	200,000	J. & J.	3	.....	125	.....

BONDS.	Date of Issue	Amo'nt Outstanding.	Interest Paid.	%	Principal Due.	Bid.	Ask'd
New Haven Street Ry. Co.....	1894	600,000	J. & J.	5	Jan. 1919	.....	100
New Haven & W. Haven R. R. Co	1892	500,000	M. & N.	5	Nov. 1912	100	102
Winchester Ave. R. R. Co. Deb.	1894	100,000	M. & S.	6	Mar. 1909	100	.....
Bridgeport Traction Co.....	1893	2,000,000	J. & J.	5	July, 1923	95	100
Hartford & Wethersfield Horse R. R. Co., Deb. Series A.....	1888	100,000	M. & S.	5	Sept., 1908	.....	.....
Hartford & Wethersfield Horse R. R. Co., Deb. Series B....	1890	100,000	M. & N.	5	May, 1910	.....	.....
Hartford & Wethersfield Horse R. R. Co., Deb. Series C.....	.....	100,000	M. & N.	5	May, 1910	.....	.....

NEW ORLEANS STOCKS AND BONDS.—Corrected by GEORGE LE SASSIER, 188 Common Street, New Orleans, La., Oct. 19. Stock quotations are prices per share.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Carrollton R. R. Co.....	100	1,200,000	Quart.	1½	1867	121½	125
Crescent City R. Co.....	100	1,150,000	"	3	1866	72	76
Canal & Claiborne R. R. Co..	40	240,000	Semi.	2½	1888	37½	40
New Orleans City & Lake Co.	100	1,500,000	Quart.	2¼	1860	106½	112
Orleans R. R. Co.....	50	185,000	"	2	1868	31	36
St. Charles Street R. R. Co..	50	600,000	"	2½	1865	55¾	57

Bonds.	Date of Issue	Amount Outstanding.	Interest Paid.	%	Principal Due.	Bid.	Ask'd
Canal & Claiborne Sts. R. R.	1892	150,000	M & N	6	1912	102	.....
Crescent City R. R. 1st Mort.	1883	75,000	M & N	6	'95-'99	100½	.....
do do new	1886	40,000	M & N	6	1896	100½	.....
do do	1893	2,000,000	J & J	6	1943	86	.....
N. O. City R. R. Co.....	1879	416,500	J & D	6	1903	116	.....
N. O. & Carrollton R. R. Co..	1882	250,000	F & A	6	'97-'06	.....	.....
N. O. City & Lake R. R. Co., 1st Mort.....	1893	1,725,000	J & J	5	1943	88¾	90
St. Charles Street R. R. Co...	1881	105,000	J & D	6	'95-'01	.....	.....

MONTREAL STOCKS AND BONDS.—Corrected by GORDON STRATHY & Co. Members Montreal Stock Exchange, 9 St. Sacrament Street, Oct. 19. Stock quotations are per cent. values.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Montreal St. Ry. (old stock)	50	$2,000,000	M. & N.	4	May, '91.	161¾	162
" " (new stock)	50	2,000,000	.....	...	May, '94.	157½	157¾

BONDS.	Date of Issue	Amount Outstanding.	Interest Period.	%	Principal Due.	Bid.	Ask'd
Montreal St. Ry.....	1885	£60,000	.....	5	1905	.....	.....
	1893	700,000		4½			

NEW YORK STOCKS AND BONDS.—Corrected by JAMES MCGOVERN & Co. 6 Wall St., New York, Oct. 19.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Bleecker St. & Fulton Ferry...	100	900,000	J. & J.	¾	.....	29	30
Broadway & Seventh Avenue..	100	2,100,000	Q.—J.	2½	.....	183½	186
Cen'l Park, North & East River	100	1,800,000	Q.—J.	2	.....	160	.....
Central Crosstown.....	100	600,000	Q.—F.	1¾	.....	159	.....
Dry Dock, E. B'way & Battery.	100	1,200,000	Q.—F.	2	.....	136	140
42d & Grand St. Ferry.....	100	748,000	Q.—F.	4½	.....	300	.....
42d St., Manhat. & St. Nich. Av.	100	2,500,000	.....	...	.....	40	50
Eighth Avenue.....	100	1,600,000	Q.—J.	3	.....	250	300
Houston, W. St. & Pav. Ferry.	100	1,000,000	Q—F.	2	.....	200	.....
Second Avenue.....	100	1,862,000	Q.—J.	1	.....	138	140
Sixth Avenue.....	100	1,500,000	Q.—J.	1¾	.....	200	.....
Third Avenue.....	100	5,000,000	M.—N.	4½	.....	186	187
23d St.....	100	600,000	Q.—F.	2½	.....	290	.....
Ninth Avenue.....	100	800,000	Q.—J.	1½	.....	145	.....
Union Railway Co.....	100	2,000,000	.....	...	.....	140	160

Bonds.	Date of Issue	Amount.	Interest Paid.	%	Principal Due.	Bid.	Ask'd
Bleecker St. & Fulton Ferry...	.....	700,000	J. & J.	7	July, 1900	110	113
B'way & 7th Ave., 1st mort....	.....	1,500,000	J. & D.	5	June, 1904	107	109
2d mort.....	.....	500,000	J. & J.	5	July, 1914	106	109
Broadway Guaranteed 1sts....	.....	1,125,000	J. & J.	5	July 1924	109	112
" 2ds interest as rental	.....	1,000,000	J. & J.	5	July, 1905	106	109
Broadway Consolidated.....	.....	7,650,000	J. & J.	5	 1943	110¼	110¾
Cen'l Park, North & East River	.....	1,200,000	J. & D.	7	Dec., 1902	112	114
Central Crosstown—1st mort..	.....	250,000	M. & N.	6	Nov., 1922	120	.....
Dry Dock, E. B'way & Battery. 1st mort.....	.....	.....	J. & D.	5	 1932	110	.....
Scrip (can be called at par)..	.....	1,200,000	F. & A.	6	Aug. 1914	100	101
42d St. Manhat. & St. Nich. Av 1st mort.....	.....	1,200,000	M & S.	6	Sept., 1910	110	112
2d mort. income bonds.....	.....	1,200,000	J. & J.	6	1915	45	52
Eighth Ave., Scrip.....	.....	1,000,000	F. & A.	6	Aug., 1914	102	106
Houston, W. St. & Pav. F'ry, 1st	.....	500,000	J. & J.	7	July, 1894	100	.....
Second Avenue, 1st mort.....	.....	1,600,000	M. & N.	5	Nov., 1909	105	.....
Third Avenue.....	.....	7,000,000	J. & J.	5	Jan., 1937	118½	118¾
23d Street.....	.....	250,000	M. & N.	7	May, 1893	100	.....
Union Railway Co.....	.....	2,000,000	F. & A.	5	Feb, 1942	106	107

PHILADELPHIA SECURITIES.—Corrected by HUHN & GLENDINNING 143 South Fourth st. (Bullitt Building), Philadelphia, Oct. 19. Stock quotations are prices per share.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Citizens'.....	50	$500,000	Q.—J.	4	1858	272	274
Continental.....	50	1,000,000	J.—J.	6	1873	127	130
Frankford & Southwark.....	50	1,250,000	Q.—J.	5	1854	325	327
Germantown.....	50	1,500,000	Q.—J.	2¾	1858	112	113
Green & Coates...	50	500,000	Q.—J.	3	1858	124½	126
Hestonville...	50	2,050,000	.....	...	1859	58¾	60
Lombard & South.....	25	500,000	A.—O.	8	1861	90	91
People's Traction Co.....	50	10,000,000	.....	...	.....	54	54½
Philadelphia City.....	50	1,000,000	J.—J.	7½	1859	165	166
Philadelphia & Gray's Ferry..	50	617,500	J.—J.	3½	1858	80	85
*Philadelphia Traction (50 pd.)	50	7,000,000	M.—N.	3	1883	103½	104
Ridge Avenue.....	50	750,000	Q.—J.	5	1872	229	235
Second & Third.....	50	1,060,200	Q.—J.	5	1853	215	216
Thirteenth & Fifteenth.....	50	1,000,000	J.—J.	9	1858	229	230
Union.....	50	1,250,000	J.—J.	9½	1864	195	200
West Philadelphia...	50	750,000	J.—J.	10	1857	195	200
Metropolitan (N.Y.) Traction	100	30,000,000	Q.—F.	1	.....	112	112½
Baltimore Traction.....	25	5,000,000	.....	1	1889	15¾	16
Buffalo (N. Y.) Railway.....	100	6,000,000	.....	...	.....	52	54
Newark (N. J.) Passenger....	100	6,000,000	.....	...	.....	25	29
Pitts. & Birmingham Trac. Co. *Ex. Allotments.	50	3,000,000	J.—J.	...	.....	12⅝	12¾

BONDS.	Date of Issue	Amount Outstanding	Interest Paid.	%	Principal Due.	Bid.	Ask'd
Baltimore Traction 1st Mort.	1889	1,500,000	M.—N.	5	1929	107½	108¾
" " Imp.	1892	1,250,000	M.—S.	6	1901	101	102
Balt. Tr., No. Balt. Div., Gold	1892	1,750,000	J. & D.	5	1942	100¾	102
Germantown, 1st mort.....	.....	67,000	J.—D.	5	1904	105	.....
" 2d mort.....	.....	160,000	A.—O.	5	1899	103	.....
Hestonville, 1st mort.....	.....	300,000	M.—N.	6	1895	103½	.....
" " "	.....	124,500	J.—J.	6	1901	105	.....
" 2d mort..... ...	.....	75,000	M.—S.	6	1902	105	.....
People's, 1st mort.....	.....	219,000	J.—J.	7	1905	115	.....
" " "	.....	285,000	J.—J.	5	1911	100	.....
" Cons. mort.....	.....	247,000	M.—S.	5	1912	95	.....
West Philadelphia, 1st mort..	.....	246,000	A.—O.	6	1906	117	.....

OMAHA STOCKS AND BONDS.—Corrected by RICHARD C. PATTERSON, Banker and Broker, 907 N. Y. Life Building, Omaha, Neb., Oct. 19.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Omaha St. Ry. Co.	100	5,000,000	M. & N.	....	Jan. 1, '89	60	.....

BONDS.	Date of Issue	Am't Out-stand-ing.	Inter'st Paid.	%	Principal Due.	Bid.	Ask'd
Omaha St. Ry. Co.	1889	2,250,000	M. & N.	5	M'y 1, 1914	95	98

PITTSBURGH STOCKS AND BONDS.—Corrected by JOHN B. BARBOUR, Jr., 306 Times Bldg., Pittsburgh, Pa., Oct. 23. Stock quotations are prices per share.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Central Traction R. R. Co.	50	1,500,000	.....	...	.....	20¾	21¾
Citizens' Traction R. R. Co.	50	3,000,000	J. & J.	3	.....	59¾	60
Pitts. & Birmingham R. R. Co	50	3,000,000	.....	...	.....	14	14½
Pittsburgh Traction R. R. Co.	50	2,500,000	.....	3	.....	....	63½
Federal St. & Pleasant Valley	25	1,400,000	J. & J.	...	.....	21½	22
Pittsburgh, Allegheny & Man	50	3,000,000	.....	...	.....	38½	39
West End R. R. Co.	50	1,000,000	J. & J.	1	.....	16	20
Second Avenue R. R. Co.	50	1,000,000	J. & J.	2	.....	50	.....
Penn Incline Plane Co.	50	250,000	.....	...	.....	.....	.....
Monongahela Incline Plane Co	50	140,000	F. & A.	...	.....	.. ..	.....
Fort Pitt Incline Plane Co.	50	60,000	.....	...	.....	.....	.....
Mount Oliver Incline Plane Co	50	100,000	J. & J.	3	.....	.....	.....
Pittsburgh Incline Co.	100	100,000	J. & J.	5	.....	.....	.....
Duquesne Traction Co.	50	3,000,000	.....	...	.....	27½	28

BONDS.	Date of Issue	Amount Out-standing.	Inter-est Paid.	%	Principal Due.	Bid.	Ask'd
Citizens' Traction R. R. Co.	1887	1,250,000	A. & O.	5	1927	106	.....
Pittsburgh Traction R. R. Co.	1887	750,000	A. & O.	5	1927	105	106
Pitts. & Birmingham Traction Co.	1892	.....	.....	5	.....	95	95½
Pleasant Valley Ry.	1892	1,250,000	J. & J.	5	1919	.....	100
P., A. & M. R. R. Co.	1891	1,500,000	J. & J.	5	1931	104½	104¾
Duquesne Traction Co.	1890	1,500,000	J. & J.	5	1930	101¾	102
Second Ave. Electric R. R. Co		500,000	J. & J.	5	1923	.....	.....
Central Traction Co.	1889	375,000	J. & J.	5	1919	.....	.....
Union R. R. Co.	1881	100,000	A. & O.	5	1901	.....	.....
West End R. R. Co.		500,000	J. & J.	5	1922	102	.....
Birmingham, Knoxville & Allentown Tract. Co.	.....	.....	.....	6	.....	.....	.....
Suburban Rapid Transit.	.....	.....	.....	6	.....	.....	.....
Fort Pitt Incline Plane Co.	1881	30,000	.....	6	1901	.....	.....
Mount Oliver Incline Plane Co	1871	44,500	M. & N.	6	1901	. ...	.....
Penn Incl'e Plane Co. 1st Mort	1883	125,000	.....	6	1903	.....	.....
Monongahela Incl'e Plane Co.	1887	50,000	A. & O.	5	1897	.....	.....
Pittsburgh Incline Co.	1889	200,000	J. & J.	6	1910–19	.....	.....

PROVIDENCE STOCKS AND BONDS.—Corrected by CHACE & BUTTS Bankers, Providence, Oct. 19.

Company	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
United Traction & Electric Co.	100	.....	.....	...	.....	.. .	.....

BONDS.	Date of Issue	Amo'nt Out-stand'g	Inter-est Paid.	%	Principal Due.	Bid.	Ask'd
United Traction & Electric Co.	1893	8,000,000	M & S	5	1993	95	100
Newport St. Ry. Co.	.....	50,000	J & D	5	1910	100	.....

ROCHESTER, BUFFALO, PATERSON, COLUMBUS, WORCESTER AND BOSTON STOCKS AND BONDS.—Corrected by E. W. CLARK & Co., 139 So. Fourth St. (Bullitt Building), Philadelphia, Oct. 19.

Company.	Par.	Capital.	Period.	% last div	Date of Issue.	Bid	Ask'd
STOCKS.							
Rochester (N.Y.) Ry.	100	5,000,000	.....	...	1890	30	31
Buffalo (N.Y.) Ry.	100	6,000,000	.....	...	1891	58	60
Paterson (N. J.) Ry.	100	1,250,000	.....	...	1891	12	18
Columbus (O.) St. Ry.	100	3,000,000	Q.—F.	1	1892	47	49
North Shore Traction Co. (Boston) Pref.	100	2,000,000	A.—O.	6	1892	77	80
do do Common.	100	4,000,000	.....	...	1892	19½	20½
Worcester Traction Co. Pref	100	2,000,000	F.—A.	6	1892	80	82
do do Common.	100	3,000,000	.....	...	1892	14	18
Consol. Trac. Co. (N. J.)	100	.....	.....	...	1893	32	34

BONDS.	Date of Issue	Amount Out-standing.	Inter-est Paid.	%	Principal Due.	Bid	Ask'd
Rochester (N.Y.) Ry.	1890	3,000,000	A & O	5	1930	96	99
Buffalo (N.Y.) Ry.	1891	5,000,000	F & A	5	1931	100	102
Paterson (N. J.) Ry.	1891	850,000	J & D	6	1931	90	95
Newark (N. J.) Pass. Ry.	1890	6,000,000	J & J	5	1930	101	101¼
Columbus (O.) St. Ry.	1892	2,600,000	J & J	5	1932	91½	93
Consol. Trac. Co. (N. J.)	1893	.....	J & D	5	1933	89	90

SAN FRANCISCO STOCKS AND BONDS.—Corrected by PHILIP BARTH, Broker, 440 California Street, San Francisco, Cal., Oct. 11.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
California St. Cable Co.	100	1,000,000	Monthly	...	.....	.....	101
Geary St., Park & Ocean R. R. Co	100	1,000,000	Monthly	...	.....	.....	100
Market Street Cable Co.	.....	18,750,000	.....	...	.....	41½	42
Metropolitan Electric	.....	1,000,000	Monthly	...	.....	27	.....
Oakland, S. L. & Haywards	.....	.....	.....	...	.....	.....	100
Presidio & Ferries R. R. Co.	100	1,000,000	.....	...	.....	12	.....
Sutter St. R. R. Co.	.....	2,000,000	Quart'ly	...	.....	.....	100

Bonds.	Date of Issue	Am't Out-stand-ing.	Interest Paid.	%	Principal Due.	Bid.	Ask'd
Cal. St. Cable R. R.	.....	.....	J. & J.	5	.....	106½	.....
Ferries & Cliff House	.....	650,000	M. & S.	6	1914	.....	110
Geary St., Park & Ocean	.....	671,000	A. & O.	5	.....	103	105½
Market Street Cable Co.	.....	3,000,000	J. & J.	6	1913	119½	.....
Omnibus Cable Co.	.....	2,000,000	A. & O.	6	1918	114½	117
Park & Ocean R. R.	.....	250,000	J. & J.	6	1914	112	.....
Park & Cliff House R. R.	.....	350,000	J. & J.	6	.....	.....	101
Powell Street R. R.	.....	700,000	M. & S.	6	1912	106½	110
Sutter St. Cable Co.	.....	900,000	M. & N.	5	.. ..	.....	106½

ST. LOUIS STOCKS AND BONDS.—Corrected by JAMES CAMPBELL, Broker, Rialto Building, 218 N. 4th St., Oct. 19. Stock quotations are prices per share.

Company.	Par.	Capital Issued.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Cass Ave. & Fair Grounds.	100	2,500,000	.....	...	1876	60	62
Citizens'	100	1,500,000	Oct. '93	4	1887	80	85
Jefferson Avenue	100	112,000	Dec. '88	2	1885	125	135
Lindell	100	2,500,000	.....	...	1890	99½	101
Missouri	100	2,000,000	Q.—J.	2	1891	200	210
People's	50	1,000,000	Dec. '89	50c	1889	20	25
St. Louis	100	2,000,000	J. & J.	3½	1890	147	150
Fourth Street & Arsenal	50	150,000	.....	...	1872	5	10
Union Depot	100	4,000,000	Jan. '94	8	1890	150	200
St. Louis & Suburban	100	2,500,000	... .	...	1891	20	21
Southern, Pfd.	.....	800,000	Jan. '94	3	.....	80	85
" Com.	.....	700,000	.....	...	.....	15	25

BONDS.	Date of Issue	Amount Out-stand-ing.	Inter-est Paid.	%	Principal Due.	Bid.	Ask'd
Cass Avenue & Fair Ground.	1892	1,800,000	J. & J.	5	1912	98	100
Citizens' Cable	1887	1,500,000	J. & J.	6	1907	105	107
Fourth St. & Arsenal	1888	50,000	J. & J.	6	1898–1903	98	100
Lindell	1890	1,500,000	J. & J.	5	1895–1910	101½	103
Missouri Cable	1887	500,000	M. & S.	6	1907	100	102
People's 1st mort.	1882	125,000	J. & D.	6	1902	99	100
" 2d mort.	1886	75,000	M. & N.	7	1902	100	102
People's Cable	1889	800,000	J. & J.	6	1889–1914	90	95
St. Louis Cable	1890	1,500,000	M. & N.	5	1900–1910	101	103
Union Depot	1890	4,000,000	A. & O.	6	1900–1910	105	106
Southern	1884	200,000	M. & N.	6	1904	103	105
Southern	1889	300,000	M. & N.	6	1909	100	104
St. Louis & Suburban	1891	1,400,000	F. & A.	5	1921	85	87
St. Louis & Suburban (Incomes)	1891	300,000	.....	6	.....	70	80

WASHINGTON STOCKS AND BONDS.—Corrected by CRANE, PARRIS & Co., Bankers, 1344 F Street, N.W., Washington, D. C., Oct. 19. Stock quotations are prices per share.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Wash'ton & Georgetown R.R.	50	500,000	Q. F.	5	1863	280	310
Metropolitan R. R.	50	750,000	Q. J.	2	1864	80	90
Columbia R. R.	50	400,000	Q. M.	1	1870	57	.....
Belt R.R.	50	500,000	Q. J.	...	1875	25	.....
Eckington & Soldiers' Home.	50	352,000	.....	...	.....	30	.....
Georgetown & Tenallytown.	50	200,000	.....	...	.....	.....	85

BONDS.	Date of Issue	Amount Out-standing.	Inter-est Paid.	%	Principal Due.	Bid.	Ask'd
Wash'tn & Geo'tn conv't. 1st.	'83–'99	3,000,000	J. & J.	6	1899-1929	125	135
" " " 2d.	.....	500,000	J. & J.	6	1903–1943	125	135
Eckington & Soldiers' Home.	.....	150,000	J. & D.	6	1896-1911	101	105
Belt.	.....	500,000	J. & J.	6	1921	80	86¼
Metropolitan R. R. convert.	.....	200,000	J. & J.	5	1901	102½	104¾
Columbia R. R. 1914.	.....	500,000	A. & O.	6	.....	107	110

Financial.

THE issue of $1,700,000 bonds by the Metropolitan Railway Company, of Washington, D. C., has been authorized by the stockholders of that company.

$ $ $

THE Northwestern Elevated Railroad Company, of Chicago, has filed a mortgage to the Illinois Trust & Savings Bank, trustees, the amount being $15,000,000. The principal is due August 1, 1944.

THE Massachusetts railroad commissioners have approved the issue of additional capital stock to the amount of $264,000 by the Brockton Street Railway Company.

$ $ $

IT is stated that arrangements for consolidating the Morrisse system of electric railways, in Paterson and vicinity, under the title of the New Jersey Electric Railway Company, are progressing rapidly.

$ $ $

CONTROL of the Union Railway Company, of New Bedford, has been secured, it is said, by a syndicate of New York, Rochester, Boston and Fall River capitalists. The new syndicate has acquired 1,350 out of 2,600 shares. The price paid is said to have been $169 per share.

$ $ $

THE annual meeting of the Mornington Tramway Company, of Dunedin, New Zealand, was held July 19. The line is operated by cable, and in the year ending June 30, 1894, the cars ran 57,881 miles, carrying 542,161 passengers. Receipts £4,840, working expenses £3,178. A dividend of 7 per cent. was declared.

$ $ $

THE annual meeting of the Melbourne Tramway & Omnibus Company, of Melbourne, N. S. W., was held August 9. The report showed passengers carried by the sixteen cable and three horse tramway lines 34,054,145, a decrease of 1,557,781 under last year; miles run 7,968,738 or 321,621 less than last year. There are forty-three and a half miles of double track (cable), and four and a half miles of double track (horse). The falling off of traffic was attributed to the continued hard times. A dividend of 5 per cent. or £18,056 was declared.

$ $ $

The Syracuse (N. Y.) Consolidated Street Railway Company, having made default on the coupons of its 5 per cent. first mortgage bonds, due January 1 and July 1 last, and foreclosure proceedings having been begun by the trustee, Simon Wormser, Casimir Tag, Clarence H. Wildes and Isaac N. Seligman, representing more than a majority of the bonds, have been constituted a committee for the protection of the bondholders. These are requested to deposit their holdings with the Central Trust Company, of New York, receiving negotiable certificates therefor.

$ $ $

THE Metropolitan Electric Company, which recently leased the plant and franchises of the Reading (Pa.) Electric Light & Power Company for ninety-nine years, with the privilege to buy at the end of the lease, has given a mortgage to the Pennsylvania Trust Company for $150,000. Coupon bonds are to be issued by the company, covering the amount payable October 1, 1909, with interest at 6 per cent. payable semi-annually. Another mortgage for $75,000 was also given by the Reading & Temple Electric Railway Company to the Reading Trust Company for the issue of 5 per cent. bonds, redeemable in fifteen years and payable in thirty.

$ $ $

THE following is a comparative statement of the operations of the Columbus (O.) Street Railway Company for the month of September: Gross earnings, 1894, $59,013.71; 1893, $47,161.44; increase, $11,852.27. Operating expenses, 1894, $23,474.38; 1893, $29,618.14; decrease, $6,143.76. Net earnings, 1894, $35,539.33; 1893, $17,543.30; increase, $17,996.03.

For the nine months ending September 30, 1894, the company presents the following report: Gross earnings, 1894, $421,166.96; 1893, $406,652.61; increase, $14,514.35. Operating expenses, 1894, $197,781.56; 1893, $255,518; decrease, $57,736.44. Net earnings, 1894, $223,385.40; 1893, $151,134.61; increase, $72,250.79.

$ $ $

THE annual meeting of the Pittsburgh (Pa.) & Birmingham Traction Company, was held October 9, and the following were elected directors: Dr. John M. Duff, C. M. Clark, A. C. Wettengel, Harry Moore, E. H. Jennings, W. R. Ford and Henry J. Lotz. President J. M. Duff read the following statement for the year ending July 1, 1894: Receipts from all sources except inclines, $297,497.96; receipts from inclines, $60,491.67; total, $357,989.63. Expenses: Expenses and taxes, $183,420.35; bond interest, $110,450; total, $293,870.35; incline expenses, $75,653.43; less dividend received from Mt. Oliver incline, $3,714; total, $71,714; total expenses, $365,809.78; less for the year, $7,820.15. The railways carried 5,862,024 passengers during the year, and were operated at the expense rate of 45½ per cent. of their gross receipts, and at 10¾ cents per car mile, exclusive of bridge tolls.

Annual Meeting of the Cleveland Electric Club.

At the annual meeting of the Electric Club, of Cleveland, held at its club rooms, Oct. 3, 1894, the following officers were elected: President, Chas. W. Wason; first vice-president, B. M. Barr; second vice-president, T. E. Adams; secretary, H. J. Davies; treasurer, E. W. Moore. Board of managers: Chas. W. Wason, H. J. Davies, R. M. Fuller, E. W. Moore, Geo. W. Cleveland.

Experiments With Fuses for 500 Volt Circuits.

Some interesting experiments with fuses for 500 volt circuits have been made recently by W. E. Harrington, superintendent of the Camden Horse Railroad Company, of Camden, N. J., in addition to those described in the paper by him on this subject read at the Atlanta Convention. The object of making the tests was to determine the value of recent rules adopted by the Underwriters' International Electric Association on the use of 500 volt fuses, reference to which is made in Mr. Harrington's paper.

The experiments were made with fuses of No. 8 B. & S. gauge copper wire, and with currents of from ten to fifty amperes, in ten ampere steps in each instance, note being taken of the ohmic resistance of the arc following the melting of the fuse. It was found that the ohmic resistance of the arc dropped off very rapidly as the current increased, the decrease being attributed to the greater volume, and consequently greater cross section of the gas formed, showing that under conditions of a short circuit on a railway system this resistance is negligible. It is interesting to note that a slight movement of air in the vicinity of the arc caused a variation in the resistance. The foregoing, Mr. Harrington believes, establishes the truth of the statement that if a given fuse protects for one maximum current, it may not for greater currents.

Different sections of No. 30 B. & S. gauge copper wire were tested in series with a C.-S. circuit breaker across the 500 volt bus bars of the switchboard of the Camden Horse Railroad Company, and it was found that with each length of the No. 30 B. & S. wire, ranging from one inch to eight inches, the circuit breaker which was set for 400 amperes was opened when a short circuit was made. Experiments were made with and without bridges. In other words, it was shown a copper wire which will fuse upon the passage of two amperes will allow about 400 amperes to pass on a short circuit. The reason for this given by Mr. Harrington is that the excessive current flows not through the fuse, but through the arc maintained at the expense of the terminals, the fuse simply playing the role of establishing a condition. In many instances, fuses made of No. 22 B. & S. gauge copper wire, six inches in length, have opened circuit breakers requiring 800 amperes to open. According to Mr. Harrington there exists a popular misconception of the action of bridges. A bridge is an additional protection, as it increases the length of the arc, other conditions remaining the same, but in short circuits the little additional length due to the bridge does not seem to have much effect, and the ideal fuse block for the protection of 500 volt circuits is one with protected terminals.

Do You Like Comfort When You Travel?

During the period covered by the World's Fair, the Lake Shore & Michigan Southern Railway came into great prominence as the route of the Exposition Flyers. These were the fastest long distance trains ever placed in service on any line of railway. They made the run from Chicago to New York in the remarkable time of twenty hours. Great importance attached to this event. The eyes of the railroad and the traveling world watched the performance of these trains; newspapers devoted columns to, and poetry and stories were written about them. They were recognized as one of the leading features in connection with the great Columbian Exposition. They aptly and powerfully illustrated the merits of this great line as a passenger route.

Long ago the United States Government recognized and selected the Lake Shore as the best route over which to run the famous White Mail Trains, the fastest service of this nature in the world.

A vigilant management, a perfect roadbed, double tracks, and absence of grades and curves have made possible the operation of this high class of service.

Thus it comes about that the Lake Shore takes rank among travelers as the most comfortable of American railways. It is a line used by persons desiring a prompt and reliable service, and who like comfort and elegance in their travels.

A. J. Smith, Gen'l Pass. & Ticket Agent, Cleveland, O.

N. B.—Wagner Vestibule Sleeping Cars without change between Chicago, Cleveland, Buffalo, New York and Boston. Elegant Dining Car service. ***