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During 1907 the Street Railway Journal printed and circulated 427,250 copies, an average of 8216 copies per week. Of this issue 7500 copies are printed.

Cycles in Governmental Policy

One of the principles sought by the founders of the American system of government was so to hedge about the jurisdiction of each department that no law would become effective until it had received the approval of each branch of the legislature and of the executive, and had been pronounced constitutional by the judiciary. This system has the advantage of preventing the hasty creation of laws and so results in conservatism in governmental policies. On the other hand, it has the disadvantage of slowness in action, or, to use an electrical analogy,

there is a pronounced lag between the cause of the trouble and the time of making the remedy effective. In other words, the sick man often dies and is buried before the physician can be called upon to prescribe for him.

It was largely to overcome this condition that the idea has been advocated and put into practice of governing by commissions, just as the courts of equity were created to avoid the circumlocutory and tedious processes of law. As we have before remarked, the principle represents a return to the more primitive forms of government by fiat or despotism. Such a system of government, however contrary to the accepted ideas in this country since 1776, might prove eminently satisfactory provided the despotism was wisely administered. Success, however, depends upon the exercise of these powers in a broad-minded way, and above all by those who have an intimate knowledge of the subjects upon which they are called to pass judgment. A commission, influenced to any considerable extent by caprice, politics or visionary ideals, is likely to cause a great deal of damage.

Two conspicuous trials of government by commissions are now being conducted in this country, one under State direction in New York, the other in national affairs by the Interstate Commerce Commission, and in both cases the street railway companies of the country are vitally interested. The direction of railways by the State authorities has passed through five stages in New York State, three in the United States. In the former case they may be listed as direct legislative control, a period of practically no supervision, a board of railroad commissioners with comparatively little authority, a rapid transit commission for a particular case with very broad powers, and the present commission having general jurisdiction over all of the public service corporations, responsible only to the State executive and with almost unlimited authority. In national affairs we have had no control, limited powers, and those conferred by the Hepburn act.

The public service commissioners have been in control in New York State since July 1, possibly too short a time to determine the effect which they will have on the transportation business of the State. The work of the city commission, or that of the First District, was perhaps more difficult than that of the commission for the rest of the State, as the transportation problems in New York City are confessedly hard of solution. The activities of the commission which have been chronicled from week to week in these pages have been varied, but at least one beneficial result has been accomplished. This is the demonstration that under the present conditions and statutes the industry is not one to attract capital. The estimate of the cost of rehabilitation and subsequent operation of the surface lines in New York City, presented at a meeting of the City Club by Mr. Ivins last week, demonstrated that

omitting the franchise tax, the New York City system would pay less than 3½ per cent on its replacement value. This ignores entirely, of course, any question of existing or past over-capitalization. Corroboration of this pessimistic view is clearly obtainable from the returns of the companies for last year, where out of all of the surface railway companies operating in the five boroughs of New York City only one paid a dividend and that was a line with 1½ miles of double track in South Brooklyn and annual gross receipts of \$61,000.

The facts have been apparent for a long time to those who have followed the situation closely. The burdens which have been continuously placed upon the companies, especially during the last 10 years, in the form of more taxes, additional transfer privileges, and in Manhattan Borough the required use of the conduit system, with the increase in cost of operation, have brought about the present condition of affairs. Will it be necessary to repeat the Chicago experience until public opinion compels the municipality to co-operate with the companies in permitting them to provide a good service? We trust not. If the urgency of the situation is recognized, a business policy can be adopted now just as well as later. The situation depends largely upon the attitude taken by the commission; a great opportunity awaits it; if its influence is exerted in the proper direction it will well justify its creation.

A very close parallel can be drawn between the recent activities of the State and national bodies in the regulation of transportation companies. Both had their being in the sentiment that a greater degree of supervision and direction was necessary over the railroads, although in the case of the national government the steam railroads were the principal cause of legislation. Whatever the immediate purpose of the Interstate statute, the electric railways are now having their first experience with direction from Washington. As the Interstate Commission is further away than the State commissions with whom they have been accustomed to deal, the railway companies are finding it more difficult to present their side of the case. Presumably, also for the same reason, and because of its occupation up to this time with the steam railroads, the commission is less closely in touch with electric railway conditions than the State commissions. Certainly such unfamiliarity is indicated by the proposed classification of accounts, with its long lists of articles unknown in street railway work. We have already published three protests on this classification from well-known accountants, and others will undoubtedly be filed with the commission.

A great deal can be said in favor of governmental supervision of public service corporations. It not only means the safeguarding of the interests of the public, but logically a commission should, and we believe will, be of equal benefit to the companies. A commission is in a position to learn the facts in regard to the effects of taxation and other legislation and can protect the companies from the imposition of unreasonable requirements or restrictions of the construction of needed extensions. In view of the possibilities of this policy, it is unfortunate that the plan of national direction should have been inaugurated by the proposal to adopt such an impracticable and useless classification of accounts as that which has just been suggested.

Maintenance on the Interborough Rapid Transit

This issue of the STREET RAILWAY JOURNAL contains the first of several articles on the organization and methods of the car equipment department of the Interborough Rapid Transit Company, which controls the elevated and subway systems of New York. The amount and intensity of the traffic on this line, as is well known, exceed that of any other transportation system in the world, but its tremendous volume is not always realized. A striking comparison is afforded by considering the number of passengers hauled by the steam railroads of the country, a traffic which somewhat resembles that of the Interborough Rapid Transit Company on account of the use of trains in both services. According to the last report of the Interstate Commerce Commission, all of the steam railroad companies reporting to the Commission, or practically all of the steam railroads in the country, transported 798,000 passengers. This number, however, is only about half that which the subway and elevated systems in New York have been carrying each day during this last winter. The fact that this enormous traffic is conducted in New York with practically no accidents, in spite of the short headway under which the trains run, speaks volumes for the vigilance exercised by the transportation and maintenance departments of the company.

In considering the work of the maintenance department, with which the accompanying articles deal, the fact should be borne in mind that the results given are accomplished under conditions which are far from being ideal. The shops have to be located within the city limits; this means that the space occupied is contracted and that the most desirable conditions of light and surroundings cannot be provided, as in most railway shops. There are practically no terminal yards or similar facilities for inspection at the northern ends of each route, and none at all at the southern termini. A large part of the operation is conducted in tunnels, with all that this implies. It is frequently necessary for a car to run from 4000 to 5000 miles a month and to make 10,000 to 12,000 starts and stops during that time. In spite of all these conditions, and others which are mentioned in the article this week, the average car miles per delay, due to mechanical causes, were only 41,792 in the case of the elevated road and 32,642 in the case of the subway. This is equivalent to one delay, owing to mechanical causes, during a run equivalent to eight round trips of the elevated cars between New York and San Francisco, or five round trips of the subway cars between the same cities. Expressed in another way, an elevated or subway train travels a distance equivalent to the circuit of the globe at the equator, and from one-third to three-quarters around the earth again, before it meets with a delay due to trouble with any part of the equipment.

Performances of this kind, so far as we know, are unparalleled in any transportation enterprise and deserve consideration and study. They could be secured only with electricity as a motive power, but this alone would count for little if not accompanied by a systematic plan of conducting the work of maintenance and inspection. The foundation of this system is a carefully kept series of records, which will be described in the articles to appear in this paper; in fact, these articles afford additional proof, if such were necessary, of the value of such data in inspection

and maintenance matters. The methods and records in New York are undoubtedly more elaborate than those which would be required on most other roads, but should offer suggestions to the smaller properties. They should also be particularly welcome because the real relationship between shop records and improvements in methods and equipment is discussed in dollars and cents instead of in generalities.

Another phase of the subject which will undoubtedly attract attention is the variety and number of the problems which have called for solution in keeping up the subway equipment. It is one thing for a manufacturer to supply apparatus for a railway operating under conditions similar to that of a hundred others; it is an entirely different matter to do so for a railway operating under such drastic schedule conditions as prevail in the New York subway. A common tendency in railroad work is to consider every case as one of difference in degree rather than in kind. Thus, if an engineer or manufacturer is called upon to design apparatus for certain conditions, the first impulse is to employ standard apparatus with such proportional decrease or increase in size or capacity as the differences in conditions seem to require, until the critical point is reached where the old models must be discarded because of their limitations in design. In general this plan is logical, but the determination of the critical point must be made by the man who operates the equipment and not by any other. No matter how many shop experiments and trials are undertaken, there is but one "acid test," and that is the record the apparatus has made in freedom from failure and in low-maintenance cost under every-day service conditions. The experience of the Interborough Rapid Transit Company has shown that the designer working according to precedent cannot make full allowance for novel and possibly unanticipated operating requirements. He must rely upon the operating man to keep him posted on the weaknesses of his products as disclosed by daily use.

Another valuable lesson taught by the Interborough maintenance articles relates to the best form of the records for keeping track of the service value of the equipment. Among those which the company finds of especial use are delay records, which show just how many car-miles are lost through the failure of certain parts; the adoption of the ton-mile unit, which offers a far better criterion for comparisons than the car-mile, and the use of the mileage basis for inspection, maintenance and lubrication. The demands upon the subway rolling stock made the attainment of reliability the prime essential without regard to the cost necessary to attain that end, but the thorough mechanical and statistical methods of the company have actually produced a reduction in cost with an increase in reliability. When cars must be operated over one track on a schedule calling for 30 eight-car trains in one hour, even a minute's interruption through the failure of equipment generates a delay impulse that is felt for miles along the line. It is a tremendous task just to keep going under such circumstances and a remarkable feat to keep the cars in such order that they can be safely left to run 1000 miles between inspections.

The article published in this number deals mainly with the scope and organization of the maintenance department

of the company, but presents some general statistics indicating briefly the effect of certain policies in inspection, car cleaning and general maintenance.

A Few Notes on Fuel

One of the most annoying features of power-house operation is the persistence with which the coal consumption runs up quite beyond what ought to be found considering the equipment. One has for example a turbine set guaranteed to give the kw-hour, including auxiliaries on, say, 20 lb. of steam. He has also a battery of boilers with all the necessary fixings, guaranteed for, say, 10 lb. evaporation under standard conditions with fuel of given thermal value. When the returns are all in from the back counties the coal actually burned runs up, say, 50 per cent above what was expected. Then there is sorrow and a generally vain attempt to find out the difficulty. Of course, to start with, the boiler specifications and the engine specifications have to be reduced to a common basis, neglect of which has often led to confusion, but after this is done and due allowance made for all variations of economy due to change of load there is generally still a very considerable gap between the theoretical and the practical. Beyond looking for the trouble in a few very obvious places the engineer is generally too busy to conduct a search and the loss goes on. The problem boils down to this: Why is it practically impossible to get from an assembled steam plant the results which tests of the parts easily show?

The case is a common one and is therefore all the more exasperating. It ought to be investigated much more frequently than it is. Taking electric generating stations as a whole, they do not show even the economy that should be expected with due regard to the fluctuating load. Perhaps more than anywhere else the furnace performance is the thing which needs overhauling. The engines and dynamos can usually be counted on for fairly consistent performance. Their efficiencies under various loads are fairly well known and so back to the boiler the results should be consistent. But what does the average plant operator really know about the actual steaming performance of his furnace and boiler plant under various conditions of load? Further, what does he know about design and operation of these for maximum economy under varying load? It is only within a few years that anything like a scientific study has been made of furnace construction and operation. As a combined unit, furnace and boiler are just as vitally related to plant economy as are the generating sets, and deserve even more study since less is now known on the subject. The tests on fuel and combustion made in the last three or four years are very important, yet there has been far too little done on the problem of holding up efficiency under practical conditions of operation. Some studies on boiler forcing have been made in the naval service and the results have been very instructive. They should be similarly made with reference to stationary boilers, and particularly with reference to furnace design and operation. As things now stand, the generating sets show admirable efficiency and the coal pile still suffers. The final criterion of economy is not what one can do with a pound of steam, but with a pound of coal.

hours was 1 minute and 40 seconds in the subway and 51 seconds on the elevated lines, and the phenomenal reliability of service under very arduous conditions will be realized.

It seems hardly necessary to state that in such points as the maintenance cost per car-mile or ton-mile and percentage of delay due to equipment failures, no just comparison is possible between steam railroads and the heavy electrical equipment of the New York non-surface lines, because the latter are operated under conditions of such intensity that steam for like service would be impossible. It is nothing unusual for the average subway motor car weighing 38.5 tons to run 4000 to 5000 miles per month, making say 10,000 to 12,000 starts and stops in that period at rates of acceleration and deceleration possible only with electricity and exceeding those applied on any other electric or steam railway. Unlike the operation of steam locomotives, the motor car is not in the care of a skilled operator capable of reporting at the end of his trip just what should be done to his apparatus, yet here the electrical equipment has been brought to such a pitch of efficiency that the car journals, for example, do not require even a superficial examination until the car has made 10,000 miles, which is about three times the railway distance between New York and San Francisco. On steam railroads it is usual to give the

Rapid Transit Company is also a sufferer in this regard, for much of its inspection is done in surroundings that are recognized to be far from ideal. Nevertheless, the company has gone ahead undaunted and made records for economy and reliability just as if such handicaps did not exist.

PRINCIPLES OF ORGANIZATION

The organization of the car equipment department of a large electric railway system calls for quite a different relationship between the superintendent and his immediate aides than on those roads where the total number of shop workers on rolling stock does not exceed more than one or two hundred men. On the small system the head of this division properly is called a master mechanic, for he is expected to play the entire gamut from blacksmithing to wiring cars; but once the organization has reached the magnitude where it is practicable to create divisions headed respectively by master blacksmiths, master carpenters, master painters and the like, the head of the department becomes a superintendent in the true sense of that word. Executive and engineering ability must be combined with mechanical knowledge, to the end that his time will not be frittered away on innumerable shop details. The headquarters of such a department must concentrate its ener-

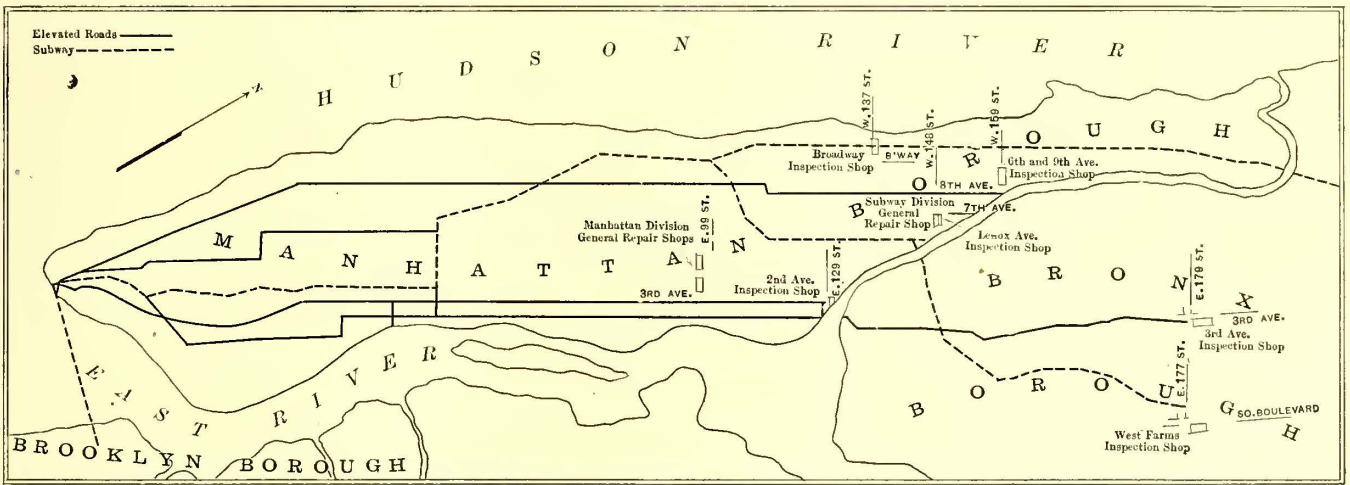


FIG. 2.—MAP OF MANHATTAN AND PART OF BRONX BOROUGH, SHOWING THE ELEVATED AND SUBWAY LINES OF THE INTERBOROUGH RAPID TRANSIT COMPANY AND THE LOCATION OF THE INSPECTION BARNS AND REPAIR SHOPS

journals some attention at the end of a division run, averaging, say, 150 miles.

Although more detailed figures will be given later, it is well to point out here that during the six months ending June, 1907, the car miles per delay due to mechanical and electrical failures were 41,792 miles on this company's elevated lines and 32,642 miles on the subway lines, proving that even in exceptionally severe cases the reliability of service is about three times greater than on many steam railroads. When these delay figures are compared with those of earlier times they reveal the remarkable fact that now after six years' service on the elevated system and three years' service in the subway, the reliability of the equipment is greater than ever before; and these improvements were made possible only by a thorough system of organization and record analysis.

It must be borne in mind that while a steam railroad generally can conduct its inspection and repairs at many different places along its line, the city railway is narrowed in its choice of maintenance grounds by the high cost of real estate within municipal boundaries. The Interborough

gives upon methods that will show at a glance just what results are being attained throughout the system and what relation the character of the equipment itself bears to such results. This means the keeping of such exact and logical public records that the evidence they offer can be accepted as a sure guide for more economical operation and improvements in design.

It is along these broad lines that the organization of the car equipment department of the Interborough Rapid Transit Company is designed. How complex the activities of this department are must be apparent to some extent from the accompanying organization chart, but unfortunately no chart can show the exact division of responsibility of the superintendent and his subordinates. Thus some other company with exactly the same organization chart would be very likely to have an utterly different distribution of authority.

The car equipment department of the Interborough Rapid Transit Company is headed by a superintendent of car equipment, who has charge of all the inspection, maintenance, construction and engineering carried out on both

the elevated and subway rolling stock. The inspection of the elevated service cars is made at 129th Street and Second Avenue, 179th Street and Third Avenue and 159th Street and Eighth Avenue, and of the subway cars at 148th Street and Lenox Avenue and between 137th and 145th Streets on Broadway. Heavy repairs for all the elevated cars are carried out at Ninety-eighth Street and Third Avenue and for the subway equipment at the repair shops adjoining the inspection structure at 148th Street and Lenox Avenue. There is also a separate shop located at 129th Street between Second and Third Avenues, devoted to con-

A study of the inspection reports and the data derived from them with regard to the efficiency of the men and the equipment will form the first article, because of the direct and immediate relationship of inspection to transportation. The second article will consider the principles followed in car inspection, cleaning and lubrication. The third will describe the maintenance and repair work. The fourth will relate to the studies of the engineers of the department in discovering and correcting defects in apparatus. The fifth and last will take up the equipment of new cars and the manufacture of parts.

COMPARISON AND ANALYSIS OF INSPECTION REPORTS

The policy pursued to bring the inspection records of the Interborough Rapid Transit Company to their present state of perfection has been one of consistent centralization of all clerical data at the main office. The inspection work itself is in charge of one general foreman and five shop foremen. Every day each foreman sends to headquarters a set of reports which show in detail the number of every car inspected and the exact nature of the work done on each. He also telephones in every morning the numbers of the bad order and other cars left in his yards. The foremen retain the inspection tags upon which their reports are based, but keep no other records except duplicates of their own reports and a book wherein they record dates of inspection, oilings and general overhauling. More de-

Form No. 661

PASS No.
 DATE.....190.....
 NAME.....
 CLASS.....

	IN	MEAL TIME		OUT
		OUT	IN	
A. M.				
P. M.				
DISTRIBUTION				HOURS
TOTAL				

CORRECT:

FOREMAN

FIG. 3.—TIME CARD USED IN INSPECTION BARN

Mr. _____
 Foreman _____ Inspection Barn.

DEAR SIR:—
 The following is a statement of amounts paid certain classes of labor at your barn for the week ending Nov. 23, 1907:

Car house helpers and foreman.....	Nov. 23.	\$376.62
Storeroom tender.....		14.00
Air brake inspector.....		14.88
Motor inspector.....		12.00
Air brakemen.....		102.37
Clerk and messenger.....		21.81
Carpenters.....		76.83
Electrical inspector.....		39.07
Total.....		\$658.58

Reduction in cost from your weekly average for the 11 weeks ending Jan. 13, 1906.....13 per cent
 Reduction in number of cars inspected.....41 per cent

Yours very truly,
 J. S. DOYLE,
 SUPT. CAR EQUIPMENT.

WEEKLY LETTER TO FOREMAN ON COSTS

129TH BARN

NEW YORK January 15, 1908

Supt. Car Equipment.

DEAR SIR:

REPORT OF CARS INSPECTED

Cars Inspected	Cars not Inspected	Days Out	Trips	Mileage	Days Over-due	Cars Inspected	Cars not Inspected	Days Out	Trips	Mileage	Days Over-due	Cars Inspected	Cars not Inspected	Days Out	Trips	Mileage	Days Over-due
		2d	Ave.	Motors				2d	Ave.	Trailers							
153		6	51	918		247		17	106	1908							
436		12	52	936		579		21	89	1602							

FIG. 4.—FOREMAN'S DAILY REPORT OF CARS INSPECTED

struction work, namely, the equipment of new cars with power and braking apparatus, wiring, etc. The executive and engineering offices are at Ninety-eighth Street and Third Avenue. These brief details of the working centers of the department are presented here in connection with the accompanying map only to give some idea of their purpose and relative locations, as the scope of the car equipment department is so wide that a proper appreciation of its work can be gained only by a series of detailed descriptions covering each division in turn.

tailed records by them would be useless, as it is the function of the general offices of the department to compare all reports sent in by the foremen and deduce therefrom the efficiency of the men and the apparatus in their care.

The study of these comparative reports and the time cards has enabled the inspection work to be developed logically on what might be termed a competitive merit plus a mileage system. The policy of the department is to give the widest publicity to the achievements of every inspection foreman, whether he has done something praiseworthy or

otherwise; there is neither a withholding of credit nor of keep to the top notch. This publicity is attained partly by
censure. The knowledge that not only the general manager the expedient of sending to each foreman every week a let-

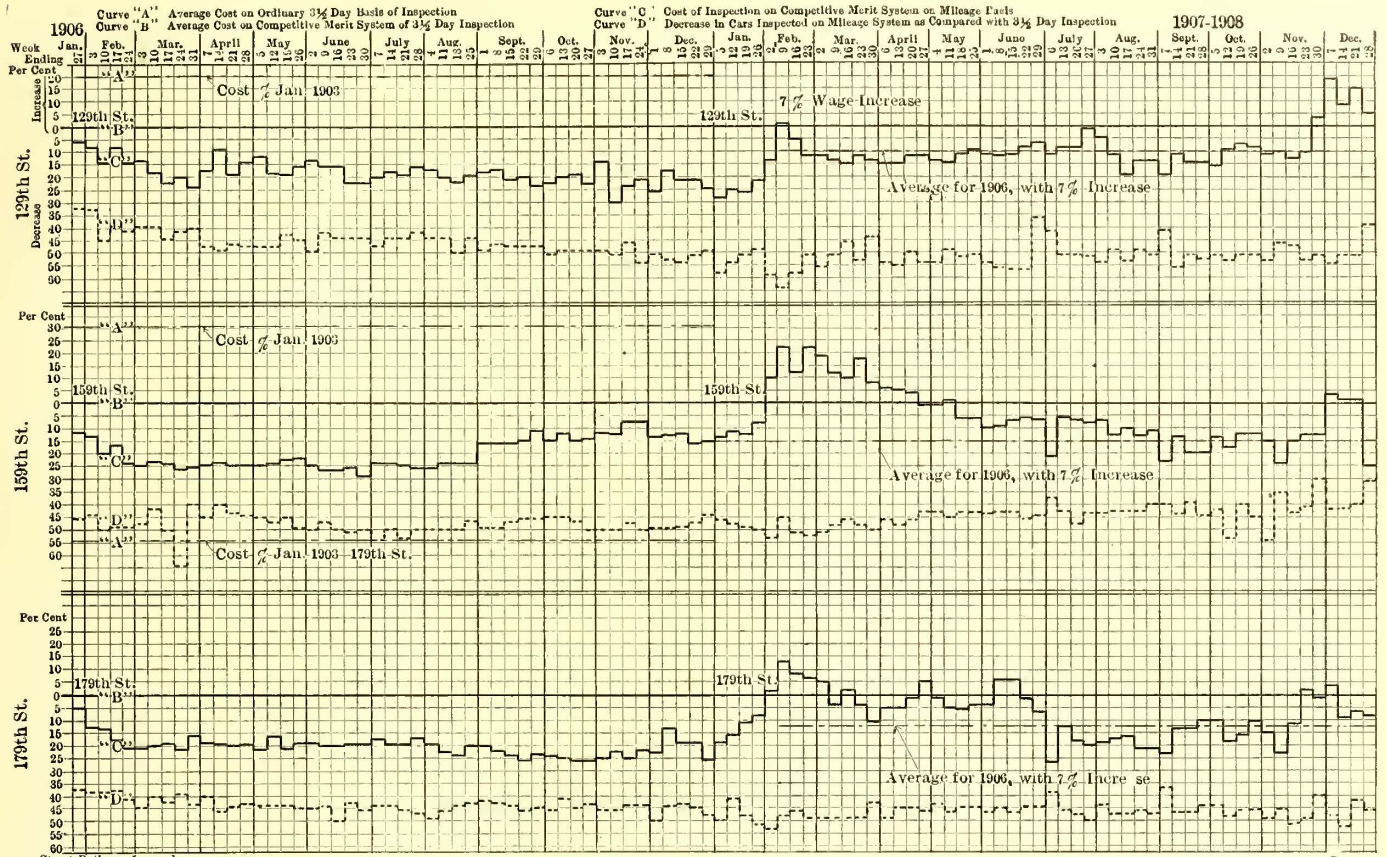


FIG. 5.—MONTHLY COMPARISON OF CAR INSPECTION COSTS AT THE ELEVATED DEPOTS

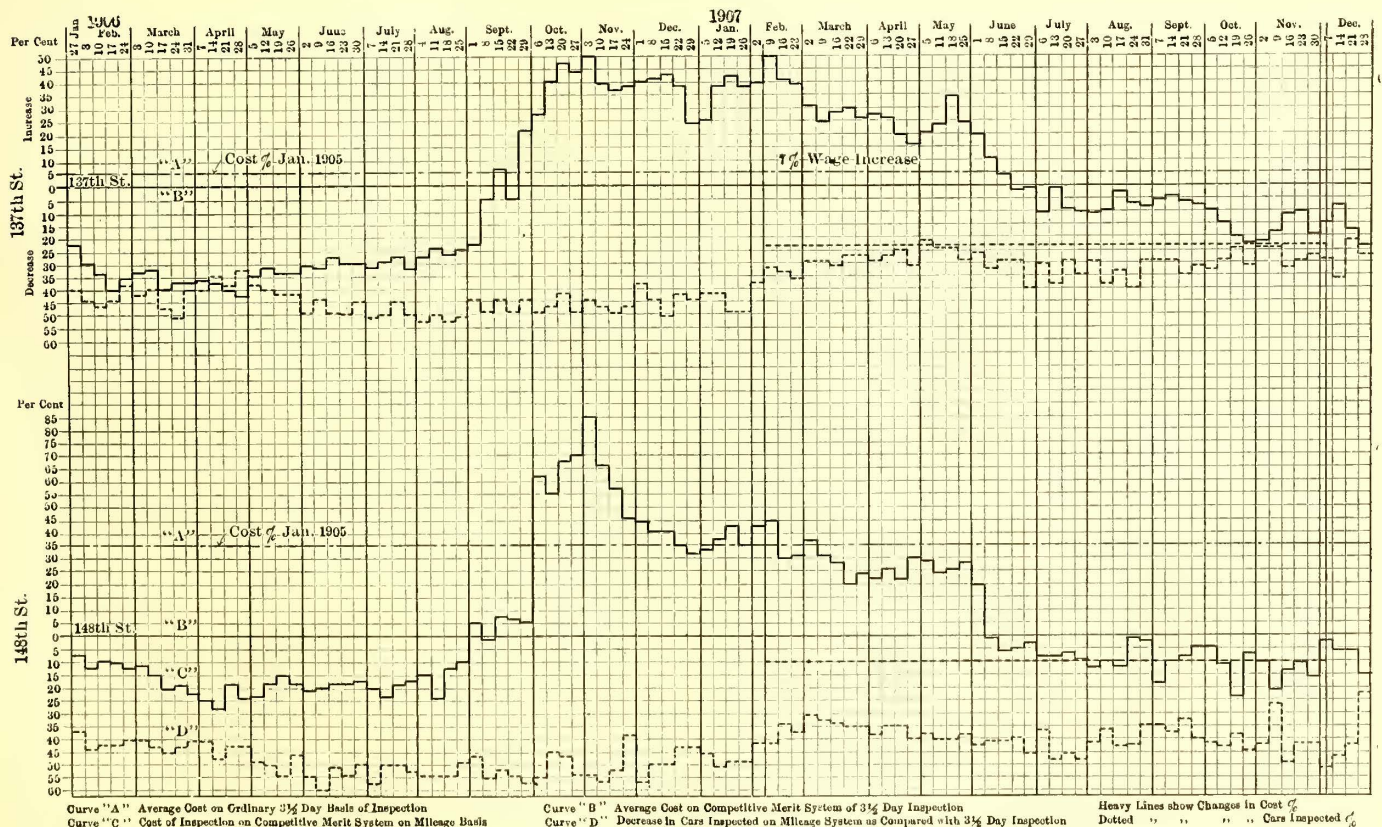


FIG. 6.—MONTHLY COMPARISON OF CAR INSPECTION COSTS AT THE SUBWAY DEPOTS

and superintendent of car equipment but also their fellow foremen are constantly acquainted with every detail of their record acts as a strong incentive with the men to

ter and chart giving the amounts paid on his division for different branches of inspection work as compared with other weeks, and the percentage of cars inspected, while

enclosing therewith duplicates of like letters sent to the other foremen. These letters, as shown by the one reproduced on page 480, are without comment but fraught with a warning that it is up to the foreman to demonstrate, as in this case, why a reduction of 41 per cent in cars inspected should bring only a 13 per cent decrease in labor cost. Those who make the best records are encouraged, of course, by increases in pay and preference in promotion. On the other hand, the foreman unable to keep to the standard set, despite the knowledge that others are doing so, is discharged.

COSTS OF INSPECTION BY MILEAGE COMPARED WITH TIME-INTERVAL SYSTEM

The second class of information derived from the daily reports and time cards, shows the cost of inspection under

**COMPARISON OF COST OF MATERIAL AT INSPECTION SHOPS, MANHATTAN DIVISION
NOVEMBER, 1907**

ACCOUNT	129th Street		179th Street		159th Street	
	Total	Per car	Total	Per car	Total	Per car
CAR BODIES:						
Sector, drawbars and platform fittings.....			\$1.15	\$0.002	\$6.72	\$0.012
Bell cord.....	\$10.24	\$0.026	25.70	.052	28.81	.049
Miscellaneous.....	120.35	.312	239.99	.489	130.91	.225
TRUCK REPAIRS.....	27.37	.071	24.10	.049	26.73	.046
BRAKES:						
Brake shoes.....	825.91	2.140	614.08	1.251	1,203.01	2.063
Triple valves.....	9.65	.025	10.33	.021	8.20	.014
Motorman's valves.....					4.08	.007
Rigging.....	2.21	.006	10.94	.022	22.99	.039
Coupling hose.....	9.80	.025	17.99	.037	12.25	.021
ELECTRICAL EQUIPMENT:						
Contactors, controllers and reversers.....			9.54	.019	21.34	.037
Control and motor wiring.....			10.80	.022	4.50	.008
Switches, fuse boxes, etc.....	6.21	.016	20.43	.042	33.50	.058
Motors.....	1.89	.005	18.50	.038	6.21	.011
Contact devices.....			1.42	.003	4.42	.008
Hedley scrapers.....	7.13	.018	14.20	.029	37.59	.064
Light and heat wiring, switches, etc.....	2.00	.005				
Headlights and markers.....	8.79	.023	27.63	.056	22.03	.038
SHOPS:						
Lights.....	38.84	.101	20.40	.042	22.08	.038
Tools.....	7.32	.019	6.30	.013	11.29	.019
Miscellaneous expenses	9.05	.023	32.24	.066	17.23	.030
TRAIN EXPENSES:						
Car cleaning.....	78.20	.203	89.42	.182	83.49	.143
Tail lamps.....	62.65	.162	85.99	.175	39.76	.068
Car lamps.....	128.00	.332	170.00	.346	284.24	.487
Motor carbons.....	53.50	.139	39.00	.080	68.00	.117
Pump carbons.....	6.00	.015	4.50	.009	12.90	.022
Lubricants.....	176.15	.456	231.44	.471	352.08	.603
Miscellaneous expenses	.75	.002	3.53	.007	4.48	.008
Totals.....	\$1,592.01	\$4.124	\$1,729.62	\$3.523	\$2,468.84	\$4.235

Cost per car mile..... \$0.001228
 Cost per thousand-ton miles..... .0556

the present mileage system, which has been found a great improvement over the former time-interval system, both in cost and in the assurance it gives that the performance of every car and its equipment is more accurately known, thus providing means for more equitable distribution of mileage per car. The reduction in cost per car on a basis of 1000-mile runs before inspection is shown graphically over a period of twenty-three months in Figs. 5 and 6 for the subway and elevated inspection depots. These sheets are sent out to the foremen every week to show them what percentage they are above or below the straight line which represents the average cost under the former time method; the curves also show the changes in percentage of cars inspected. After the week ending Feb. 2, 1907, there was a general increase in wages amounting to 7 per cent. A new datum line was then drawn below the old one to show the foremen what their present cost should be.

MONTHLY REPORTS OF LABOR AND MATERIAL FOR INSPECTION

Not only do the foremen receive the weekly letters and curve sheets already referred to, but also a monthly letter accompanied by a series of separate sheets covering the cost of labor and material, car cleaning and number and causes of delays, as will be named in order. The monthly letters are circulated in exactly the same public fashion as the weekly statements, but in this case each letter contains one or more specific criticisms or commendations. Several, therefore, are reproduced on page 485 to show what close supervision is exercised over the men and how readily the weak points can be discovered.

The blue prints accompanying the monthly letter covering itemized costs of labor and material are made out on two sheets, one comparing the two subway shops and the other the three elevated plants. The figures are derived

**COMPARISON OF COST OF MATERIAL AT INSPECTION SHOPS, SUBWAY DIVISION
NOVEMBER, 1907**

ACCOUNT	137th Street		148th Street	
	Total	Per car	Total	Per car
CAR BODIES:				
Sector, drawbars and platform fittings.....	\$33.00	\$0.107	\$14.48	\$0.033
Bell cord.....	23.94	.077	10.79	.025
Miscellaneous.....	132.24	.428	155.39	.360
TRUCK REPAIRS.....	21.06	.068	20.60	.048
BRAKES:				
1,843.49	5.966	2,130.14	4.931	
Motorman's valves.....	3.33	.011	3.37	.008
Rigging.....	3.00	.010	14.46	.033
Coupling hose.....	12.25	.040	16.79	.039
ELECTRICAL EQUIPMENT:				
Contactors, reversers, and controllers.....	4.71	.015	13.06	.030
Control and motor wiring.....			5.96	.014
Circuit breakers.....	3.88	.012		.009
Motors.....			3.96	.007
Contact devices.....	6.56	.021	3.18	.007
Headlights and markers.....	4.80	.016		
SHOPS:				
Lights.....	56.14	.182	27.20	.063
Tools.....	25.20	.081	14.63	.034
Miscellaneous expenses.....	40.77	.132	29.67	.069
TRAIN EXPENSES:				
Car cleaning.....	88.61	.287	225.45	.522
Tail lamps.....	95.82	.310	73.01	.169
Car lamps.....	425.12	1.376	470.31	1.089
Motor carbons.....	10.73	.035	12.19	.028
Pump carbons.....	15.00	.049	32.58	.075
Fuses.....	19.18	.062	21.37	.049
Lubricants.....	377.17	1.221	421.17	.975
Miscellaneous.....	50.00	.161	9.00	.021
Totals.....	\$3,296.00	\$10.667	\$3,728.76	\$8.631

Cost per car mile..... \$0.002118
 Cost per thousand ton miles..... .0643

from the foreman's daily reports and the workmen's time cards. The labor sheet covers as many different kinds of work as can conveniently be classified while the material sheet gives a list of parts under the headings of Car Bodies, Trucks, Brakes, Electrical Equipment, etc. Both sheets show the cost reduced to a car mileage and thousand-ton-mile basis. From the figures given for November, 1907, it appears that the average costs for labor and material for inspecting an elevated car were \$8.64 and \$3.96, respectively; the corresponding averages for a subway car were \$14.43 and \$9.64. Comparing the total car-mile cost, it is found that the elevated averaged \$.003474 and the subway \$.005275. According to the latter figures, the inspection cost of a subway car is considerably greater, but that this is due principally to the greater weight and rate of acceleration of the latter is shown by comparing the cost on a ton-mile basis which is really the logical unit for a fair comparison. It thus appears that the cost of inspection per

thousand ton-miles is \$1,582 on the elevated and \$1,599 on the subway. These figures represent a thousand ton-mile reduction of \$.0306 on the elevated and \$.0745 on the subway from the figures for November, 1905, when the work of inspection was on a time basis.

DELAY RECORDS

It is doubtful whether there is another railway company in the United States, steam or electric, by which such accurate records are kept of the nature of and the mileage lost by every delay. Service interruptions are due to so many causes that at first it would seem an impossible task to classify and evaluate them properly, yet here is a company which has done so and with profit.

Broadly speaking, the delays in service may be due to failures in the maintenance of way, motive power, transportation or car equipment departments. While in this article

it would be inappropriate to explain how these losses are detailed in other divisions, the procedure of the car equipment department is designed to cover all causes. The daily written and telephone reports from the inspection shop foremen and transportation department, combined with the known mileage of every car, make it possible to find just what a particular failure in the inspection systems or car equipment means to the company. There can be nothing better than these records to prove the efficiency of the system. For example, the accompanying comparison of delays due to defects ascribed to the car equipment department shows that the average number of delays per month for the first six months of 1907 was 57.3 on the Manhattan or elevated division and only 26.7 on the subway division; the corresponding figures under the time-interval system were 75.7 and 34.2. The average time per month so lost in the first period was 339.7 minutes on the elevated and 137.7

COMPARISON OF COST OF LABOR AT INSPECTION SHOPS, MANHATTAN DIVISION

NOVEMBER, 1907

ACCOUNT	129th Street		179th Street		159th Street	
	Total	Per car	Total	Per car	Total	Per car
CAR BODIES:						
Sector, drawbars and platform fittings.....	\$39.42	\$0.102	\$50.49	\$0.103	\$71.30	\$0.122
Miscellaneous repairs..	125.48	.325	229.68	.468	353.71	.607
TRUCKS:						
Journal bearings.....	.55	.001	.....	.....	.....	.....
Wheels.....	23.85	.062	28.22	.058	43.64	.075
Miscellaneous repairs..	403.75	1.046	227.20	.463	404.11	.693
BRAKES:						
Brake shoes.....	68.59	.178	88.31	.180	173.77	.298
Triple valves.....	3.80	.010	41.99	.085	27.36	.047
Motorman's valves....	37.80	.098	8.36	.017	41.80	.072
Brake rigging.....	148.36	.384	237.49	.484	233.87	.401
Coupling hose.....	17.01	.044	.....	.....	40.37	.070
AIR COMPRESSORS AND GOVERNORS:						
.....	23.05	.060	32.09	.065	23.03	.040
CONTROL APPARATUS:						
Contactors, reversers and controllers.....	131.18	.340	128.45	.261	213.99	.367
Control and motor wiring.....	4.18	.011	22.47	.046	5.32	.009
Switches.....	11.80	.031	7.60	.015	27.93	.048
Couplers and jumpers..	19.21	.050	14.41	.029	13.40	.023
Rheostats.....	2.91	.008	3.98	.008	27.75	.048
MOTORS:						
Armatures and commutators.....	1.07	.003	.....	.....	.....	.....
Sandpapering commutators.....	2.12	.006	5.86	.012	23.94	.041
Gears and pinions.....	.....	.....	13.11	.026	.....	.....
Brush holders.....	.....	.....	.....	.....	28.75	.049
Miscellaneous repairs..	24.23	.063	.....	.....	90.71	.156
CONTACT DEVICES:						
.....	41.42	.107	61.18	.125	76.48	.131
HEDLEY SCRAPERS:						
.....	43.36	.112	91.58	.187	100.80	.173
LIGHT AND HEAT:						
Wiring, switches, etc..	.....	.....	.....	.....	8.22	.014
Headlights and markers.....	5.68	.015	4.35	.009	.....	.....
Heaters.....	1.14	.003	.....	.....	62.66	.107
TRAIN EXPENSES:						
Car cleaning.....	1,463.36	3.791	1,572.66	3.203	2,109.59	3.619
Lamp trimming.....	106.40	.275	117.00	.238	129.65	.222
Oiling.....	126.14	.327	144.97	.295	185.83	.319
Car lamps.....	36.93	.096	38.55	.078	89.88	.154
Fuses.....	1.05	.003	27.65	.056	.....	.....
Shoe fuses.....	32.71	.085	58.33	.119	111.15	.191
Motor carbons.....	9.50	.024	29.83	.061	27.36	.047
Inspection of trains....	255.10	.661	97.28	.198	138.23	.237
SHOP EXPENSES:						
Fire apparatus.....	6.33	.016	.....	.....	1.72	.003
Trolleying trains.....	1.09	.003	15.96	.033	28.31	.049
Cleaning car house....	31.11	.080	10.73	.022	33.70	.058
Emergency work.....	16.86	.043	83.42	.170	70.76	.121
Foremen.....	128.34	.332	193.78	.395	185.92	.319
Clerk and messenger....	49.50	.128	49.50	.101	93.90	.161
Store room.....	18.75	.049	17.25	.035	30.00	.051
Inspection board.....	18.75	.049	17.25	.035	30.00	.051
Miscellaneous labor....	14.86	.038	.....	.....	.....	.....
Totals.....	\$3496.74	\$9.059	\$3,770.98	\$7.680	\$5,349.41	\$9.193

Cost per car mile.....	\$0.002696	\$0.002263	\$0.002199
Cost per thousand ton miles.....	.1223	.1035	.0991
Average number of miles between inspections, motor cars.....	1110.68	1125.47	980.74
Average number of miles between inspections, trailer cars.....	1849.54	1356.83	1560.68
Baggage, coal, flat, and supply cars.....	\$3.52 \$0.078		\$54.17 1.290

COMPARISON OF COST OF LABOR AT INSPECTION SHOPS, SUBWAY DIVISION

NOVEMBER, 1907

ACCOUNT	137th Street		148th Street	
	Total	Per car	Total	Per car
CAR BODIES:				
Sector, drawbar and platform fittings ..	\$52.01	\$0.168	\$38.57	\$0.089
Miscellaneous repairs.....	256.11	.829	377.91	.875
TRUCKS:				
Journal bearings.....	15.58	.051	3.88	.009
Wheels.....	19.50	.063	34.75	.080
Special wheel gage.....	162.57	.526	160.13	.371
Miscellaneous repairs.....	97.86	.317	2.25	.005
BRAKES:				
Brake shoes.....	189.53	.613	170.73	.395
Triple valves.....	4.24	.014	11.40	.027
Motorman's valves....	69.73	.226	32.68	.076
Brake rigging.....	295.79	.957	248.23	.575
Coupling hose.....	15.52	.050	17.48	.041
Trip device.....	4.75	.015	16.91	.040
AIR COMPRESSORS AND GOVERNORS:				
.....	176.91	.573	173.27	.401
CONTROL APPARATUS:				
Contactors, reversers, and controllers ..	266.02	.861	252.53	.585
Control and motor wiring.....	.....	.....	.....	.42
Circuit breakers.....	32.90	.107	4.63	.011
Switches.....	1.26	.004	15.96	.037
Couplers and jumpers....	18.59	.060	5.97	.014
Rheostats.....	6.08	.019	.....	.....
MOTORS:				
Armatures and commutators.....	25.17	.081	.....	.....
Sandpapering commutators.....	97.66	.316	.....	.19
Gears and pinions.....	6.61	.021	.....	.52
Motor bearings.....	42.12	.136	12.23	.028
Brush holders.....	5.13	.017	26.96	.062
Miscellaneous repairs.....	52.01	.168	40.95	.091
CONTACT DEVICES:				
.....	108.06	.350	91.77	.213
LIGHT AND HEAT:				
Headlights and markers.....	10.99	.036	13.50	.031
Heaters.....	30.44	.099	5.62	.013
TRAIN EXPENSES:				
Car cleaning.....	1,581.15	5.117	1,926.20	4.459
Lamp trimming.....	462.75	1.498	531.28	1.230
Oiling.....	196.87	.637	327.36	.758
Car lamps.....	128.73	.416	145.02	.336
Fuses.....	40.64	.132	74.75	.173
Shoe fuses.....	.....	.001	2.66	.006
Motor carbons.....	22.61	.073	4.37	.010
Inspection of trains....	169.65	.549	247.19	.572
SHOP EXPENSES:				
Trolleying trains.....	44.46	.144	32.68	.076
Cleaning car house....	.....	.....	6.65	.015
Emergency work.....	7.34	.024	21.04	.049
Foremen.....	192.30	.623	207.30	.480
Clerk and messenger....	93.24	.302	93.08	.216
Store room.....	18.35	.059	17.40	.040
Inspection board.....	18.34	.059	17.40	.040
Miscellaneous labor....	6.62	.021	1.33	.003
Totals.....	\$5,046.57	\$16.332	\$5,415.15	\$12.535

Cost per car mile.....	\$0.003243	\$0.003074
Cost per thousand ton miles.....	.0984	.0930
Average number of miles between inspections, motor cars.....	1207.93	1202.36
Average number of miles between inspections, trailer cars.....	1423.66	1417.57
Flat and supply cars.....		.84 .032

PART SUMMARY OF TRAINS REMOVED FROM SERVICE, CHARGEABLE TO INSPECTION BARNES, DURING OCTOBER, 1907

MANHATTAN DIVISION

	129th Street		159th Street		179th Street	
	De-lays	Min.	De-lays	Min.	De-lays	Min.
Contactor grounded	1	..	..	..	..	..
Contactor welded	..	..	..	..	1	..
Multiple contactor auxiliary switch had soft tips	1	..	..	..	..	..
T-S auxiliary switch wire jumper burned off	..	..	1	..	..	..
Head broken off screw holding terminal on controller switch block	..	..	1	..	..	..
Auxiliary controller finger missing	..	..	..	..	1	..
Auxiliary controller finger base loose in block	..	..	..	..	1	..
Controller blow-out magnet weak	..	..	1	..	..	..
Rheostat resistance lead broken	..	..	1	..	..	..
Rheostat coil broken	..	..	1	..	..	..
Contact shoe broken	1	..	..	..	..	..
Contact shoe worked loose	1	..	..	..	..	..
Coupling link broken	..	..	1	..	..	..
Car allowed to go in service with draw bar bent	..	..	1	..	..	..

Ratio of trains removed from service to motor cars. . . . 1:31—1:38.66—1:9.8

PART SUMMARY OF TRAINS REMOVED FROM SERVICE, CHARGEABLE TO INSPECTION BARNES, DURING OCTOBER, 1907

SUBWAY DIVISION

	137th Street		148th Street	
	De-lays	Min.	De-lays	Min.
Contactor shunt broken	1	..	3	..
Contactors burned and reverse fuse blown	1	..	..	..
Contactor interlock finger bent	..	..	1	..
Contactor wipe spring broken	..	..	1	..
Controller auxiliary finger out of adjustment	..	..	2	..
Rheostat coil open circuited and grounded	..	..	3	..
No. 7 wire broken at terminal on controller finger board	1	..	..	..
Circuit breaker graduating spring weak	1	..	..	..
Main fuse improperly inserted	..	..	1	..
Worn pinions and gears	..	..	2	..
Hot armature bearings	2	..	11	..
Hot motor axle bearings	4	..	4	..
Hot journals	14	..	64	..
Lag screws in coupler socket broken	..	..	1	..
Loose trip device	1	..	..	..
Weak elliptic springs	1	..	..	..
Defective Manhattan link	1	..	..	..
Coupling link broken	..	..	2	..
Worn platform boards	1	..	..	..
Hand brake chain too short	..	..	1	..
Brake rod broken	..	..	4	..
Bad order doors	..	..	6	..
Pump field jumper burned off	1	..	..	..
Pump brush holder insulator broken	1	..	1	..
Burst hose	..	..	3	..
Totals	30	..	110	..

Ratio of trains removed from service to motor cars. . . . 1:6.63—1:2.12

PART SUMMARY OF DELAYS, CHARGEABLE TO INSPECTION BARNES, DURING OCTOBER, 1907

SUBWAY DIVISION

	137th Street		148th Street	
	De-lays	Min.	De-lays	Min.
Contactor shunt broken	1	6	..	..
Contactors interlock plate screw broken	1	4	..	..
Controller flash shields broken	4	22	2	31
Reverser cradle screw head broken	..	..	1	4
Relay finger out of adjustment	..	..	1	4
Contact shoes broken due to striking brake shoe at side of track in yard	1	2	..	..
Coupling links broken	1	3	2	9
Leaky hose gasket	..	..	1	4
Burst hose	1	13	1	7
Hand brake chain too short	..	..	1	2
Average number of motor cars	9	50	9	61

Ratio of delays to motor cars. . . . 1:22.11 1:28.98
 Ratio of minutes delay to motor cars. . . . 1: 3.98 1: 3.83

SUMMARY OF DELAYS, CHARGEABLE TO INSPECTION BARNES, DURING OCTOBER, 1907

MANHATTAN DIVISION

	129th Street		159th Street		179th Street	
	De-lays	Min.	De-lays	Min.	De-lays	Min.
Contactor grounded	1	3	..	..	..	..
Auxiliary switch on multiple contactor open circuited	1	2	..	..	..	..
Auxiliary controller finger base loose	..	..	..	..	1	3
Shoulder on cam at top of controller shaft did not have extension which holds up device operating emergency brake	..	..	1	2	..	..
Controller switch block screw broken	..	..	1	5	..	..
Rheostat resistance lead broken	..	..	..	..	1	6
High commutator bars	..	..	1	8	..	..
Worn pinion	..	..	1	5	..	..
Main fuse improperly inserted	..	..	..	..	1	4
Main fuses blown, cause unknown	..	..	..	..	1	6
Finger broken in train line socket	..	..	1	8	..	..
Worn gate slide	1	2	..	..	..	..
Motor nose strap bolt broken	..	..	..	..	2	14
Contact shoe broken due to flaw	1	3	..	..	..	..
Leaky triple piston packing ring	1	5	..	..	..	..
Coupling links broken due to flaws	..	..	1	3	1	15
Drawbar head plate bent	..	..	1	10	..	..
Journal box cover spring broken	..	..	2	13	..	..
Fulcrum bolt broken	..	..	2	22	..	..
Burst hose	..	..	1	3	2	12
Hose gasket blown out	..	..	1	5	..	..
Totals	5	15	13	84	9	65
Average number of motor cars	217		348		255	

Ratio of delays to motor cars. . . . 1:43.40 1:26.76 1:28.32
 Ratio of min. delay to motor cars. . . . 1:14.46 1: 4.14 1: 3.92

COMPARISON OF DELAYS DUE TO ALL CAUSES, MANHATTAN AND SUBWAY DIVISIONS

Month	Division	DELAYS		Car Miles per Delay	Car Miles per Min. Delay	Mileage
		No.	Min.			
1907						
January	Manhattan	181.	1345.	29,119.64	3,918.70	5,270,655
	Subway	141.	763.	23,244.18	4,295.45	3,277,430
February	Manhattan	182.	1499.	25,986.29	3,155.10	4,729,505
	Subway	124.	768.	23,774.71	3,838.62	2,948,064
March	Manhattan	167.	1128.	31,685.94	4,691.09	5,291,552
	Subway	114.	657.	28,785.77	4,994.79	3,281,575
April	Manhattan	126.	938.	41,283.06	5,545.48	5,201,665
	Subway	117.	786.	28,045.19	4,174.66	3,281,287
May	Manhattan	94.	745.	57,031.28	7,195.89	5,360,940
	Subway	81.	467.	41,581.40	7,212.19	3,368,093
June	Manhattan	78.	479.	65,651.69	10,690.67	5,120,832
	Subway	64.	393.	50,421.60	8,211.15	3,226,983
Average for six months	Manhattan	138.	1022.3	41,792.98	5,866.15	5,162,525
	Subway	106.8	639.	32,642.14	5,454.47	3,260,572

COMPARISON OF DELAYS, MANHATTAN AND SUBWAY DIVISIONS, MOTIVE POWER DEPARTMENT

Month	Division	DELAYS		Car Miles per Delay	Car Miles per Min. Delay	Mileage
		No.	Min.			
1907						
January	Manhattan	6.	56.	878,442.51	94,118.84	5,270,655
	Subway	..	..	..	..	3,277,430
February	Manhattan	2.	12.	2,364,752.41	394,125.40	4,729,505
	Subway	..	..	..	..	2,948,064
March	Manhattan	1.	5.	5,291,551.88	1,058,310.37	5,291,552
	Subway	2.	10.	1,640,787.68	328,157.54	3,281,575
April	Manhattan	..	..	..	..	5,201,665
	Subway	..	..	..	..	3,281,287
May	Manhattan	..	..	..	..	5,360,940
	Subway	..	..	..	..	3,368,093
June	Manhattan	..	..	..	..	5,120,832
	Subway	1.	19.	3,226,982.70	169,841.20	3,226,983
Average for six months	Manhattan	1.5	12.2	1,422,457.80	257,759.10	5,162,525
	Subway	.5	4.8	811,278.39	82,999.79	3,260,572

COMPARISON OF DELAYS, MANHATTAN AND SUBWAY DIVISIONS, MAINTENANCE OF WAY DEPARTMENT

Month 1907	Division	DELAYS		Car Miles per Delay	Car Miles per Min. Delay	Mileage
		No.	Min.			
January	Manhattan	8.	56.	658,831.88	94,118.84	5,270,655
"	Subway	17.	64.	192,789.98	51,209.84	3,277,430
February	Manhattan	11.	137.	429,954.98	34,521.93	4,729,505
"	Subway	9.	58.	327,562.66	50,828.69	2,948,064
March	Manhattan	8.	61.	661,443.98	86,746.75	5,291,552
"	Subway	20.	125.	164,078.77	26,252.60	3,281,575
April	Manhattan	7.	101.	743,095.03	51,501.63	5,201,665
"	Subway	16.	149.	205,080.43	22,022.06	3,281,287
May	Manhattan	6.	34.	893,489.99	157,674.70	5,360,940
"	Subway	15.	77.	224,539.53	43,741.47	3,368,093
June	Manhattan	6.	38.	853,471.98	134,758.73	5,120,832
"	Subway	7.	48.	460,997.53	67,228.81	3,226,983
Average for six months	Manhattan	7.7	71.2	706,714.64	93,220.43	5,162,525
	Subway	14.	86.8	262,508.15	43,547.24	3,260,572

COMPARISON OF DELAYS, MANHATTAN AND SUBWAY DIVISIONS, CAR EQUIPMENT DEPARTMENT

Month 1907	Division	DELAYS		Car Miles per Delay	Car Miles per Min. Delay	Mileage
		No.	Min.			
January	Manhattan	61.	412.	86,404.20	12,792.85	5,270,655
"	Subway	34.	213.	96,394.99	15,386.99	3,277,430
February	Manhattan	70.	459.	67,564.35	10,303.93	4,729,505
"	Subway	27.	139.	109,187.55	21,209.09	2,948,064
March	Manhattan	63.	373.	83,992.88	14,186.47	5,291,552
"	Subway	32.	158.	102,549.17	20,769.46	3,281,575
April	Manhattan	57.	300.	91,257.29	17,338.88	5,201,665
"	Subway	22.	93.	149,149.40	35,282.65	3,281,287
May	Manhattan	55.	301.	97,471.63	17,810.43	5,360,940
"	Subway	28.	147.	120,289.04	22,912.20	3,368,093
June	Manhattan	38.	194.	134,758.70	26,396.04	5,120,832
"	Subway	17.	76.	189,822.50	42,460.30	3,226,983
Average for six months	Manhattan	57.3	339.7	93,574.84	16,471.43	5,162,525
	Subway	26.7	137.7	127,898.77	26,336.78	3,260,572

COMPARISON OF DELAYS, MANHATTAN AND SUBWAY DIVISIONS, TRANSPORTATION DEPARTMENT

Month 1907	Division	DELAYS		Car Miles per Delay	Car Miles per Min. Delay	Mileage
		No.	Min.			
January	Manhattan	24.	124.	219,610.63	42,505.28	5,270,655
"	Subway	19.	112.	172,496.29	29,262.77	3,277,430
February	Manhattan	31.	357.	152,584.67	13,247.91	4,729,505
"	Subway	21.	123.	140,383.99	23,967.99	2,948,064
March	Manhattan	25.	145.	211,662.07	36,493.49	5,291,552
"	Subway	17.	112.	193,033.84	29,299.78	3,281,575
April	Manhattan	27.	159.	192,654.26	32,714.87	5,201,665
"	Subway	26.	187.	126,203.34	17,546.99	3,281,287
May	Manhattan	11.	56.	487,358.18	95,731.07	5,360,940
"	Subway	9.	45.	374,232.56	74,846.51	3,368,093
June	Manhattan	10.	65.	512,083.19	78,782.03	5,120,832
"	Subway	5.	32.	645,396.54	100,843.21	3,226,983
Average for six months	Manhattan	21.3	151.	295,988.83	49,912.44	5,162,525
	Subway	16.2	101.8	275,291.09	45,961.20	3,260,572

minutes on the subway, and under the time system 471.3 and 181.1, respectively.

The value of the records and the thoroughness of the inspection work on the mileage system is proven by the fact that the subway equipment ran at the rate of 26,337 car miles per minute delay and the elevated equipment 16,471 car miles, while under the old method these figures were only 16,549 and 9466 miles for the subway and elevated lines respectively. The average number of subway cars out

daily on account of bad order was 10.36 during August, September and October, 1906, but by May, June and July, 1907, this had been reduced to 8.67 cars a day.

The delay reports are made up every day, week and month at the headquarters of the car equipment department, where lists like those reproduced are prepared, showing how many delays were due to improper inspection of certain features at specified shops. The foremen are kept continually advised of the defects discovered and are warned they must watch sharply to keep them down and eliminate them if possible.

The benefit of these delay records is not confined merely to keeping the inspection efficiency at high-water mark.

FOUR TYPICAL WARNINGS TO REDUCE DELAY CAUSES

Dec. 6, 1907.

Mr. _____,
Foreman _____ Inspection Barn.

DEAR SIR:—

I note that you have five delays amounting to fifteen minutes chargeable to your barn. This is a marked improvement over your showing for September.

I note that there is no charge against gears and pinions, motor bearings, brush holders and cleaning car house. You should see that time is properly distributed, as no doubt each of these items received due attention.

Yours very truly,

SUPT. CAR EQUIPMENT.

Dec. 6, 1907.

Mr. _____,
Foreman _____ Inspection Barn.

DEAR SIR:—

I note that there are thirteen delays amounting to eighty-four minutes chargeable to your barn, and I am surprised to find such an increase in delays as compared with your record of former months. You will please give this matter your personal attention and make every effort to bring the maintenance of your equipment up to its former efficiency.

Yours very truly,

SUPT. CAR EQUIPMENT.

Dec. 6, 1907.

Mr. _____,
Foreman _____ Inspection Barn.

DEAR SIR:—

I note that you have nine delays amounting to fifty minutes chargeable to your barn. This is but a very slight improvement on last month's showing. There are four delays amounting to twenty-two minutes, due to broken flash shields in controllers. You will please give this matter your personal attention, as the extent of the delay due to this cause is unusual. There is no charge against markers or switches, although your attention was called to same last month.

Yours very truly,

SUPT. CAR EQUIPMENT.

Dec. 6, 1907.

Mr. _____,
Foreman _____ Inspection Barn.

DEAR SIR:—

Herewith you will find prints showing cost of inspection, also sheets showing efficiency of service during the month of October.

I note that there has been twenty-six trains removed from service on Third Avenue line chargeable to your barn. This is a very poor showing, and now that your assistant that you complained of as handicapping you has been removed, and a man of your choice installed, I shall expect that the number of trains removed from service, as well as the number of delays chargeable to your barn, will be very materially reduced.

Yours very truly,

SUPT. CAR EQUIPMENT.

The analyses by the department's engineers of these records of apparatus in service have had a most salutary influence toward developing improvements in the design and construction of car equipment. This phase of the delay problem is so important that its further consideration must be reserved for a separate article.

In concluding this subject for the present, it may be of interest to point out here the complete refutation offered by these delay statistics to the oft-repeated assertion that the weak point of electric railway operation as compared with steam is the necessary dependence on one or two power generating plants and a complex transmission system. It will be noted from the tables that a monthly average of fully 257,759 car miles was operated per minute's delay in

power supply on the Manhattan division and practically 83,000 miles on the subway division. Figures showing such reliability of power supply have never yet been produced by any steam railroad. Even if allowance is made for the fact that the locomotive also carries the propelling machinery in addition to the generating equipment, there can be no question of the superior reliability of the electric service. This fact appears from the tables in which is shown the total average time lost every month in the first half of 1907, due to power and car equipment troubles.

elevated car in 1906 was \$4.12 and for a subway car \$6.74; in 1905 before the introduction of the present improved methods, the corresponding costs were \$5.03 and \$5.88. The 1907 costs run as follows: In the 148th Street subway yards the cost dropped from \$8.55 in June to \$4.46 in October, due to the better checking and the introduction of piece work; at the 129th Street elevated yard from \$4.82 in May to \$3.79 in November; at the 179th Street elevated yard from \$4.49 in May to \$3.70 in October. The best eleven months' average for subway cars was \$6.16 made at

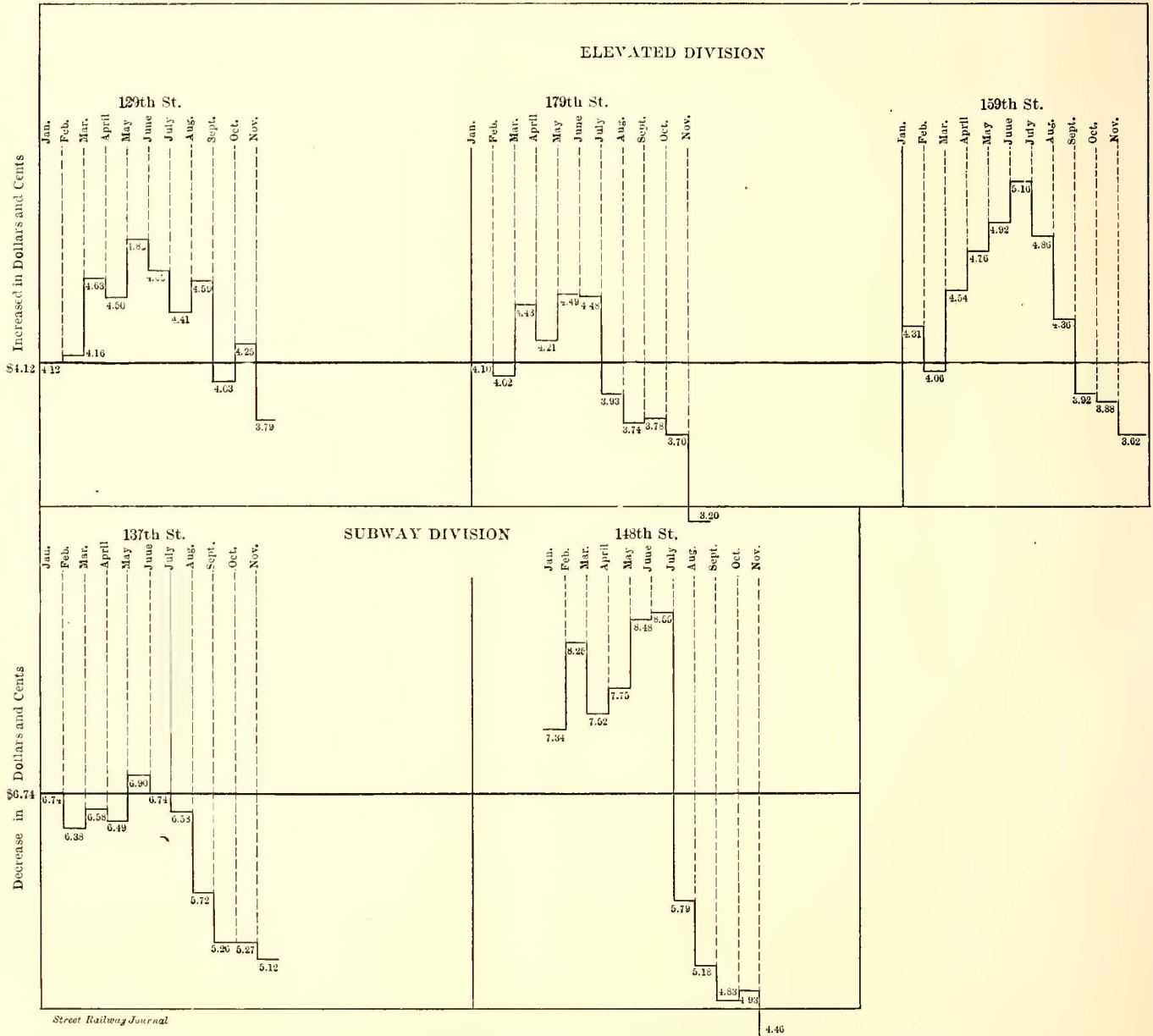


FIG. 7.—CAR CLEANING LABOR COSTS OF THE INTERBOROUGH RAPID TRANSIT COMPANY, COMPARISON PER CAR PER MONTH

Thus only 351.9 (12.2 + 339.7) minutes were lost on the Manhattan division and 142.5 (4.8 + 137.7) minutes on the subway division.

COMPARISONS OF CAR CLEANING COSTS

Monthly curves similar to the foregoing are made out for car cleaning and sent to the inspection foremen, who are also in charge of this work. These comparisons are based on the cost per car per month. An inspection of these sheets as reproduced in Fig. 7 on this page reveals some interesting figures for doing the same kind of work in elevated and subway service and also during different years and months. Thus the average monthly cost of cleaning an

137th Street; the best ten months' average for elevated cars was \$4.08, made at 179th Street.

The preceding paragraphs have covered in a broad way the general functions and organization of the car equipment department and most of the statistical data given has embodied general results rather than details. The next article will consider the practice of the Interborough Rapid Transit Company with regard to car inspection, lubrication and cleaning, showing through what means the company has reached its present high standards of efficiency and economy and how its methods have brought about improvements in rolling stock equipment.

NEW ADDITION TO THE REPAIR SHOPS OF THE UNITED RAILWAYS, ST. LOUIS

During 1907 the United Railways Company of St. Louis completed an extensive addition to its general repair shops at Park and Vandeventer Avenues. The new shop building, which was designed by the company's building department under the direction of John I. Beggs, president of



IRON ROOM, SHOWING HEAVY MACHINERY ON EACH SIDE OF RUNWAY

the company, is located east of the large general repair shop which was completed in 1903, and is bounded on the north by Vista Avenue, on the east by Spring Avenue, on the south by vacant property owned by the company, allowing for a future extension to Park Avenue if necessary, and on the west by a transfer table separating the new and old shops and serving both. The new shop building has six bays, five with saw tooth roof construction, the sixth bay at the north end having a flat roof. Owing to the natural slope of the ground considerable excavating was required on the east side, the street level being about 15 ft. above the floor at this end of the building. A concrete retaining wall was built along Spring Avenue, leaving a clear space of about 5 ft. between the retaining wall and the building foundation, and extending under the sidewalk. This forms a fireproof compartment for storing paints, oils and varnishes. There are also two concrete tunnels extending under Spring Avenue connecting with the company's property east of Spring Avenue.

The foundations of the new building are of concrete, the walls of brick and roof trusses of wood. Ample light

is secured in all the bays by making the entire vertical side of the saw tooth roof above the fire wall which faces the north of glass, and placing large skylights on the south side.

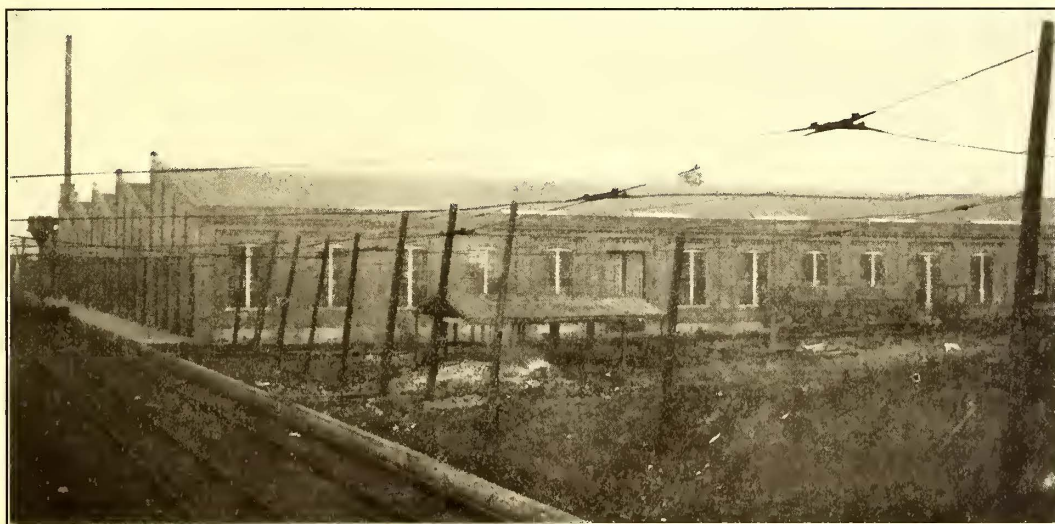
The shop is divided into eight divisions by fire walls extending through the roof. The large bay on the north side is used in manufacturing steel bottoms for the new cars which the company is now building. It is spanned by two Pawling & Harnischfeger electric traveling cranes, one a ten-ton crane over both steam and electric tracks and one a five-ton crane over the punches, shears, riveters and other machines.

The adjoining bay is served by two six-ton Curtis hand cranes, each fitted with two three-ton chain hoists. These are used for assembling the steel bottoms on their trucks, after which they are ready for the wood work which is completed in the last bay at the south end. The three bays between are used for general repair work. The other divisions are the pattern room in the north-east corner and the wood working mill and varnish rooms on the east side.

The mill is equipped with all of the machinery necessary for doing the company's repair work and for building new cars on a large scale. The machines are all fitted with individual drive, the motors being placed in concrete pits under the floor. The covers to these pits

are provided with a glass, protected by an iron grating through which the motor commutators may be seen and trouble detected before it becomes serious.

A track runs through the center of the mill from north to south and lumber is hauled from the lumber yard to the machines on a special flat car. The machines are so arranged that the material moves toward the varnish room as the work progresses. An air compressor and reservoir



A PORTION OF THE EXTERIOR OF THE NEW ST. LOUIS SHOPS, FROM THE SOUTH

in the mill supplies compressed air at 100 lb. pressure to the entire shop for operating pneumatic drills, riveters, oil furnaces, gas paint burners and for cleaning motors and machines, hose connection cocks being placed convenient to all machines. The mill has a complete dust collector system with a double 80-in. exhaust fan driven by a 150-hp

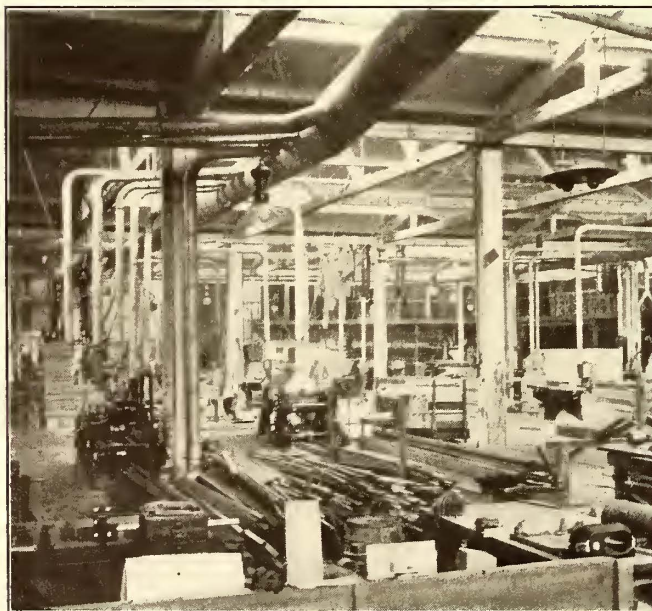
motor. The shavings can be delivered either to a large corrugated steel shavings tank or to the furnaces of the boilers used for heating. The mill floor is of wood; all other floors are of concrete. Besides the 150-hp fan motor



GENERAL VIEW OF FIRST BAY, SHOWING HEATER PIPES, ROOF CONSTRUCTION AND LIGHT WIRING

there are sixty-five other motors varying in size from two to fifty horse-power; all motors are wound for 550 volts.

For artificial lighting both arc and incandescent lamps are used. The arc lamps are placed near the roof trusses and a row of incandescent lamps is hung between tracks and near the walls. The interior of the building is painted white, and this is a great aid in illumination. All of the light and motor circuits are controlled by a central switch-



VIEW IN MILL ROOM, LOOKING SOUTH

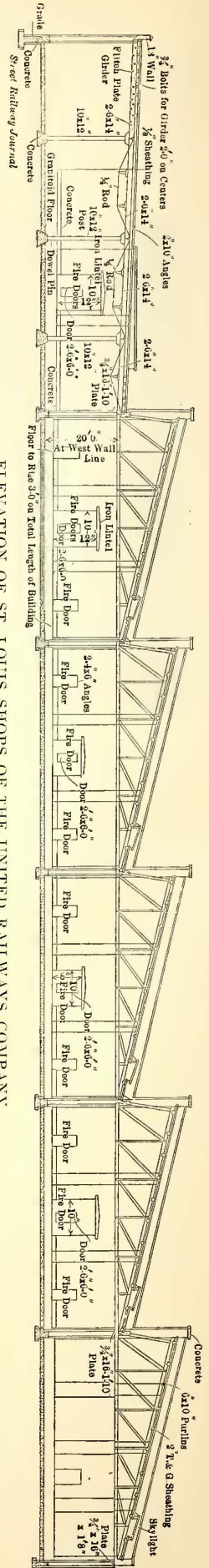
board in the storeroom. A complete local telephone system has been installed in the shops with a switchboard in the master mechanic's office. This brings all of the foremen within easy call of that office and also makes communication between departments convenient at all times. The heating of the building is by direct radiation with manifold

coils on the walls. Steam for heating is supplied by two 150-hp boilers below the floor in the northwest corner of the building. For fire protection there are fifteen 1½-in. fire hydrants with hose connected and ready for immediate use placed at convenient points around the building. Located near each hydrant is a red lamp which burns continuously. Fire barrels and buckets are also placed about the building and a watchman's fire alarm circuit is installed. The exterior finish of the new shop is the same as the building completed in 1903, which was described in the STREET RAILWAY JOURNAL Nov. 14, 1903, page 874.

INDIANA COURT INSTRUCTS VERDICT FOR COMPANY

A circuit judge at South Bend, Ind., on March 6, took a case against the Chicago, South Bend & Northern Indiana Railway Company out of the hands of the jury and instructed the jurors to return a verdict for the company. The court's ruling also upheld the right of street railway companies to establish rules for preserving sanitary conditions on their cars and clothes them with the right to enforce such rules. The suit at issue was that of Leroy Kobb against the company. The plaintiff was ejected from a car on the north side Mishawaka line several weeks ago by the conductor, who claimed Mr. Kobb, who was riding with his wife, ignored requests to desist from throwing peanut shells upon the car floor. In the complaint filed Kobb asked for \$5,000 damages for alleged humiliation. After the case had proceeded two days the judge, at the request of the counsel for the company, instructed the jury to find for the defendant. The court held the conductor acted wholly within his rights in ejecting the defendant from the car, as he was acting under a reasonable rule of the company. The ruling of the court defines clearly the attitude the traveling public is expected to assume in keeping cars clean, as it gives car companies the right to enforce rules forbidding such common nuisances as spitting upon the car platform, throwing paper upon the floor and littering the car with fruit peelings.

ELEVATION OF ST. LOUIS SHOPS OF THE UNITED RAILWAYS COMPANY



THE FIRE INSURANCE DEPARTMENT OF THE BROOKLYN RAPID TRANSIT COMPANY

One of the first lines of policy decided upon after the present management of the Brooklyn Rapid Transit Company assumed charge was the reduction of the fire hazard. The property had been beset by a series of severe conflagrations, and by way of recalling the losses of the company there is the record for a single year four or five years ago of the loss by fire of the Ridgewood power station, the Flushing Avenue car house, the Flatbush Avenue car house and the Ninth Avenue car house.

To deal with the subject properly, the company engaged a special insurance engineer, F. T. Sloan, and to him entrusted the work of recommending forms and types of construction to be adopted. Previous to his connection with the B. R. T., Mr. Sloan had acted in a similar capacity for the United States Steel Corporation's insurance department. The incoming administration was planning the immense improvements which have been recorded from time to time in these columns, and Mr. Sloan acted as consulting adviser in regard to them, meanwhile organizing the forces at his command for the proper protection of the existing property. The first thing undertaken was to better the fire organization and to increase the fire fighting equipment by installing at each barn additional fire pails, barrels, chemical extinguishers and hydrants and hose. Then organizing the fire fighting force, the work was carried from car house to car house and shop to shop and the men thoroughly drilled. As a result each car house or shop is protected by a force of firefighters consisting of a chief, an assistant chief, foreman, hydrant men, hose men, extinguisher men, axe men, trolley men and bucket brigade. The chief of the brigade instructs the men and drills them once a week and takes charge in case of fire. The assistant chief, on duty in the day time, acts for the chief. The foreman, on duty at nights, acts for the chief. The hydrant men, of whom there are two, turn on the valves. Two men handle the hose. There are two extinguisher men where the size of the brigade will permit, the same rule applying to the axe men. The trolley men are appointed with reference to their familiarity with the handling of cars about the depot. The bucket brigade is made up of the men who are not assigned to regular posts. The brigades are organized for both night and day forces, and now are drilled every two weeks, whereas they were formerly drilled every week. The alarms are tested every 24 hours. The time is recorded that it takes for the first man to respond to an alarm, also the time before the hose is taken down ready for the stream to be turned on. The men are all instructed as to the location of the private fire alarm gongs, boxes and push buttons, and also the nearest city alarm box. The instructions are to ring in both private and public alarms as soon as a fire is discovered. The men are also thoroughly instructed as to what kind of fires to expect in street railway work and how best to deal with them. The instructions regarding the running of cars out of the barn are that the cars nearest the fire shall be run out first, but that if the fire is large the best cars shall be run out.

A recent slight car house fire furnishes a striking example of what has been accomplished in the way of organization. The insulation of a light wire which had been injured took fire and communicated to the woodwork. The local fire alarm was used and also the auxiliary fire alarm. The fire brigade had a stream of water on the fire 45 seconds after the alarm had been sounded. Eight cars were removed from the section of the building in which the fire

occurred and the fire had been successfully put out before the city department arrived. Aside from the breaking of a few lights of glass the equipment was not damaged.

The next work after reorganizing the fire-fighting force was to recommend forms of construction for existing buildings which would reduce the fire risk and to suggest types of construction for new buildings, as gone into thoroughly in the articles which have appeared in this paper on the Thirty-sixth Street shops and the East New York shops and elevated storage yards. In this way barns of large area were divided into bays separated by fire walls, making the risks small. Fire doors were installed in a number of cases and unnecessary windows were bricked up.

In several cases old buildings which were poor risks were entirely removed, and cars are now stored in the open. The old shops of the Kings County Elevated are an instance of this. These shops were built by the Kings County Elevated Company long before the property passed to the B. R. T. and subsequently under the B. R. T. management were abandoned except for storage purposes. Now they are no longer used even for this. The same is true of the old Vernon Avenue depot, the old Thirty-sixth Street shops and the old Coney Island barns, all of which have been razed.

The new barns and the new shops furnished scope for the adoption of the new recommendations, and in the case of the new Maspeth depot resulted in a reduction of the premium from \$3 to \$0.77 per \$100, while in the case of the Ninth Avenue car house a reduction was effected from \$2.64 to \$0.48 per \$100.

By lengthening two walls 29 ft. high, 15 ft. each and installing six fire hydrants and hose and one or two other minor changes, the rate of insurance on the Bergen Street depot was reduced from \$1.95 on building and contents and \$2.20 on cars per \$100 to \$0.90 on building and contents and \$1.15 on cars.

There were only two sprinkler systems installed when the new department was established. These have been improved and made more effective. No car house was equipped with fire extinguishers. New extinguishers are installed at every house and shop, and one is carried in each of the elevated cars. The idea that has been carried out was to divide the new car houses by fire walls so as to reduce to a minimum the valuation and number of cars subject to one fire and provide protection so that the cars in the other sections could be readily run into the street. At neither the Ninth Avenue nor the Maspeth barn was wood used except for the finish in the offices. With this form of construction, of course, the company considered it unnecessary to install a sprinkler system.

As an example of the construction adopted for the shops the buildings at East New York may be cited. The feature of this installation was that not a portion of the structure was of frame construction. All the main foundation walls and building piers are of concrete. The walls of the main shop in this case, except the retaining wall separating it from the inspection shop, are constructed of steel columns built up of angle-iron frames in cement to form a 2-in. curtain wall. The steep portions of the roof were covered with Johns-Manville asbestos roofing, while the flat portions were covered with tar and slag. In fact, the buildings were so carefully designed in regard to fire protection that the insurance premium is perhaps the lowest in the country for an unsprinkled electric railway shop installation. Here also the car storage yard was divided by fire walls. All wall openings are further protected by double, automatic fire doors. In addition fire dampers, which close automatically,

were installed in the pipes of the heating system to prevent drafts being carried through the different pipes.

The handling and storage of oil received particular attention, and wherever the space was available a separate and distinct fireproof storage house was provided. The gravity system was used at Maspeth and probably will be adopted as standard in the future. In general the oil houses are of brick with concrete roofs and are ventilated to the outside. The floors are of concrete, with a 4-in. drain. The National Board Standard fire door has been adopted, the size of which is 4 in. higher than the floor. The Bowser system will also be installed in the new building being erected for the line department at Nostrand Avenue and Herkimer Street. The Bowser system is very effective and can be adopted, as has been the case in Brooklyn, so that no oil in barrels need ever enter a building proper. In one instance an opening was provided to the streets and six different kinds of oil were delivered by gravity from the tank wagon to the receiving tanks buried 2 ft. under the concrete floor of the oil house. Each storage tank is accessible through a manhole. The amount of oil in the tank is registered by gage. Separate pumps are provided for each kind of oil, and the oil is effectually metered as it is drawn off. In this way the only oil above the floor level is that in the pumps themselves, which is an almost negligible quantity.

PAY-AS-YOU-ENTER CARS IN NEW YORK

Last week Oren Root, vice-president and general manager of the New York City Railway Company, extended an invitation to the newspaper men of the city to take a trial trip on one of the new pay-as-you-enter cars of the Madison Avenue line, so that they should be acquainted with the general scheme of the cars before the regular service should be inaugurated on Sunday, March 22. A car was brought down to Astor Place on Thursday afternoon, March 19, and the party was taken up Madison Avenue to Forty-fourth street. Mr. Root had the party in charge and explained the details of the car, which have already been described in the *STREET RAILWAY JOURNAL*. He stated that the pay-as-you-enter feature would eliminate a large part of the inconveniences and annoyances to which passengers, especially women and children, were subjected in a crowded car caused by the conductor forcing his way through the car to collect fares. He referred to the advantages in the way of reducing accidents on account of keeping the conductor on the rear platform, where he has entire supervision of the rear doors, while the front exit door is entirely in charge of the motorman. He said that at present the number of passengers on a car would be limited to 75, or 38 seated and 37 standing. When this number is reached the car would display a sign, "Car Full," at the front and rear platforms, after which no more passengers would be taken until some of those on the car had dismounted. The average number carried on a car is much less than 75 even during rush hours, so that the only inconvenience would occur as a result of a street blockade, but this, in the very nature of things, would be very short in duration. At present the conductors will collect the fares in the usual way and record them on a register worked by a treadle; later a fare-collecting box will be used. When asked about the question of delay in making change, Mr. Root said that the experience of the company indicated that the points where the largest numbers of passengers get on are transfer points; these passengers, of course, have transfers, so that the number requiring change would be limited.

Mr. Root distributed among the newspaper men present photographs of the car, as well as of some old buses used on the Madison and Eighth Avenue lines, where passengers were required to pay on entering by dropping their fare in a box. He also handed them a folder and pamphlet which the company had prepared describing the car and seating arrangement. Mr. Root stated that the cost of the experiment to the company was about \$1,100,000 for the 155 cars, which are equipped with four motors each with air-brakes and differential brakes, and an additional \$400,000 for changes in the special work at curves and in the car house to accommodate the greater length of the cars, which are 48 ft. long, or 11 ft. longer than those formerly used. He said that the adoption of the cars was somewhat in the nature of an experiment, but if it received the approval of the public other cars of the same type would be adopted on other lines, probably the Eighth Avenue line first. The present equipment was sufficient to conduct the regular service on the Madison Avenue line, but would be supplemented by the regular cars during rush hours.

These photographs and descriptions of the car were published in all of the New York papers the following morning, accompanied in most cases by editorials indorsing the plan of the company to use cars of this kind and expressing the hope that the public would co-operate in every way. At the same time advertisements were published by the receivers of the company in all of the papers giving a plan of the cars and instructing the public how to use them.

The regular service was commenced at 5 o'clock Sunday morning, March 22, and proved very successful. A few individuals, either through perversity or ignorance, attempted to force their way from the platform into the car without paying, but the conductors were instructed to treat such persons courteously on the first day and collect fares from them after they had entered the car. As a precaution, the management had a lawyer at each of the corners where there is usually congestion, and also in each magistrate's court on the east side. These attorneys were prepared to act in the event of the arrest of motormen or conductors who might have to eject a passenger for violation of the rules, but their services were not required. The police had also been instructed in regard to the experiment with the new cars, and were of great assistance.

As a result of the day's business, Mr. Root on Sunday evening gave out the following statement:

"The operation of the pay-as-you-enter cars on the Madison and Fourth Avenue line has proved an unqualified success. The commendation of the cars by the passengers, so far as I have been able to learn, has been universal.

"What has been claimed for these cars has been actually demonstrated. Two features of the day's operation are especially worthy of mention—first, the ease and pleasure with which the public grasped the new conditions, and, second, the rapidity and lack of friction with which the people were handled at congested points, such as Fifty-ninth Street.

"The possible criticism is the height of the steps. We have arranged with our engineers to change them as rapidly as possible, so that they will approximately be the same height as all the other surface cars."

Since the inauguration of the service all of the New York papers have published editorials commending the cars and referring to the satisfaction which they have given the public. The company has not given out any official figures of the earnings of the cars, but it was unofficially reported in the daily press that on Sunday a number of the cars earned over \$300 each.

ELECTRICAL NIGHT AT THE NEW YORK RAILROAD CLUB

The fourth annual electrical night of the New York Railroad Club was held on Friday evening, March 20, and proved one of the most interesting meetings that the club has ever held. There was no formal paper, but several short talks by electrical engineers who have had a prominent part in the recent heavy electric traction work in and about New York. L. B. Stillwell, consulting engineer, gave some figures showing the tremendous number of passengers carried and car miles operated on the Interborough Rapid Transit Company's system, as compared with the passengers and mileage of the great steam railroads. He also described the electrical features of the Forty-second Street or Steinway tunnels under the East River, which are to be operated by the New York & Queens County Traction Company when franchise negotiations are concluded with the city. Some particulars of these tunnels will be found elsewhere in this issue. Mr. Stillwell also described the arrangements for pumping out water from the sumps of the Interborough Company's East River tunnel, the forced draft system for supplying fresh air in case trains are stalled in the tube, and the telephone system whereby the dispatcher at the Bowling Green station can be quickly informed of any trouble. Although there is little inflammable matter in this tube the company has provided plenty of fire extinguishers and fire hose, as there is always a possibility that fire may arise from defective insulation. In conclusion, Mr. Stillwell mentioned briefly the conditions under which cars are operated in the Hudson Company's tunnels.

J. M. Waldron, signal engineer of the Interborough Rapid Transit Company, then described the novel features of the signal system as adopted for the East River tunnel. An abstract of Mr. Waldron's remarks will be found elsewhere in this issue.

Hugh Hazleton, the next speaker, described with the aid of lantern slides the constructional features of the Hudson Companies' cars and gave some interesting comparisons of the time that would be saved in traveling from different points of New York to Newark owing to the construction of the Hudson tunnels and the electrified tracks to Newark. The Hudson Companies are now operating with purchased power, but will soon be in position to use their own power station, which is being equipped with Curtis turbines.

W. J. Wilgus mentioned five interesting incidental features of the New York Central electrification which he called by-products of electrification: (1) He calculated that the possibility of using other than ground surface for railroad purposes effected a saving over the cost of a steam terminal of the same capacity equal to the cost of two city blocks to the west of the present terminal valued at \$50,000,000. (2) By using current from its own power station for lighting yards and terminals, operating freight elevators and the like, the New York Central will save about \$200,000 a year. (3) The availability of large amounts of current for operating labor-saving devices, floating bridges, moving platforms, trains, etc. (4) An estimated saving of \$114,000 a year in switching will result from the use of electric locomotives during the period of non-peak loads on the power station. (5) The great advantage offered by a continuous working conductor through which it is easy to establish safety devices in connection with signals so that a far greater degree of control of train movement can be obtained than with independent power units. Thus it becomes feasible to have only one man at the head of the

train, while steam practice makes it necessary to have two. This elimination of one man to a train naturally would effect a great saving in labor cost.

W. S. Murray, electrical engineer of the New York, New Haven & Hartford Railroad, said with regard to the New Haven single-phase locomotives that while troubles had appeared here and there, none of them was fundamental and no doubt would be eliminated with further experience. As to multiple unit operation, his company had already ordered several sets for use with the single-phase equipment.

George Gibbs gave a list of some of the most important applications of electric railway work during the past year. W. C. Kerr spoke on the point of view an electrical engineer should take in considering electrification projects for steam railroads. Great progress along these lines could not be expected until the electrical engineer could give his steam railroad clients a better idea of the cost such changes would involve.

B. G. Lamme, of the Westinghouse Electric & Manufacturing Company discussed the Spokane & Inland Railway Company's single-phase freight locomotives. The specifications under which the early locomotives were ordered did not reveal the long and severe grades which the Spokane & Inland Railway Company's line possessed. The line leaves Spokane on a long 2 per cent grade, and it was the expectation of the builders that freight trains would leave Spokane practically empty and return loaded. As a matter of fact, however, as much business appears to go out of Spokane as comes in, so that the outgoing loads are beyond those calculated. The motors on these locomotives were artificially cooled by direct-connected fans. Consequently the cooling effect decreased in the same proportion as the loads increased. It was therefore decided to drive the forced draft fans by independent motors. The new railway motors, instead of being placed on an hour rating, are now rated on the basis of continuous tractive effort. The later locomotives are guaranteed to give a continuous tractive effort of 16,000 lb. and to run up a 2 per cent grade indefinitely without overheating. A tractive effort of 25,000 lb. is available for emergencies. It was Mr. Lamme's opinion that for long runs the rating should be on the basis of continuous tractive effort developed rather than on the usual hour rating of street railway motors.

Wm. McClellan took up the point mentioned by Mr. Kerr as to costs being given by electrical engineers to the steam railroad companies. This was naturally a question of time and experience. The New Haven and the New York Central electrification costs were now being figured and the indications were that it would not be long before electrical engineers would have firmer ground to stand on. It seemed to him that the great trouble besides the financial one was which system to adopt. That problem could only be properly settled by taking a broad view of the subject of electrification as a whole. While a certain system might be the best for the first section to be electrified when considered by itself, the electrical engineer must not overlook the fact that later on the electrification would be extended and then it might develop that some other system should have been adopted.

It is stated that the advisability is being considered of fitting up several interurban cars in Indiana for the accommodation of the members of the Central Baseball League playing in Indiana and Ohio. The equipment will include dining facilities and berths.

PROTECTING THE TRAINS IN THE TUNNEL OF THE INTERBOROUGH RAPID TRANSIT COMPANY EAST RIVER TUNNEL

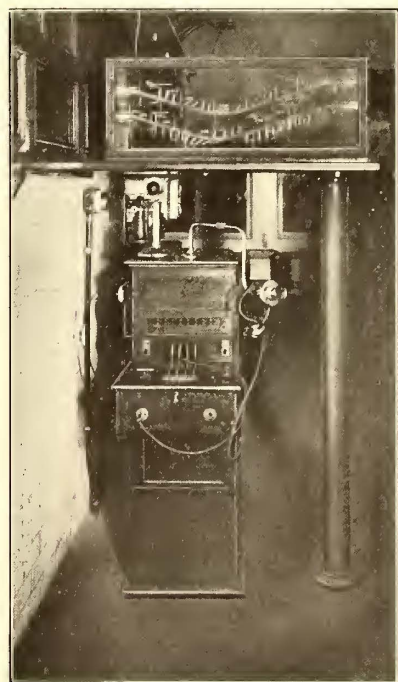
At the March 20 meeting of the New York Railroad Club, J. M. Waldron, signal engineer of the Interborough Rapid Transit Company, gave a description of the novel features of the signal system used in his company's East River tunnel, of which the following report is an abstract:

Only the express trains of the Lenox Avenue division are operated through the tube, those of the Broadway division continuing to the terminus at South Ferry, one station beyond Bowling Green. To facilitate train movement the South Ferry trains on leaving Bowling Green leave the south bound main line, pass around to the South Ferry station over the top of the Brooklyn tunnel tracks and go back to the north bound main line at Bowling Green. The grades at both ends of the tube are 3.1 per cent.

The problem was to signal these tracks to permit the maximum number of trains to pass under the river in safety, and not neglect the service at the South Ferry station. It was found that the greatest speed a train could acquire in passing under the river would be about 60 miles

per hour, requiring a block 2400 ft. long, and that the speed at the top of the 3.1 per cent grade would be about 22 miles per hour. Should a motorman disregard a signal his train would be brought to a stop before reaching a train in the next block in advance. The junction of the South Ferry loop track with the north-bound track from Brooklyn, at the South End of Bowling Green station, at the top of the 3.1 per cent grade, introduced some very interesting features.

The study of these features, made with a two-minute headway service from Brook-



DISPATCHER'S DESK, BOWLING GREEN STATION.

lyn, and a four-minute headway service around South Ferry loop, showed that to run any kind of service it would be necessary for north-bound trains from South Ferry to skip the Bowling Green station and also necessary to reduce to a minimum the delays occasioned by stopping trains from Brooklyn on the steep ascending grade, as every train so stopped requires from 12 to 15 seconds to release brakes and get the train under way.

It was therefore decided to install a complete system of visual indications in the Bowling Green tower to give the operator a miniature reproduction of all train movements between Wall Street, New York, and Borough Hall, Brooklyn. He would have under his jurisdiction the control of signals and stops at both entering ends of tubes, so that when a train for any reason should be delayed in either tube an unusual length of time he could immediately pre-

vent other trains from entering therein. It was also arranged that either track under the river could be used for traffic in reverse direction in a safe manner. When used in this way the automatic trips will clear up automatically as the train approaches them. The entire control of traffic through the tubes is under the jurisdiction of the Bowling Green operator.

The apparatus for reproducing the condition of tracks under the river, and showing the location of trains passing through from New York to Brooklyn or reverse, consists of a box about 4 ft. long, 2 ft. high and 1 ft. wide with black glass front, behind which are placed colored lights. On the face of this glass are two narrow strips about $\frac{1}{2}$ in. wide, arranged to represent longitudinal sections of each tube under the river. When there are no trains in the tubes these are green ribbons of light extending from Borough Hall to Bowling Green. Miniature signals in their correct location are placed on this model. When a train enters the tube at either end the green light is immediately changed to red for the block which that train occupies. This red light follows the position of the train through the tunnel. When a train passes out of a block the green light is again displayed in its rear.

To reduce as much as possible the delays which the junction south of Bowling Green would occasion to trains from Brooklyn and South Ferry loop in entering Bowling Green station, additional signals and stops with cut overlap track sections were installed to permit trains to approach toward the Bowling Green station immediately upon the preceding train starting from station platform without decreasing the factor of safety. This arrangement saves about 9 seconds to each train from South Ferry loop and of about 12 seconds to each train from Brooklyn over what would be the case were the same method of control in vogue at this station as at other stations in the subway.

The Interborough Rapid Transit Company has been trying for a number of months to get permission to install this same arrangement of signals at the approach to express stations, but up to the present time has not been granted the necessary authority to do so. If these changes were made, two additional express trains in each direction per hour could be added to the subway service.

CURRENT TRANSMISSION AND COLLECTION IN THE EAST RIVER TUNNELS OF THE NEW YORK & LONG ISLAND RAILROAD COMPANY

At the March 20 meeting of the New York Railroad Club, L. B. Stillwell, consulting electrical engineer, presented an account of the electrical features of the New York & Long Island Railroad Company's tunnels between New York and Long Island City, from which the accompanying facts are taken. These tunnels have been ready for some time, but operation is being deferred until certain franchise difficulties are adjusted with New York City. The cars are of steel construction but of surface type, as many of them will continue as through cars over different routes of the allied New York & Queens County Railroad Company. They have been equipped with GE-87 motors suitable for operation on 600-volt d. c.

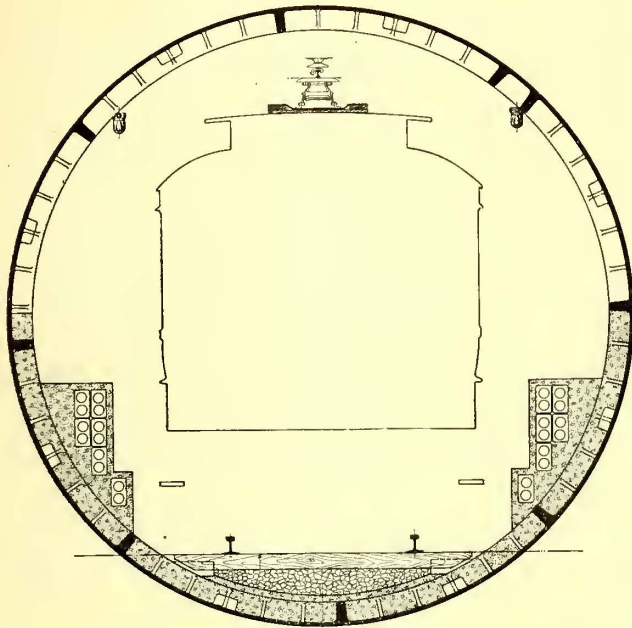
When operated over the city lines these cars will collect current through the company's standard trolley wheel and pole. The restricted space in the tunnel section made it necessary to add to the cars a more compact and reliable form of current collector. This collector consists of a pantograph similar to that applied on the New York Cen-

tral electric locomotives, but of smaller dimensions. In its lowest position this contact shoe is only 8 in. above the roof of the car, 11 $\frac{3}{8}$ in. in its normal running position and 1 ft. 4 in. in its highest position.

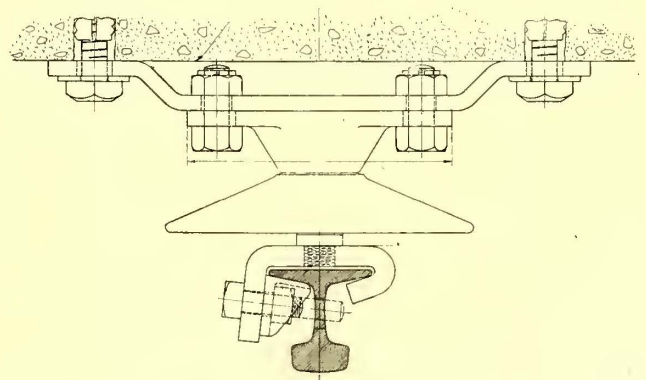
Current is taken from a contact rail placed in line with the center of the tunnel. This rail is of standard T section weighing 20 lb. per yard and supported at intervals of



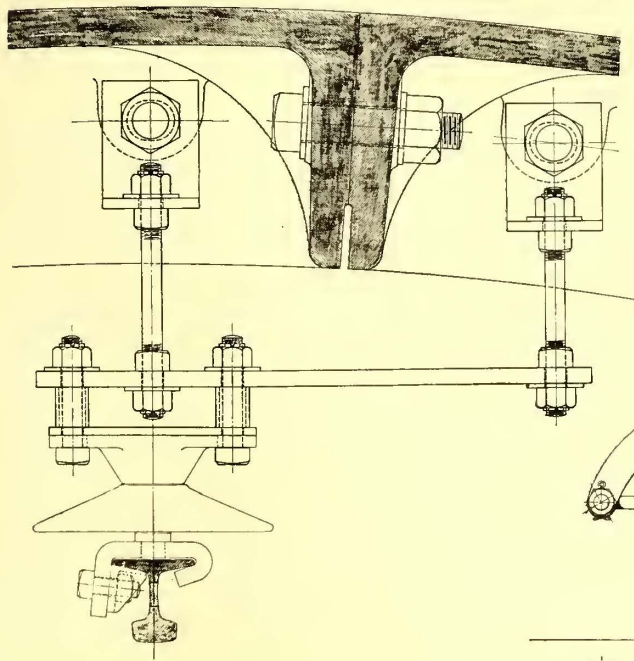
INTERIOR VIEW OF CONCRETE SECTION OF THE FORTY-SECOND STREET TUNNEL, SHOWING OVERHEAD CONTACTOR, ROADBED, ETC.



CROSS-SECTION OF ONE OF THE FORTY-SECOND STREET TUNNELS, SHOWING LOCATION OF OVERHEAD CONTACT RAIL



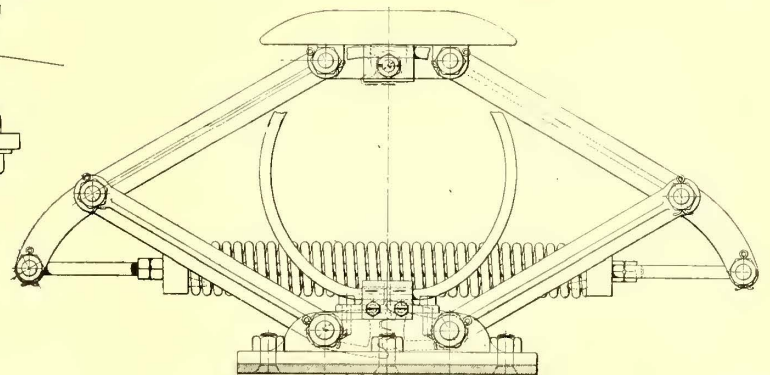
ASSEMBLY OF 20-LB. OVERHEAD CONTACT RAIL



ADJUSTABLE BRACKET FOR OVERHEAD CONTACT RAIL IN CAST IRON SECTION

9 ft. The rail is carried head down and is secured to the insulator and bolted to brackets adjustable in four directions.

The principal tunnel dimensions are as follows: Height from top of ties to roof of tunnel at center, 14 ft. 2 in.; height from top of rail to normal position of shoe, 12 ft.



PLAN AND SIDE ELEVATION OF OVERHEAD CONTACT SHOE, DESIGNED FOR THE FORTY-SECOND STREET TUNNEL

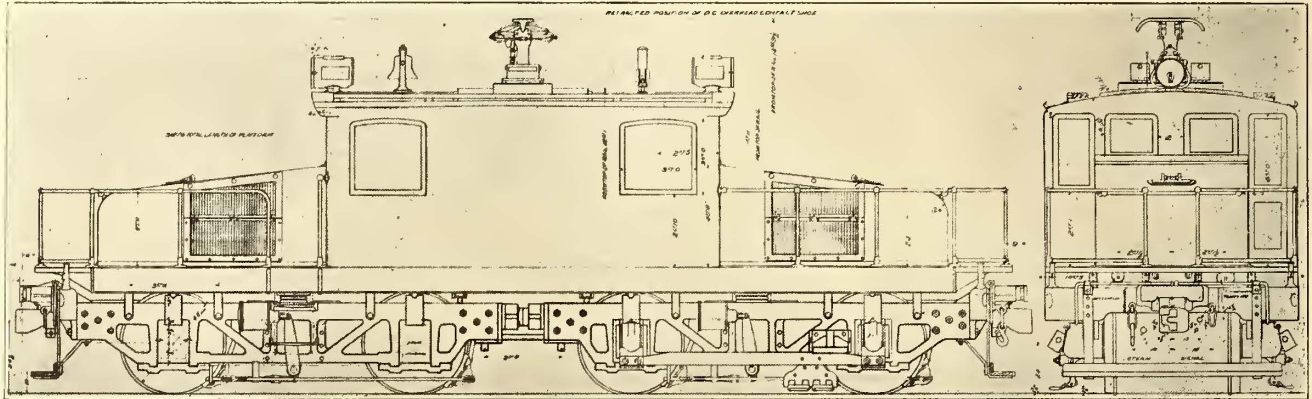
4 $\frac{3}{8}$ in.; height from top of ties to roof of car, 11 ft. 11 in.; distance between tunnel lights, 10 ft. 8 in.; height from top of shoe to roof of tunnel, 15 $\frac{3}{8}$ in.; height from top of shoe to top of insulator, 6 $\frac{1}{2}$ in.

DETROIT RIVER TUNNEL LOCOMOTIVES

Side and end elevations of one of the six electric locomotives which the General Electric Company and the American Locomotive Company are building for the Detroit River Tunnel Company are shown in the accompanying engraving. These machines are to be used for hauling both passenger and freight trains through the tunnel which

The superstructure consists of a main operating cab and two auxiliary end cabs. The main cab is 15 ft. 6 in. in length and contains the engineer's operating mechanism and valves, while the end cabs house the auxiliary apparatus, such as contactors, rheostats and air reservoir. The auxiliary cabs are of such a height as to permit the engineer having a good view of the tracks, and a narrow platform runs from the main cab to the ends of the locomotive, providing easy access to the couplers.

The electrical equipment of each unit consists of four GE-209 motors and the Sprague-General Electric multiple-unit train control. The current is supplied to the motors through the medium of an inverted third-rail at a pressure of 600 volts. The motors are of the commutating pole type,



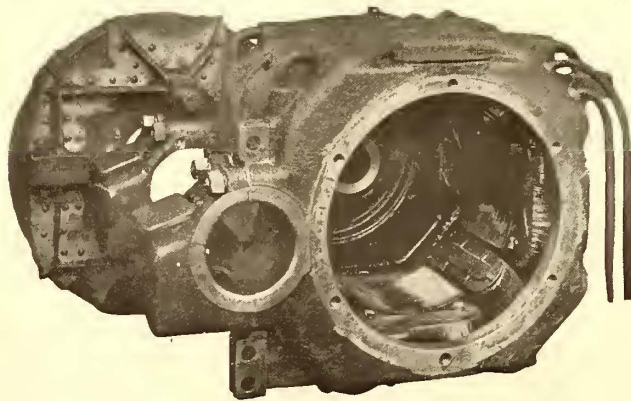
SIDE AND END ELEVATIONS OF DETROIT LOCOMOTIVE

is being constructed under the Detroit River to connect the tracks of the Michigan Central Railway in Windsor, Ont., with those in Detroit, Mich.

The rating of this type of locomotive, according to the standard nomenclature adopted by the manufacturers, is 404-E-200-4-GE-209. They are moderately slow speed machines and weigh 100 tons on the drivers. The frame is of the articulated type and can best be described as consisting of two four-wheel trucks hinged together. The trucks are of a very solid construction with cast steel side frames of truss pattern carried on semi-elliptical journal

each having four ordinary field poles and four interpolated poles. They are among the largest commutating pole units yet constructed for railway work. The armature is a series drum-wound armature and the frame of the motor is of the box type. Each motor will develop approximately 300 horsepower, and at its one hour rating will develop a tractive effort of 9000 lb. at a speed of 12 m.p.h., while a complete locomotive is capable of hauling a 900-ton train up a 2 per cent grade at the required schedule speed. A pinion will be mounted on each end of the motor shaft, as the torque is so large as to render it inadvisable to put all the work on one pinion. The torque of each motor amounts to 4050 lb. at a 1-ft. radius. The gear ratio is 4.37.

These motors will be cooled by forced ventilation, a blower being installed in the main cab for this purpose which has a capacity of 2000 cu. ft. per minute, this providing 500 cu. ft. of air per minute for each motor. An air compressor of type CP-26 with a capacity of 100 cu. ft. per minute piston displacement is provided in the main cab for operating the air brakes. The principal dimensions follow:



SIDE VIEW OF MOTOR FIELD

box springs. The diameter of the driving wheels is 48 in. The draft rigging is carried directly on the outer end frames of each truck and the two trucks are hinged together by means of substantial hinges and pins. By adopting this method of construction, the draft of the locomotive is carried directly through the truck frames and the center pins are relieved of all hauling strains.

Length over buffers.....	41 ft. 6 in.
Length inside to inside knuckle.....	39 ft. 6 in.
Total length of platform.....	38 ft. 6 in.
Length of underframe	34 ft. 0 in.
Total wheel base.....	27 ft. 6 in.
Rigid wheel base.....	9 ft. 6 in.
Span of third-rail shoes.....	22 ft. 8 in.
Length of motorman's cab.....	15 ft. 6 in.
Height top of cab from top of rail.....	11 ft. 11 in.
Height of pantograph when in retracted position from top of rail.....	14 ft. 9 $\frac{1}{2}$ in.
Height of floor line above the top of rail.....	5 ft. 0 in.
Width over all	10 ft. 2 $\frac{1}{2}$ in.
Diameter of wheels.....	48 in.

STORAGE BATTERY HOUSE VENTILATION ON THE NEW YORK CENTRAL

In the account of the New York Central electrical equipment in the issue of this paper for Oct. 12, 1907, only a brief mention was made of the system of heating and ventilation employed in the storage battery houses. The com-

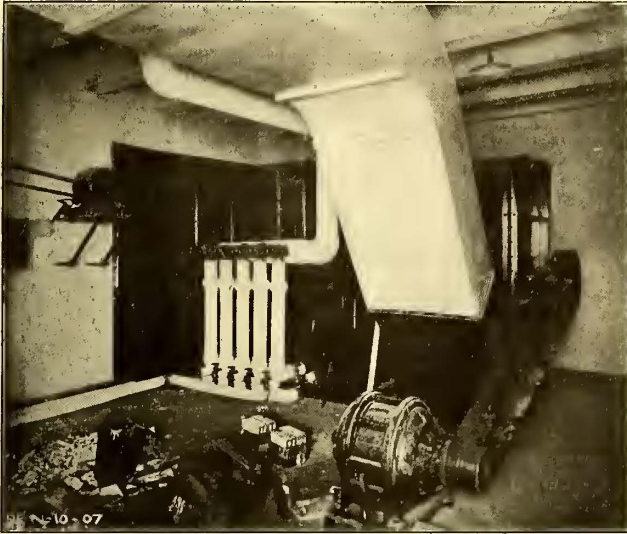


FIG. 1.—HEATING AND VENTILATING ROOM IN SWITCH HOUSE

pany which installed the storage batteries agreed to certain guarantees on them, provided the temperature was maintained at 70 deg. This necessitated a heating plant for cold weather and a means of cooling in warm weather, as well as proper ventilation at all times. The acid fumes thrown off by the batteries precluded the possibility of heating by direct radiation, as the fumes would attack and destroy the radiation and pipe lines. Hence the blower system was adopted. The entire heating plant is centralized in a de-



FIG. 2.—YONKERS BATTERY ROOM, SHOWING OVERHEAD DUCTS

tached building, the air being delivered to the various portions of the building by ducts, protected in such a manner as to resist the corrosive action of the acid fumes. So far, five of these stations have been equipped, two of which are illustrated by the accompanying views.

The air is circulated through a sectional pipe heater by a steel plate fan which is driven by a belted motor as shown in Fig. 1. Steam is supplied by a small low-pressure boiler,

which is located in an adjacent room. The air discharged by the fan is distributed at the proper temperature, by suitable ducts, to the various apartments.

Two methods of distribution have been employed, as shown in Figs. 2 and 3. At Yonkers carefully protected galvanized iron ducts are used as shown in Fig. 2. In the other substation battery rooms there is no piping, the air being admitted at one end of these rooms through tile conduits terminating at registers made of 95 per cent lead and 5 per cent antimony.

The results have been equally as satisfactory by blowing in at one end of the battery rooms as when the air is distributed throughout the room by ducts with branches at frequent intervals. The advantage is apparent at once in Fig. 3 by the absence of the ducts on the ceiling, which,

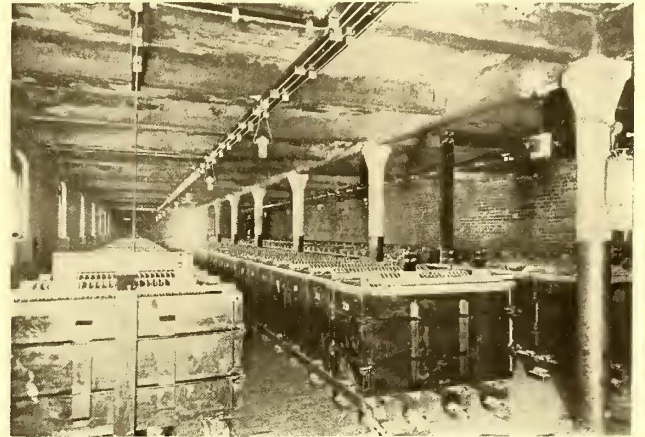


FIG. 3.—KINGSBRIDGE BATTERY ROOM WITHOUT DUCTS

though they do not occupy space available for any other purpose, detract from the appearance of the room, are costly to install and require frequent attention to keep them in a condition to resist the acid fumes.

The system is compact, easily accessible and under control at all times—very different from the old direct radiation system. Further, it is moderate in cost and economical both in operation and maintenance. Another feature of value is the flexibility, as it is possible to deliver the air at any temperature without diminishing the volume. These heating and ventilating systems were designed by the American Blower Company, of Detroit, Mich., and were installed by John Hanin & Brother, of New York.

TRAMWAYS IN SHANGHAI

The following extracts about the completion of the electric railway in Shanghai, China, are taken from a local newspaper of that city:

“The construction of the Shanghai tramways has been practically completed. The cars for the service have arrived in the city and most of them have been put together. All that is now awaited is the current to supply the motive power for the trams. Two or three weeks must then elapse before the service is inaugurated, as, in order to minimize the risks of accident, the company desires to make the native drivers thoroughly efficient before the trams are allowed to traverse the busy streets of the settlement. The current, it is expected, will be switched on in about a fortnight, and the motor drivers will be trained up and down a convenient thoroughfare for the purpose. Upward of 23 miles of track have been laid, and there remains little to be done but to complete the overhead cable work on two bridges, both of which are nearing completion.

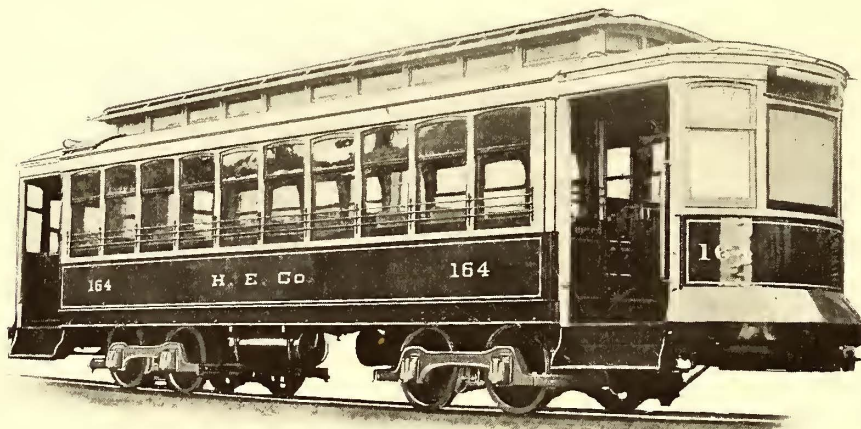
"The tram routes have been divided into 11 sections over which the passenger is entitled to travel. The sections on each route are posted in conspicuous places in each car, and printed in English and Chinese. The first-class fare for one section is 2½ cents, for two sections 5 cents.

"The drivers and conductors will be Chinese, but cars will be visited by foreign inspectors at least twice on each journey. The terms of the concession do not allow any exterior disfigurement by advertisements. Each car is divided into two compartments, which seat 12 first and 20 second-class passengers, respectively. The seats in the first-class compartment are covered with rattan; those in the second-class are of wood.

"The cars are lighted by electricity, and notices, in English, French and Chinese, warn passengers against smoking, spitting, or bringing dogs on board."

SEMI-CONVERTIBLE CARS FOR HOUSTON

The Houston Electric Company, of Houston, Tex., has recently received from the St. Louis Car Company a number of its semi-convertible type of cars. The sash moves up into the roof, where it is securely fastened, with no possible danger of falling down and injuring passengers. The cars are 28 ft. over corner posts and 31 ft. 6 in. over all.



EXTERIOR OF NEW CAR FOR HOUSTON

The width over the arm rail is 8 ft. 6 in. The finish is in handsome figured mahogany. The cars are provided with curtains at each window and at each door opening and have the St. Louis Car Company's latest improved "walkover" seat. The trucks are of the company's No. 47 type, which has been adopted as standard in a number of the larger cities. The channel iron steel construction of the Robertson type permits the arm rail of the car to be placed very low and adds very much to its appearance.

MULTIPLE UNIT A. C.-D. C. FOR NEW HAVEN

The New York, New Haven & Hartford Railroad Company has just placed an order with the Westinghouse Electric & Manufacturing Company for four a. c.-d. c. multiple unit equipments for the motor car service on its New York division. Each car will have a quadruple equipment of motors. The motors will be geared and transmit their torque through a quill, spring-supported on 42-in. drivers, and will be designed of such capacity as to perform the local service between the Grand Central Station and Stamford, making all station stops. Trains will be made up upon a proportion of one motor car to two trailer cars. The trailer cars will be of all steel construction.

NEW INTERLOCKING SWITCH AND SIGNAL SYSTEM FOR PACIFIC ELECTRIC RAILWAY

The Pacific Electric Railway Company has completed the installation of its interlocking switch and signal system at Slauson Junction at a cost of \$22,000. It is one of the largest and most complete plants of its kind in the West and will greatly facilitate the handling of traffic at the junction. Slauson is the switching point for the cars of the Long Beach, Newport, Santa Ana, Whittier and San Pedro lines, as well as the Watts local. The Santa Fé tracks also cross the Pacific Electric tracks at Slauson and heretofore the delay in switching and "nagging" the crossing has been a formidable obstacle to the rapid handling of traffic. The regular daily schedule calls for 600 switches in 24 hours. On holidays and during the summer months the trolley service to the beach towns is greatly increased. Before the installation of the interlocking system it was necessary for every car to make two stops, the first to allow the conductor to throw the derail switch and the second to ascertain whether there was a train approaching on the Santa Fé track.

The distant signal bridge is 1650 ft. from the nearest switch at the junction. Four hundred and fifty-five feet from the crossing is the "main signal" bridge. Fifty-five feet beyond this bridge is the derailing switch. The backing switch is about 200 ft. beyond the crossing point. When a car is backed it must be done from the tower, and the semaphore arms on the "dwarf" tower must show a clear track.

Under the terms of agreement with the Santa Fé company the cost of installation is borne by the Pacific Electric, but the expense of operation is equally divided between the two companies. Work is being rushed on a similar system for Amoco station, the switching point between Slauson Junction and Ninth Street. Though smaller in size the Amoco plant is

in every particular similar and will cost, when completed, \$17,000.

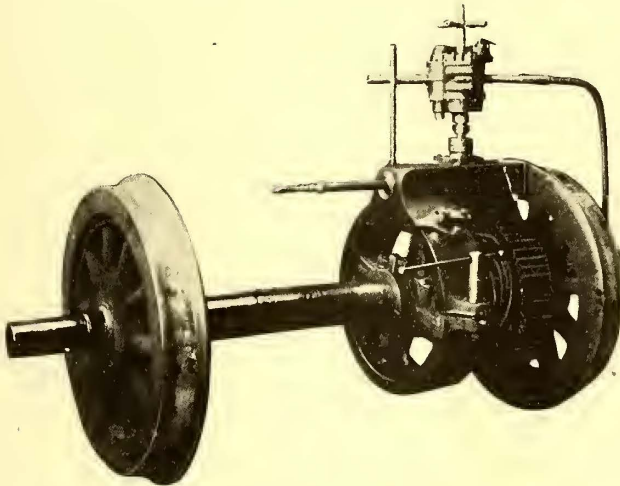
B. & W. TO CONTINUE HALF-HOUR SERVICE

General Superintendent E. P. Shaw, Jr., of the Boston & Worcester Street Railway Company, recently said in answer to a question as to whether the Boston & Worcester will try to reduce operating expenses by cutting down the train service: "The Boston & Worcester Street Railway Company has passed through three of the best winter months since it started, for receipts and service, and is very well satisfied with the present schedule. We will not reduce our schedule this winter, but we will continue to run every half hour as in the past. When the riding demands it, we will give additional service. The company is better able to maintain its schedule service on account of the addition of the double track put in last summer."

General Manager Jordan, of the Cleveland, Painesville & Eastern Railroad Company, of Willoughby, Ohio, has announced a contest for a trade-mark design for the company, the prize to be \$25. The contest closes May 4.

A CONVENIENT TOOL FOR CUTTING GEARS ON AXLES

The accompanying illustration from a photograph shows a convenient and economical attachment for re-cutting worn gears without removing them from the axle, which has been devised by J. E. Osmer, master mechanic of the Northwestern Elevated of Chicago. A split master gear is bolted on the axle carrying the worn gear to be cut and around this is bolted a heavy shoe similar to an eccentric strap. This shoe is cast with a slotted guide on top extending out over the gear and carrying a traveling carriage which can be moved in or out, parallel to the gear teeth by a screw. On the carriage is mounted a small air drill in the vertical spindle of which is inserted a revolving milling cutter, shaped to the profile of the gear teeth. An adjustable stop pin is provided on one side of the shoe which surrounds the master gear and when the apparatus is applied this pin is inserted into one of the teeth of the master gear



TOOL FOR CUTTING GEAR TEETH

and adjusted so that the cutter is centered between two teeth. When the air is turned on the revolving cutter is worked across the face of the gear by the screw feed on the traveling carriage. After one tooth is cut the stop pin is withdrawn, the whole shoe and cutter revolved the pitch of one tooth, the stop pin reinserted and the next tooth cut. By rolling the wheels through one complete revolution the carriage is kept always on top. The device saves the cost and time of removing one wheel to press off the gear, as is ordinarily done. It can be applied in about five minutes and does its work quickly and accurately.

EMPLOYEES' MUTUAL BENEFIT ASSOCIATION OF THE FT. WAYNE & WABASH VALLEY

The Employees' Mutual Benefit Association of the Fort Wayne & Wabash Valley Traction Company was organized last year through the efforts of C. D. Emmons, general manager of the company, and its benefits were made effective beginning Oct. 15, 1907. The initial membership included all heads of departments and about 150 employees. All employees of the accounting, operating, mechanical, maintenance of way, electric and power departments between the ages of 21 and 45, if in good physical condition, are eligible and participate in the benefits so long as they remain in the company's service.

The objects of the association are to provide relief for its members in case of sickness, injury or death, and to promote social relations and good fellowship among the employees and officers. The company insured the success

of the benefit plan by contributing a good sum of money at the start and the services of its accounting department to take charge of the books and funds. The dues of each member are 50 cents a month. The benefits are 50 cents a day after the first seven days of sickness and 75 cents a day in case of injury while engaged in the company's service, injury benefits beginning with the first day. In case of death through sickness or injury the beneficiary of the member receives \$100. No benefits are paid if sickness, injury or death is caused by intemperance or immoral acts. Members are not required to pay dues while disabled. The affairs of the association are conducted by a president and board of trustees composed of one member from each department of the service.

Club rooms have been provided in every city in which the company operates city or interurban lines. At Fort Wayne the company has provided three large rooms at the Holman Street car house for the use of the members of the association. They have been furnished throughout and are maintained with heat and light at the expense of the company. One of the smaller rooms is used as a reading room. A good library of standard books and current fiction has been donated and on the tables are kept current issues of the leading magazines and technical papers. The card room adjoining is furnished with chairs and tables for card and other games. Next to it is a large pool room, double the size of the card room and library. Here the company has provided a good pool table, balls and cue racks, for the free use of the members. This room is never empty from early morning until late at night. The trainmaster can always find several extra crews for emergencies in the club rooms. The men are never denied the privilege of a hearty laugh, but boisterous or disorderly conduct is strictly forbidden and good order is maintained in and about the building at all times. A more cheerful or better satisfied lot of motormen and conductors would be hard to find. The association idea is growing in favor rapidly and it is believed that in a short while every eligible employee of the company will be enrolled as a member.

PAY-AS-YOU-ENTER CARS FOR CHICAGO

The Chicago Railways Company last week placed an order with the Pullman Car Company for 400 wooden pay-as-you-enter cars and with the Pressed Steel Car Company an order for 50 steel cars of the same type. The specifications on which the bids were received were prepared by B. J. Arnold, chairman of the board of supervising engineers and were approved by the board. A license was secured from the Pay-as-You-Enter Car Company for the use of that principle of car construction in the new cars. A table of the dimensions of the new cars was published on page 301 of the issue of this paper for Feb. 22. At the same time the Chicago Railways Company placed an order with the General Electric Company for 400 double-motor equipments to be used on the cars.

The last railway shelter in the series that has been gradually completed for the new Washington Street tunnel in Boston since last spring was uncovered in Adams Square, opposite the foot of Cornhill, last month. It is the most northerly stairway for the station centering under the old State House, the point where the East Boston tunnel crosses over the new tunnel. The only other entrances remaining to be provided are those to be added to the old subway station at Haymarket Square, where the old subway and new tunnel will merge.

LABORATORY WORK IN COMBINED RAILWAY AND LIGHTING PROPERTIES

The use of laboratory methods and equipment in the closer study of operating problems in combined railway and lighting properties is no longer regarded as an academic practice by progressive organizations. The physical equipment of such properties is generally closely inter-related in its installation and series, except in the distribution circuits. Minimum cost of power generation is desirable in any electrical property, but it is absolutely essential to the central station. When the transportation, lighting and power functions are combined in a single system, particularly if that system be located beyond easy reach of the larger cities and manufacturing facilities of the country, the properly conducted laboratory can be utilized with singular effectiveness in the direction of economical operation.

A case in point is the laboratory of the Georgia Railway & Electric Company in Atlanta. Primarily essential to the central station end of the business, the laboratory performs a vast amount of work useful in keeping the standards of measurement accurate in connection with the generation and distribution of railway power. The functions of this laboratory are entirely separate from the routine duties of the regular meter-testing department, which is housed in another place. Its equipment is in the main laid out to perform extremely accurate calibrations, although part of its work is the maintenance of commercial accuracy in the power and substation instruments. Permanent wiring and switching connections greatly facilitate the work. The limit of accuracy in the work is generally about 0.1 per cent, though .02 per cent can be obtained in some of the operations. Comparisons between the standard apparatus in the laboratory are made to .02 to .05 per cent; tests of standard indicating and recording meters are made from 0.1 to 0.2 per cent; tests of station indicating meters are made from 1 to 2 per cent, and magnet coils are measured within about 5 per cent.

Records are kept of every instrument tested, showing the size, kind, style of meter, circuit used upon and the work performed by the laboratory. If an instrument cannot be made correct throughout its whole scale, a correction curve is supplied and a copy of the curve is kept with the rest of the data. This record has been found of great value, for the entire history of each station and portable instrument giving all previous checks and repairs is always at hand. Station recording wattmeters are calibrated at least twice a year, and instruments are frequently rebuilt by the laboratory without the expense and lost time of sending to the factory for repairs. Last year, out of 371 indicating meters rebuilt, repaired or calibrated, only 1.3 per cent were sent to the factory.

Work of this character is, of course, desirable on all kinds of power systems, though at present it is a development feasible to the larger companies rather than to those of more limited resources and equipment. It is probable that the investment in station and portable instruments can be cut down from 25 to 30 per cent by the operation of such a laboratory on a good-sized combined railway and lighting property. At the best, instruments returned to the factory for calibration require three or four weeks' time for return, and on long trips of 1000 miles or more over rough track the most careful packing does not always insure that an instrument correct at the factory will be correct at its destination. Express charges must also be figured, often running as high as \$5 or \$10 per instrument

on the round trip. The saving by rebuilding instruments is also very considerable, and in two or three days it is often possible to repair the most troublesome defects with calibration ready for renewed service. In connection with acceptance tests of equipment the preliminary calibration and checking of all instruments is obviously of fundamental importance. Of course, in many cases where a company is within practicable radius of a well-established testing laboratory conducted by outside parties, the best policy may be to send its instrument to such a place. Sometimes by combining their forces small companies can enjoy practically the same service in expert instrument work available to larger organizations. The larger the scale on which the work is done, the greater is the tendency toward economy under proper supervision.

STREET RAILWAY Y. M. C. A. PROGRESS IN MEMPHIS

The Memphis Street Railway Company employs over 600 white men. Of this number about 500 are conductors and motormen. The rules of the operating department are necessarily rigid, and must be carried out to the letter because of the size of the system. The company now serves a population estimated at about 175,000 and is one of the most progressive in the South. The class of men who seek street railway work in Memphis are, as in many other cities, chiefly young men from the rural districts. With comparatively few exceptions these men come from American homes. The temptations of city life are many, and in appreciation of the fact that few people take a personal interest in the social, moral and religious welfare of these young men, the Memphis company has now maintained for over two years a Y. M. C. A. department at its main car houses, the secretary being B. F. Black. The department is provided with shower baths, games of many kinds, stationery for letter writing, papers and magazines, good books to read, organ and piano, secular and religious song books. Words of encouragement are spoken to the timid and cautious, advice is freely given on personal matters, and in cases of sorrow and distress sympathy and material help are extended. The secretary is an ordained clergyman and frequently officiates at the marriages, baptisms and funerals of the men employed by the company.

It is impossible to measure the work done in a department of this kind by statistics, but a few figures taken from the report of the secretary for the two years ending Aug. 1, 1907, show to a degree the usefulness of this work. During this period more than 13,000 baths were taken, more than 73,000 games of various kinds played, 555 books read, 21,000 magazines estimated read (29 are taken in the reading room), more than 14,500 letters were written and nearly as many delivered, and the total estimated number of men at the rooms was 276,000. Three public entertainments were given to employees and their families, the attendance being 1060. At three musical concerts the attendance was 700. Seventy-nine Gospel meetings were held and the attendance was 2848. The secretary made 132 visits to the sick and distressed, 12 delegates were sent to conventions and the secretary visited 13 other associations, studying their methods and plans of administration.

Nine addresses on street railway work were made by the secretary outside the department. Part of the secretary's time was devoted to work in co-operation with the local Memphis Y. M. C. A. in the line of shop meetings, church services, etc.

FINANCIAL INTELLIGENCE

WALL STREET, March 25, 1908.

The Money and Stock Markets

The upward movement in values which was in progress on the Stock Exchange at the close of last week was continued during the week under review, prices for practically all of the leading issues making new high records for the movement, while in many instances prices went even higher than those recorded during the bull movement last January. Trading was upon a much larger scale, and while a great part of it was of a professional character, nevertheless there was a material increase in the volume of commission house business, indicating that the outside public has entered the market extensively. As a matter of fact, the buying by outsiders has been larger than for many months past, and many of these purchases were made upon a cash basis. Underlying conditions have improved considerably, and the general belief seems to be that the general financial and commercial situation will continue to improve from now on. The developments in the money market have been of a decidedly favorable nature. Despite the payment of about \$35,000,000 to the government within the past few weeks, rates for accommodation for all periods up to six months have declined to the lowest levels reached since last summer. The local banks continue to accumulate money, the surplus reserves on last Saturday amounting to nearly \$37,500,000. Increasing ease was also reported in the foreign markets, the Bank of England reducing the minimum discount rate to 3 per cent, the lowest rate that has been in force since 1905, and as private discount rates at that center have worked easier, the belief prevails that a further reduction in the official rate will be made in the not distant future. Other favorable influences were the excellent showing made by the United States Steel Corporation's report, which was accompanied by the statement that the trade has shown improvement ever since the beginning of the new year. The report of the American Sugar Refining Company for the year ended Dec. 28 last, the first ever made by the company, also served to improve sentiment. The surplus for the year, after paying \$6,299,930 in dividends, was \$2,449,361, while the company reported a surplus as a contingent reserve for business of \$25,576,936. The copper trade also showed further improvement, the increased demand from both domestic and foreign consumers being reflected in a further advance of ¼c. a pound in the price of the metal. The decisions of the United States Supreme Court, declaring unconstitutional the Minnesota freight and passenger rate law and at the same time nullifying a law passed by the North Carolina Legislature against the Southern Railway, involving the same principle, were well received, and were largely responsible for the buoyancy of the market at the close. The reduction of the New York Central dividend to a 5 per cent basis, and the expectation that other of the large railway systems may find it necessary to take similar action had only a temporary effect upon values.

Philadelphia

While the number of issues traded in was comparatively small, the total volume of business in the local traction shares was considerably larger than in the preceding week, and prices generally scored further sharp advances. The upward movement noted in Philadelphia Rapid Transit at the close of a week ago was continued during the early part of the period under review, the stock advancing further to 18¾ on unusually large transactions. At the high level, however, realizing developed and as a result there was a reaction of 1¼ points, but again at the close the stock became strong and closed within a small fraction of the highest. The week's transactions in the stock alone aggregated about 20,000 shares. Union Traction also was conspicuously active and strong, the stock scoring an advance of 2¾ points. From 51 at the opening, the price ran off to 50, but subsequently it jumped to 52½. Consolidated Traction advanced from 64 to 64½. Philadelphia Traction

sold at 86, Philadelphia Company common at 35; American Railways at 42¾, and United Companies of New Jersey at 240.

Baltimore

There was a further material improvement in the market for traction issues at Baltimore, and while the United Railway issues continued to be the favorites, still greater interest was manifest in other traction securities. United Railway advanced ½ point further to 86, while the refunding 5s moved up to 76¼. The incomes held firm, but the price was unchanged at 49 @ 49¾. The stock was fractionally higher at 49. City & Suburban 5s brought 108; Baltimore City Passenger 5s sold at 102; North Baltimore 5s at 110½, and Atlanta Street Railway 5s at 101½.

Other Traction Securities

Trading in the Boston market was not very active and was accompanied by more or less irregularity in prices. Boston Elevated was firm throughout, the stock making a gain of ½ for the week to 129½. Boston & Worcester sold at 14 and the preferred at 55 @ 54¾. Boston & Suburban preferred sold at 50, and Massachusetts Electric preferred at from 47 to 44½ and back to 45. A steady demand was reported in the Chicago market for the bonds and notes of the Chicago traction companies. It is said that practically all of the Chicago Railway Companies 6s are in the hands of investors, and the same may be said of the Chicago City Railway 5s. In the open market sales of Metropolitan extension 4s were reported at 80, and of the gold 4s at 87. South Side Elevated stock sold at 60, West Chicago receipts at 30, and sales of North Chicago receipts were made at 45½ @ 43. Metropolitan common brought 16, and the preferred 49. City Railway stock was traded in at from 170 to 175.

Little business was done on the Cleveland Stock Exchange the past week. Northern Ohio Traction & Light common furnished most of the trading, the figures varying from 18¾ to 20.

Security Quotations

The following table shows the present quotations for the leading traction stocks and the active bonds as compared with two weeks ago:

	March 17.	March 24.
American Railways	42¾	42
Boston Elevated	128	129
Brooklyn Rapid Transit.....	45¾	47
Chicago City	155	155
Cleveland Electric	42	44½
Consolidated Traction of New Jersey.....	64	64
Detroit United	31	33
Interborough-Metropolitan	7½	7½
Interborough-Metropolitan (preferred).....	19½	18¾
International Traction (common).....	33	33
International Traction (preferred).....	61	60¾
Manhattan Railway	*125	125
Massachusetts Elec. Co. (common).....	10¾	10
Massachusetts Elec. Co. (preferred).....	47¾	45
Metropolitan Elevated, Chicago (common).....	419	15
Metropolitan Elevated, Chicago (preferred).....	449	47
Metropolitan Street	15	—
North American	50	48
Philadelphia Company (common).....	36	35
Philadelphia Rapid Transit.....	17¼	18¾
Philadelphia Traction	85	86
Public Service Corporation, certificates.....	58	58
Public Service Corporation, 5 per cent notes.....	—	85
South Side Elevated (Chicago).....	60	461
Twin City, Minneapolis (common).....	—	—
Union Traction (Philadelphia).....	49¾	52

a Asked. * Ex-dividend.

Metals

The steel industry shows a reactionary tendency, if anything. Whereas a few weeks ago, the United States Steel Corporation was working about 53 per cent of its normal capacity, it has since fallen to about 50 per cent. The chief difficulty seems in work along railroad lines. Railroads are out of the market for practically everything they can dispense with. The copper metal market continues to improve, prices for the leading grades showing advances of ¼ @ ¾c. a pound during the week. Lake is quoted at 13 @ 13¼c., electrolytic at 12¾ @ 13c. and 12¾ @ 12¾c. for castings.

RECEIVER'S INVENTORY OF CAMDEN & TRENTON

Wilbur F. Sadler, Jr., receiver of the Camden & Trenton Railway Company, has filed with the Court of Chancery an inventory and account. Under the head of assets the following is shown:

ASSETS.	Book value.	Appraised value.
Cash in bank.....	\$1,290	\$1,290
Petty cash.....	300	300
Cinnaminson Electric Light, P. & H. Co., capital stock par value.....	20,000	.....
Bordentown E. L. & M. Co., cap. stock par value.....	13,620	.....
Rolling stock Car Trust certificates (seven cars).....	50,291	26,250
Cinnaminson E. L., P. & H. Co. Equip. Tr. notes.....	4,153	3,600
*Property (City of Trenton).....	12,906	13,500
Insurance on property.....	48	.....
Office furniture and fixtures.....	804	422
Tools, etc.....	446	1,231
Station agents, furniture, etc.....	169	.....
Conductor and motormen supplies.....	58	.....
Profit and loss.....	125,001	.....
Bills receivable:		
Cinnaminson E. L., P. & H. Co.....	19,257	.....
Bordentown E. L. & M. Co.....	9,119	.....
Trenton and New Brunswick.....	159	149
Union Trust Co. Trustees.....	4,500	4,500
A. N. Chandler & Co.....	5,273	5,273
Burlington County Traction Co.....	202	.....
Cinnaminson E. L., P. & H. Co. (power account).....	508	.....
C. & E. Telephone lines.....	18	.....
Cost of construction and equipment of road.....	3,189,154	.....
15 cars and 1 sprinkler.....	.....	2,650
Tracks, bridges and overhead.....	.....	279,883
Right of way and franchises.....	.....	425,000
Riverside and Bordentown real estate.....	.....	5,250
Total.....	\$3,457,876	\$791,701

*Trenton property is subject to a mortgage of over \$10,000

LIABILITIES.

Public Service Corporation of New Jersey.....	\$1,630
Bordentown E. L. & M. Co. (power).....	1,105
Trenton Terminal Railroad Co.....	69
Accrued interest on:	
First mortgage bonds.....	28,498
General bonds.....	19,798
Car Trust certificates.....	590
Delinquent taxes.....	346
Mortgage (Trenton real estate).....	156
Second mortgage (Trenton real estate).....	324
First mortgage Trenton real estate.....	7,500
Second mortgage Trenton real estate.....	2,703
Taxes and water rent.....	29
Camden car licenses (Public Service Corporation).....	210
Bills payable.....	231,415
Vouchers payable.....	20,324
Capital stock, \$1,750,000.	
First mortgage 5 per cent 30-year gold bonds.....	\$750,000
Less amount of bonds in treasury.....	40,000
Total.....	710,000
General mortgage 5 per cent 30-year gold bonds.....	\$1,750,000
Less amount of bonds in treasury.....	1,127,500
Total.....	622,500
Car trust certificates.....	39,000
City of Trenton for paving.....	21,674
Burlington Co. Traction Company (estimated).....	600
Accrued interest on bills payable (approximated).....	21,000
Sebastian Zindell, verdict.....	170
Total.....	\$1,729,616

HAMILTON COMPANY REJECTS CITY'S OFFER

The Hamilton Street Railway Company has rejected the offer of the city to collect 8 per cent of the receipts up to \$316,000 and 5 per cent above that of the receipts for the remainder of the contract between the city and the company in return for concessions of dubious value at best to the company. While doing so it makes two propositions. It proposes that for this and the two following years no percentage be collected by the city on the increase over \$316,000, and that 4 per cent only be collected on the increase for the rest of the term. The other proposition is that the revenue to be derived by the company for the remainder of the term be limited to 6 per cent on the company's stock, the balance to be used in improving and extending the road. The company contends that

if it accepted the city's offer it would be unable to finance the road, and that if either of its counter propositions were agreed to the money would be forthcoming and the improvements and extensions at once begun.

REVIEW OF THE REPORT OF THE INTERNATIONAL TRACTION COMPANY

The report of the International Traction Company System, of Buffalo, recently made public, showed considerable improvement in gross earnings, as compared with the previous year, the gain in that item being close to half a million dollars, or approximately 8 per cent. Operating expenses, however, were likewise increased, which left the net earnings somewhat below those for 1906, although greater than in the calendar year 1905. There was also an increase of almost \$100,000, or over 5 per cent, in fixed charges, leaving the surplus for the year less by about \$150,000, or 48 per cent, than on Dec. 31 of the previous year.

During the past few years there has been steady improvement in the gross earnings of the company. For instance, as compared with 1904, the gross recorded in the last fiscal period represents an expansion of over \$1,000,000.

The surplus of the company for the late fiscal period, while not as large as in the two previous years, was considerably in excess of that for 1904. The following table shows the gross and net earnings and surplus for the past four years:

	Gross earnings.	Net earnings.	Surplus.
1907.....	\$5,380,437	\$2,017,554	\$312,261
1906.....	4,972,688	2,087,702	464,854
1905.....	4,484,643	2,000,980	417,166
1904.....	4,088,426	1,675,657	134,120

It is an interesting and noteworthy fact that during the last fiscal year the company increased its car mileage by 1,779,790 miles, or about 9 per cent. Liberal expenditures, also, were made for improvements and additions during 1907, over \$500,000 having been expended for repaving, relaying tracks with heavy rails, etc., and some \$865,578 for additions to equipment, track and buildings.

President Pierce, in his report to the stockholders, did not hesitate to commend most favorably the new pay-as-you-enter cars which were added to the company's complement of equipment during the year and put in operation in January of this year on the Niagara Street line in Buffalo. In fact, President Pierce is so well satisfied with the new class of rolling stock that the work of installing the pay-as-you-enter feature upon 150 of the company's standard cars has already been begun and before the end of the present year the system will have 200 of such cars in operation in the city of Buffalo.

An interesting feature of the last annual report is a detailed table showing the funded debt of the company, dates of maturity, when interest is payable, rate of per centage paid and the various amounts of the companies named. The funded debt outstanding is shown to have been over \$31,000,000 on Dec. 31 last and is made up as follows:

Name	Maturity.	When int. payable.	Rate per cent.	Amount.
B. Ry. Co. con. mtg.....	1913	A. & O.	6	1,000,000
B. Ry. Co. debentures.....	1917	A. & O.	6	1,000,000
B. E. St. Ry. 2ds.....	1912	M. & S.	6	293,500
B. Ry. Co. R. E. Mtg.....	1909	J. & D.	6	150,000
B. T. Co. 1sts.....	1948	J. & D.	5	673,000
B. B. & L. Ry. 1sts.....	1927	J. & D.	5	215,000
B. & N. F. E. Ry. 1sts.....	1935	J. & J.	5	750,000
B. & N. F. E. Ry. 2ds.....	1921	J. & J.	5	105,000
B. & L. Ry. 1sts.....	1938	J. & J.	5	500,000
L. & O. Ry. 1sts.....	1920	J. & J.	5	800,000
N. F. S. B. Co. 1sts.....	1928	J. & J.	5	300,000
L. C. B. Co. 1sts.....	1928	A. & O.	5	125,000
N. F. P. & R. Ry. 1sts.....	1932	M. & N.	5	2,624,000
Crosstown St. Ry. Co. of Buff. 1sts.....	1914	J. & J.	5	600,000
I. T. Co.....	1949	J. & J.	4	18,315,000

Total funded debt outstanding.....\$31,156,500

No balance sheet was given in the last pamphlet report. The one given in the report of the previous year, however, as of Dec. 31, 1906, showed that there was a profit and loss surplus of \$613,473; bills receivable of \$3,131,000; accounts receivable, \$324,000, and bills payable, \$425,000. The capital stock of the company was given as \$15,000,000, of which \$10,000,000 is common and \$5,000,000 4 per cent cumulative preferred.

AFFAIRS IN NEW YORK

Senator Page and Assemblyman Wainwright introduced a bill amending the Public Service Commission act to give the commission power over telephone and telegraph companies. The bill was approved by the Governor before its introduction and was prepared by the two commissions. It places telegraph and telephone companies and the ferry and stage line companies under the jurisdiction of the Public Service Commissions. In the amendment a provision is inserted to enable the commission for the first district to proceed against the street railroad corporations of New York for the forfeiture of rights they claim on certain streets in the downtown section, if it decides that the corporation is exercising a franchise without authority or has abandoned or does not use all or part of the franchise. It is practically provided that the determination of the commission, upon hearing, as to the maximum fares to be charged over a route, shall control, notwithstanding that another or different rate has been heretofore authorized by statute, and the commission is specifically given power to start on its own motion a proceeding for such a determination of what shall be the maximum fare. The powers of the commission over the accounts of corporations are broadened by giving them the power to audit accounts and to decide after hearing how outlays and receipts shall be charged and credited. The commission's power to supervise gas or electric corporations is broadened to parallel to a large extent the supervisory powers of the commission over railroad corporations.

The receivers of the New York City Railway Company have filed a petition with the State Board of Tax Commissioners seeking to have the special franchise taxes on the New York City Railway system reduced. The petition states that the property since 1902 has not been a paying one and that each year the company has faced and paid an increasing deficit. The decrease in earnings is due, in part, says the petition, to the increase in transfer passengers. The revenue passengers, transfer passengers and gross income for the year ended June 30, 1907, as compared with that ended June 30, 1903, are as follows:

	1907	1903
Revenue passengers	376,629,571	3,962,243,922
Transfer passengers	194,765,342	158,626,750
Gross income	\$21,874,630	\$21,864,835

In their petition the receivers show an analysis of the income account for the year ended June 30, 1907, along with what it probably will be for the year ended June 30, 1908, on the theory that the company will provide for its special franchise taxes, for which only special provision has been made in the past, and provide an adequate depreciation fund not included heretofore. This shows as follows:

Gross income for year ended June 30, 1907.....	\$21,874,630.72
Operating expenses and maintenance, excluding interest, rentals, taxes and depreciation.....	13,172,571.03
Taxes, including special franchise taxes as claimed by the State equalized at 89 per cent.....	2,939,355.91
Balance	\$6,662,703.78
Deduct estimated decrease gross earnings for 1908	1,100,000.00
Deduct estimated increase operating cost for 1908.	1,000,000.00
Depreciation	3,000,000.00
Balance applicable to return on investment....	\$1,562,703.78

The receivers are now in default on the dividends on Metropolitan stock and Third Avenue Railroad stock, on interest on Third Avenue bonds and Metropolitan bonds and on the dividend Central Crosstown stock.

According to reports published last week and not denied J. P. Morgan & Company have become the financial agents of the Brooklyn Rapid Transit Company. They have taken a considerable portion of the company's treasury bonds and it is expected that they will take still more of these bonds from time to time as conditions warrant and as the needs of the company become apparent. The financial connections between the Brooklyn Rapid Transit and Flower & Company have been for the most part severed. As yet nothing has been done looking toward a representative of Morgan & Company being elected to the board of directors of the company. This new financial

connection by the Brooklyn Rapid Transit Company was brought about, it is said, only after a thorough investigation by J. P. Morgan & Company of the company's physical and financial condition. The banking firm not only will market the company's securities, but will also have a voice in the company's management.

MORE ELECTRIC LOCOMOTIVES FOR NEW YORK CENTRAL

To increase its equipment of electric locomotives for the electrical zone above New York City, the New York Central & Hudson River Railroad Company has ordered twelve additional electric locomotives from the General Electric Company. The locomotives will be of the "6000" type, similar to those now in use. The bodies of these locomotives will be constructed by the American Locomotive Company and the electric equipment built and installed by the General Electric Company.

LEGISLATION IN OHIO

What is known as the Freiner bill, providing for a state tax commission, has been recommended by the Tax Committee of the House of Representatives. This bill does away with the 15 or more corporation taxing boards and in their place creates a commission consisting of three members, to be appointed by the Governor for terms of six years, with a salary of \$5000 per year for each member. The minority political party in the state shall always be represented in this board, and it is provided that no two members shall belong to the same party. The claims for this proposed law are that it will put taxing authority out of the hands of politicians, and that the taxes on public service and other corporations will be made more uniform throughout the state. It is also thought that it will be impossible to dominate the commission in any way or to secure any special favors from it, if the right kind of men are selected for places on the board. Under the present law most of these taxing boards are made up of the auditor, treasurer and attorney general of the state, none of whom are expected to be experts in tax matters, although the duties devolving upon them are important.

The House Committee on Railroads and Telegraphs has discovered that the greater part of the Freiner bill, placing express companies under the jurisdiction of the State Railroad Commission, was incorporated in the Chamberlain bill, which passed the House some weeks ago. These portions of the bill were stricken out and the remainder placed in the hands of a sub-committee to await the action of the Senate on the Chamberlain bill.

The Senate Committee on Railroads has recommended for passage the Lamb bill, permitting interurban railroad companies to appropriate the use of the city tracks to reach a terminal. In the event of a dispute as to the amount to be paid for such privilege, the courts may be asked to determine the question.

Under the Woods bill, which will become a law as soon as signed by the Governor, railroads contemplating changes of grades over public highways shall file a regular petition in the courts stating the facts, and the cause shall be heard much the same as any other case after the proper authorities, having the highway under control, have been notified.

Senator Lamb, of Lucas County, has introduced a bill in the State giving the State Railroad Commission authority over grade crossings. It provides that when two steam roads or two interurbans or one or the other crosses an electric or street railway, the commission shall have power, after notice to the roads interested and a full investigation, to make an order requiring that the roads intersecting and crossing at grade shall install interlocking switches or such other devices as will protect the crossing property. The commission will also have authority, under the bill, to divide the expense between the roads making such crossing.

Under the Shuler public utilities bill, reported from the House Committee on Railroads, a few days ago, the State Railroad Commission will be given powers of supervision over electric railways and authority to ascertain the financial condition of the companies, the cost of the construction and the amount and prices of bonds sold, and give publicity to various items in connection with the construction and operation of such roads.

COMPARATIVE STATEMENT OF EARNINGS OF INDIANA ROADS

The following is a comparative statement of the earnings of the Indiana companies for the years ended June 30, 1906, and 1907, as far as the figures are available for publication:

EARNINGS		
	1906	1907
From freight	\$527,612	\$389,052
From passengers	7,411,093	9,080,872
From mails	24,501	5,471
From rents	197,492	321,875
From all other sources.....	552,076	441,531
Total	\$8,712,774	\$10,238,776
EXPENSES		
Additions and betterments.....	702,866	806,242
Maintenance of way and structures...	501,854	544,522
Maintenance of equipment.....	558,655	674,722
Conducting transportation	2,517,547	2,964,573
General expenses	1,260,533	310,698
Total expenses	\$5,541,455	\$5,300,759
INCOME		
Net earnings	3,161,319	4,938,017
Other income .....	.....	.....
Gross income	\$3,161,319	\$4,938,017
Deduct:		
Interest on funded debt.....	2,078,302	2,590,099
Taxes	350,367	448,362
Rentals	267,001	685,463
Total	\$2,695,670	\$3,723,926
Net income	465,649	1,214,091
Less dividends .....	.....	63,181
Surplus for the year.....	.....	1,150,909
Sinking fund .....	.....	88,000
Net surplus .....	.....	\$1,062,909

TOLEDO RAILWAY & LIGHT COMPANY'S EARNINGS

The Toledo Railways & Light Company's report for February and two months compares as follows:

	1908.	1907.
Gross receipts	\$207,878	\$199,701
Operating expenses	116,301	119,159
Net earnings	\$91,577	\$80,542
Other income	820	1,077
Total income	\$92,397	\$81,619
Charges and taxes	68,449	63,154
Two months' surplus	23,948	18,465
Gross receipts	\$124,839	\$420,891
Operating expenses	241,389	249,487
Net	\$183,450	\$171,404
Other income	1,598	1,696
Total income	\$185,048	\$173,100
Charges and taxes	137,053	125,462
Surplus	47,995	\$47,638

RULES OF THIRD-RAIL OPERATION

The Maintenance of Way Department of the New York Central & Hudson River Railroad Company has just issued in handy book form, for use in the department, its set of rules governing the maintenance of track, third-rail and appliances on the electric division. This book supersedes earlier orders

and instructions inconsistent therewith. The book contains general rules, special rules for the supervisor of third-rail, third-rail foreman, section foreman and patrolman, giving their duties and the rules governing the third-rail and track. It also contains instructions of what to do in case of electric shock, reprinted from the *Electrical World*. Clearance diagrams are also given as well as lay-outs of different types of switches, details of brakes, insulators, inclines, etc., also a diagram of the railroad telephone system of the New York Central.

REPORT OF INTERNATIONAL TRACTION COMPANY FOR THE YEAR ENDED DEC. 31, 1907

The report of the International Traction Company for the year ended Dec. 31, 1907, shows that, notwithstanding the financial panic which so seriously affected general business during the last quarter of the year, the gross earnings of the system for 1907 were \$5,445,070.27, being an increase of \$420,771.53 over those of 1906. The surplus for the year was \$312,260.57, or \$152,593.32 less than for the previous year, on account of higher operating expenses, taxes and interest.

In presenting the report President Pierce said in part: "The service afforded to the public during the year was considerably improved over that of the previous year. The car mileage was increased 1,779,790 miles, equivalent to 9 per cent. "The policy of appropriating a fund for depreciation was continued during 1907.

"During the year \$525,327.82 was expended for repaving, re-laying tracks with heavy rails, etc., and \$865,578.51 for additions to equipment, track and buildings. These expenditures were charged respectively to the fund for depreciation and to capital account.

"The physical condition of the property was kept up to its usual high standard, and the following improvements were completed during the year:

"The construction of the Fillmore Avenue line of 11.2 miles was completed and the line put in operation, thus increasing the total mileage to 369.58 miles of single track.

"A new car house and storage yard, having a capacity of 200 cars, was completed at a cost of \$225,000, on Broadway, Buffalo.

"Tracks were laid under new franchise through Franklin Street, Buffalo, from Chippewa Street to the Terrace.

"The East Avenue line in Lockport was extended to the city limits, to meet the new interurban road from Rochester that will be in operation next spring, and a large number of minor improvements were installed.

"In addition to the above, 50 new pay-as-you-enter cars were purchased during the year and put in service in January, 1908, on our Niagara Street line in Buffalo. They have proved a marked success, the municipal authorities, the public and the newspapers joining in praise of the new system of car operation.

"It is expected that legal proceedings in connection with the opening up of Elmwood Avenue from Virginia to Chippewa Streets will be completed by spring, making it possible to build new lines through Chippewa, Franklin and other streets, under a franchise recently granted to the International Railway Company. These lines, when finished, will relieve the congestion of street-car traffic now existing on Main Street and make the street railway system of Buffalo most complete."

The comparative income and surplus accounts for the years ended Dec. 31, 1907 and 1906, follow:

EARNINGS.		
	1907.	1906.
Passenger	\$5,272,111.64	\$4,858,526.80
Freight	103,755.56	110,157.14
Mail	1,938.11	1,799.06
Express	2,606.29	2,143.39
Advertising privilege.....	35,166.66	24,064.17
Income from securities owned.....	600.00	600.00
Miscellaneous	28,892.01	27,008.18
Gross earnings.....	\$5,445,070.27	\$5,024,298.74
EXPENSES.		
Operating expenses.....	\$3,099,439.36	\$2,656,661.66
Depreciation	269,021.82	234,791.88
Taxes	284,140.74	254,819.55
Total expenses.....	\$3,652,601.92	\$3,146,273.09
Total income.....	\$1,792,468.35	\$1,878,025.65
Fixed charges.....	1,480,207.78	1,413,171.76
Net income for year.....	\$312,260.57	\$464,853.89

ITHACA SECTION A. I. E. E.

At the education meeting of the Ithaca Section of the A. I. E. E., held Feb. 21, Dr. Steinmetz's paper on "Electrical Engineering Education" was read and discussed. Following the formal part of the meeting an informal smoker was held in the offices of the electrical engineering department, and an opportunity was thus afforded for the local members to become better acquainted, and to take up individual points which could not be discussed in the meeting. On March 6 a very profitable discussion followed the presentation of the following papers:

"The Non-Synchronous Generator in Central Station and Other Work," by W. K. Waters, abstract by H. W. Smith.

"Some Developments in Synchronous Converters," by Chas. W. Stone, abstract by H. L. Sharp.

"Some Features of Railway Converter Design and Operation," by J. E. Woodbridge, abstract by E. J. McIlraith.

These supplemented in a helpful manner the classroom instruction in the same subjects. The papers are also being used as reference text in connection with the senior lectures in electrical engineering.

UNITED RAILWAYS REPORT

The United Railways Company, of St. Louis, reports a gain in both gross earnings and net earnings for February over the corresponding month of 1907. The detailed statement, issued March 16, follows:

	FEBRUARY	
	1908	1907
Gross earnings and other income.....	\$775,454	\$764,680
Expenses, taxes and depreciation.....	519,540	548,479
Net earnings.....	\$255,914	\$231,325
Charges	233,418	231,325
Net income.....	\$22,496	.....
Deficit .....	.....	\$15,124
	JAN. 1 TO FEB. 29	
Gross earnings and other income.....	\$1,602,852	\$1,591,017
Expenses, taxes and depreciation.....	1,073,899	1,126,349
Net earnings.....	\$528,953	\$464,668
Charges	466,872	462,866
Net income.....	\$62,081	\$1,802

BOOKLET ON THE A. S. I. R. A.

Secretary Swenson, of the American Street & Interurban Railway Association, has just issued a neat booklet on the purposes, plans and work of that body. It is the first step in a movement to interest in the association all street and interurban railway companies which are not now members and induce them to join. The pamphlet, which is printed in very attractive shape, describes the scope of the American association and of each of the four affiliated organizations, mentions briefly some of the papers and reports which have been presented before each of the older associations during the last two or three years and outlines the work of all committees at the present time. Particulars are also given of the statistical bureau established at the general office, from which member companies can obtain reliable information bearing upon various phases of the business and from which letters and bulletins containing data are sent to member companies at frequent intervals. The pamphlet also contains the schedule of annual dues, which vary according to the annual gross receipts from railway operation; a list of the officers and committees of the association and its active and associate members is also given. The pamphlet is attractively bound and bears on its front cover the new badge of the association, a quatrefoil in blue with the initials of the main association, surrounded by a frame, in the four corners of which are the letters A. E. C. T. standing for the initials of the four affiliated associations.

To those who have not been following closely the work of the association the pamphlet will prove a revelation of the completeness with which the organization is taking care of the interests of its members. In every department of the industry active work is being accomplished. The organization deserves the hearty support of all the railway companies in the country.

CHANGE OF DATE OF MEETING OF NEW YORK STATE STREET RAILWAY ASSOCIATION

The Executive Committee of the Street Railway Association of the State of New York has postponed the date of its annual meeting to June 30 and July 1. The annual banquet will be held on the evening of June 30. The place is the same as announced previously, that is, at the Clifton Hotel, Niagara Falls, Ont.

THE CLEVELAND SITUATION

Mayor Johnson's schedule presented Friday morning, March 20, shows the value of the stock of the Cleveland Electric Railway to be \$39.83, a reduction of \$1.90 from the value he fixed a few weeks ago. This change was made on the ground that there will be no increase in the earnings on the system through the average life of the franchises, because of the competition of low-fare lines. These figures do not include anything for the franchises on the portions of the lines lying outside the city limits, on which the Cleveland Electric will claim a definite value.

On the same basis the Mayor found a value of \$51.59 per share on Mr. Goff's claims. This, however, includes the overhead charges which Mr. Goff claims, but excludes outside franchises. Mr. Goff's valuation, including the same items, was \$57.64 a share. In addition he proposes to add \$5 a share to this, making a total valuation of \$62.64, a reduction of \$17.50 from his former estimate. Including the claims of Mr. Goff for outside franchises the men are now closer together by \$3,650,400 than they have been. Mayor Johnson reached his valuation as follows:

Value of stock, as shown by Prof. Bemis' table of stock values	\$41.28
Less deduction, provided there is no growth in the earnings on the system within the city during the average life, as shown in the same table.....	1.45
	<u>\$39.83</u>

The Mayor figured Mr. Goff's claims as follows:

1—Additional overhead charges and financing.....	\$7.20
2—Glenville claim on St. Clair avenue.....	1.34
3—Euclid Heights claim.....	.32
4—Interest at 5¼ per cent.....	.53
5—One-ninth on franchise value.....	1.99
6—Eleven days claimed by Davies on Doan street.....	.15
7—Fourteen days claimed on account of use of expired grants .....	.19
	<u>\$11.72</u>

Adding this to the valuation the Mayor found, \$39.83, gives his estimate of what Mr. Goff should have presented, \$51.55. Mr. Goff's figures, however, make this difference \$17.81. The one-ninth of the franchise value is figured on the estimate made by Prof. Bemis for the total franchise value, \$3,792,491.47, to which are added the claims on the St. Clair line in Glenville and the Euclid Heights line, made by Mr. Goff, \$314,645.31 and \$75,187.04 respectively, making a total of \$4,182,323.82.

At the same meeting the Mayor reported on the work that had been done by some of the committees on organization, appointed a few days ago. He stated that the name, Cleveland Street Railway Company, had almost been decided upon for the holding company. This is similar to the name of the old company, but at the same time is somewhat different. The officers of both the Cleveland Electric Company and the Forest City Railway Company object to a name that shall be the same as either, so a slight difference will be made. Agreements had been reached on nine out of ten points on the new franchise and the lease, he said. The main point to be settled is the rate of fare to be included in the new grant to the Cleveland Electric Company. Mr. Goff insists upon its being made six tickets for a quarter, while the Mayor thinks seven is liberal enough. Mr. Goff also wants less restrictive paving, while the Mayor is standing for about the same requirements as in the present ordinances. The City Council on Monday decided to accept the offer of President Du Pont, of the Municipal Traction Company, to pay for relaying the tracks on either Central Avenue or Quincey Street.

THE RAILROADS OF RHODE ISLAND

According to the Railroad Commissioners of Rhode Island there now are 385+ miles of road in the state, 393+ miles of which is single track; this is an increase of about 27 miles of road and 2 miles of single track. The paid up capital stock of all the roads is \$24,181,086.80, an increase over last year of \$560,000.00. The rolling stock of the companies includes 945 motor cars, 65 freight cars, and 161 other cars. This shows an increase in motor cars of 10; a decrease in freight cars of 2, and an increase in other cars of 83. The total property and assets of the corporations are reported as \$54,434,260.22, an increase over last year of \$2,762,622.99. The total receipts from all sources were \$5,442,067.88; total expenditures, \$4,362,138.37; net earnings, \$1,079,929.51. As compared with the report of last year, these figures show an increase in receipts of \$317,173.14; an increase in the expenditures of \$517,549.34; and decrease in net earnings of \$200,376.20. The receipts of the roads were derived from the following sources, viz.: From passenger departments, \$4,266,052.95; from freight departments, \$157,351.72, and from rents of roads, express privileges, transportation of the mails, and all other sources, \$1,018,663.21. As compared with last year's report, these figures show an increase in receipts from passenger departments, \$301,936.74; an increase in receipts from freight departments of \$19,200.94; and from miscellaneous sources a decrease of \$3,964.54. Dividends were paid by four corporations, as follows: Union Railroad Company, 8 per cent, \$720,000.00; Pawtucket Street Railway Company, 6 per cent, \$30,000.00; Newport & Fall River Street Railway Company (6 per cent paid directly to stockholders by Old Colony Street Railway Company, lessee, on \$900,000), \$54,000; Rhode Island Suburban Railway Company, 2 per cent, \$100,000. The total amount paid in dividends was \$904,000. The whole number of passengers carried was 77,420,309, a decrease over last year of 2,528,126. Four roads report a decrease in the number of passengers carried. The funded debt of all the corporations is \$7,819,700; floating debt, \$4,140,172.69; total indebtedness, \$11,959,872.69. There is a decrease in the funded debt of \$36,000; an increase in the floating debt of \$2,729,442.33. An increase in total indebtedness of \$2,693,442.33. The whole number of persons employed by these corporations is 2,988, an increase from last year of 130.

LIST OF ELECTRIC RAILWAY BOOKS

The book department of the McGraw Publishing Company has just issued an eight-page folder containing a list of books on electric railway construction and operation. They are divided into 10 subjects as follows: Handbooks; Economics and Accounting; Design, Construction and Operation; Tracks—Location, etc.; Cars and Motive Power; Brakes and Signals; the Motorman; Elementary; Law; General. Altogether 56 titles are listed.

THE QUESTION OF FREE TERRITORY IN CLEVELAND

It is said that the question of free territory in Cleveland is becoming an important one between Mayor Johnson and Mr. Goff. The Mayor insists that all Cleveland Electric territory be free, while Mr. Goff opposes the proposition on the general grounds that such an arrangement would not be fair in case the Cleveland Electric should be compelled to take back its property after a trial of municipal operation. In this matter the Mayor has again displayed his anxiety to bring in competition against the old company in case his pet plan should fail of success.

The old question whether increased traffic on the portions of the lines in the suburbs would materially increase the operating expense for the next three or four years was again taken up Monday. Mr. Goff had a table of estimates showing that there would be no increase on the Detroit Avenue line, as an example, and he offered Warren Bicknell, president of the Cleveland Construction Company, and T. J. Ross, electric railway engineer, to prove that his assertions were correct. Mr. Bicknell said that there would be no additional service necessary except to take care of the west-bound traffic to the city limits, which would amount to very little. Although Mr. Bicknell has had many years' experience in the electric railway business, the Mayor sought to discredit his ability to judge of this question, just as he has done with all the experts who have been brought forward by Mr. Goff.

Mr. Goff suggested Tuesday that he and the Mayor build

the lines on Quincy Street and Central Avenue and that both companies be allowed to operate over them. He said this would be the most satisfactory way to settle the matter. They would be given a franchise jointly. The Mayor accepted the suggestion. President Andrews promised to have a meeting of the board of directors Wednesday, after which a proposition will be made on this matter.

MEETING OF THE CHICAGO SECTION OF A. I. E. E.

The regular monthly meeting of the Chicago Section of the American Institute of Electrical Engineers was held at Kimball Hall, Chicago, March 19. About 250 members and guests, among them a number of steam railway officers, were present, and listened to an interesting informal talk on "The Relation of Electricity to the Problem of Transportation," by A. H. Armstrong, railway engineer of the General Electric Company. Mr. Armstrong briefly described what had already been done in solving some of the problems of heavy electric traction on the West Jersey & Sea Shore, the New York Central, and the New York, New Haven & Hartford. He then compared the capacity of steam and electric locomotives on heavy mountain grades, and showed by lantern slides the latest types of electric locomotives designed for high speed, medium speed and slow speed work. There was little discussion following the conclusion of the talk. B. J. Arnold, past president of the Institute, presided.

STATISTICS OF WESTINGHOUSE-PARSONS TURBINES

The Westinghouse Machine Company reports its aggregate turbine business at the beginning of the year in the following table, which shows a summary of 640,700 kw., or 930,000 brake hp. This output is distributed among 282 plants (3,298 brake hp. per plant), and 493 machines averaging 1886 brake hp. per machine.

Classification.	Plant up to 1,000 kw.	Capacity above 10,000 kw.	Total number of plants.	Average capacity of turbines kw.	Total capacity kw.
Electric traction:					
Electric Railways	18,900	144,500	69	1,975	282,600
*(R. R. electrification).....		33,900	4	3,350	46,900
Total	18,900	178,400	73	.....	329,500
Electric lighting:					
Central stations	23,550	45,000	73	1,440	180,100
Isolated plants	3,200	.....	7	400	3,200
Municipal	4,000	.....	11	570	8,700
Total	31,700	45,000	91	.....	192,000
Steam railroads:					
R. R. electrification.....		33,900	4	3,350	46,900
*(R. R. car shops).....		9,200	17	490	15,700
Total	9,200	33,900	21	.....	62,600
Industrial:					
Textile mills	8,200	.....	22	595	13,700
R. R. car shops.....	9,200	.....	17	490	15,700
Cement mills	700	.....	5	1,012	7,100
Iron and steel works.....	1,000	.....	3	500	5,000
Pulp and paper mills.....	800	.....	5	778	7,000
Rubber works	900	.....	4	621	4,350
Powder works	1,200	.....	2	400	1,200
Machinery mfrs.	5,400	.....	12	576	15,000
General mfrs.	5,750	.....	11	453	7,250
Total	33,150	.....	81	.....	76,300
Mining and irrigation.....	8,000	.....	19	686	21,950
U. S. Government.....	1,750	.....	4	1,225	12,250
Miscellaneous	6,700	.....	14	483	8,700
Grand total	99,250	223,400	282	.....	640,700

*Industries in parentheses, but allowed for in grand total.
NOTE.—Business uncompleted, Dec. 31, 1907: 60 turbines, of 153,550 kw.; total, leaving shipped or in operation, 433 machines, or 487,150 kw., averaging 1,122 kw.

In addition there were at that time under construction at East Pittsburg 148 machines. These bring the grand total of the turbine business of this company up to 864,300 kw., or 1,253,000 brake hp.

The division of industries shows that while the most fruitful field for the turbine in the early days of its development was in electric traction and electric lighting work, its field has greatly broadened out into the general industries, until to-day nearly 15 per cent of the total represents manufactures as against 34 per cent electric lighting, and 51 per cent in traction. An idea of the size to which modern central stations have grown is furnished by the fact that nearly 35 per cent of the total capacity tested is contained in stations of over 10,000 kw. capacity. A decade ago, at the beginning of the turbine business, stations of this size were few and far between. To-day most large cities can boast of at least one if not several stations of this capacity.

STREET RAILWAY PATENTS

UNITED STATES PATENTS ISSUED MARCH 10, 1908.

[This department is conducted by Rosenbaum & Stockbridge, patent attorneys, 140 Nassau Street, New York.]

881,115. Electrically Operated Fender for Street Railway Cars; Mathan Fallek, Denver, Colo. App. filed June 17, 1907. The fender is manually raised by means of a revoluble staff, on which a cord attached to the fender is wound. A dog engages the staff to hold the fender in inoperative position, said dog being electrically released by means of a circuit completed by a push-button in the controller handle.

881,139. Electric Block Signal; Edward P. Matter, Alexandria, Va. App. filed May 13, 1907. Depending from the locomotive cab is a brush which engages a contact plate to establish an alarm signal in the cab in case a semaphore is set at danger.

881,237. Rail Brake; George L. Hall, New York, N. Y. App. filed Feb. 27, 1907. Comprises a base plate adapted to support the rail and formed of two members adjustable on each other to vary the height of the upper surface of the base plate, said members being formed with interlocking parts to hold them in their adjusted positions and an upwardly and inwardly extending brace arm connected to the upper member and adapted to engage the rail.

881,263. Car Brake; Charles V. Rote and Park E. Shee, Lancaster, Pa. App. filed June 3, 1907. Provides a combined wheel and rail brake embodying two sets of brakes, the action of one being dependent upon the other, and means co-operating therewith for simultaneously throwing all of the brake shoes into action.

881,313. Compound Railway Rail; Alfred P. Finley, Sherman, Tex. App. filed Aug. 20, 1907. Comprises a base and web portion, the web extending centrally from the base portion upwardly, terminating with laterally projecting ribs, one of which is flanged upwardly and perforated. A pair of tread portions, one being grooved to receive the flange portion of the web, the other channeled to receive the T-web portion and connecting devices for the flange and treads extending there-through.

881,348. Rail Joint; Mead E. Semple, Sharon, Pa. App. filed April 30, 1907. An integral rail chair engaging the base and web of the rails and notches in the base of the rails registering with the spike holes in the chair.

881,359. Trolley Pole Controller; Cisco R. Traxler and Edward E. Lineback, Winston Salem, N. C. App. filed April 16, 1907. The trolley cord is attached to a weight and a vertical tubular guide is provided in which the weight travels.

881,387. System of Control for Electric Motors; Arthur C. Eastwood, Cleveland, Ohio. App. filed March 6, 1907. A multiple control system for trains designed to make use of direct current at low voltage for individual motors and establish a complete control by which their voltage is low at starting without the use of resistance.

881,452. Track Sanding Device; Edgar J. Anderson, Davenport, Iowa. App. filed Aug. 14, 1907. The discharge pipe is telescopically elongated to discharge directly in front of the wheel when a presser-foot is depressed by the motorman, and the discharge pipe telescopically shortens when the presser-foot is released and automatically closes the exit of the hopper.

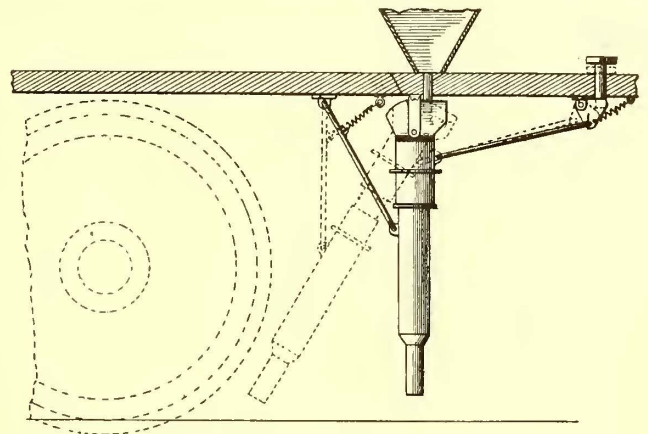
881,468. Car; Ogden E. Edwards, Jr., New York, N. Y. App. filed Nov. 30, 1906. Details of construction relating to the car windows.

881,470. Trolley; Charles Harkness, Providence, R. I. App. filed Nov. 28, 1906. The harp carries a table swiveled on a vertical axis and from which there projects upward a pair of trolley wheels.

881,531. Current Collector for the Third Rail of Electric Railways; John G. Baukat, White Plains, N. Y. App. filed Aug. 24, 1907. The collector shoe is adapted for engagement with a third-rail on either its upper or underneath surface. Means whereby when the shoe is broken another may be readily attached to its holding bracket.

881,552. Emergency Brake; Fred B. Corey, Schenectady, N. Y. App. filed March 21, 1903. An automatic air brake system having means independent of the engineer's valve for exhausting the train-pipe and at the same time closing the communication between the train-pipe and the engineer's valve.

881,587. Trolley Wheel Placing Device; Hubert G. Husted, Oberlin, Ohio. App. filed July 29, 1907. A small supplemental roller with spiral grooves converging toward its center and which is designated to re-position the trolley wheel beneath the wire so that it may be easily engaged while the car is running.



PATENT NO. 881,452.

881,635. Cab Signal System; David P. Thomson, Schenectady, N. Y. App. filed Aug. 2, 1907. Both traction rails are conductively continuous and have sources of alternating current connected at intervals across the rails. A coil carried by the vehicle in front of the front wheels and in inductive relation to the alternating current in the rails and electro-responsive means on the vehicle connected to the coil.

881,637. Amusement Device; William S. Van Sant, Oakland, Cal. App. filed Sept. 16, 1907. Comprises independently traveling carriages and direction means by which the carriages are first started in pairs and afterward separated and moved in opposite directions.

881,751. Fluid Pressure Railway Brake; William A. Weant, Mocksville, N. C. App. filed Sept. 30, 1907. A fluid pressure railway brake provided with means operated by the piston rod of the brake cylinder for actuating a pressure retaining valve when the brakes are applied and released.

881,788. Pleasure Railway; Edward F. Gardner and August J. Schmidt, Scranton, Pa. App. filed May 31, 1907. The combination of a track consisting of inclined portions arranged at different elevations and having connecting bends, and means for transferring a car from one inclined portion of the track to another without inverting the car.

PERSONAL MENTION

MR. FRANCIS S. PEABODY, of Chicago, has been elected president of the Mattoon City Railway, Mattoon, Ill., succeeding Mr. E. A. Potter, resigned.

MR. C. L. DE MURALT, consulting engineer and professor of electrical engineering at the University of Michigan, is giving a course of lectures to the senior electrical engineering students at Ann Arbor on the electrification of steam railroads.

MR. A. A. BARNES has been elected president of the Indianapolis, Crawfordsville & Western Traction Company, of Indianapolis, Ind., succeeding Mr. A. E. Reynolds, resigned. Mr. A. M. Hewes, of Chicago, has been appointed general manager and Mr. A. H. Stocking has been appointed acting manager.

MR. HARRY McCOLGIN, heretofore general freight agent of the Indianapolis, Columbus & Southern Traction Company, Columbus, Ind., has resigned to become auditor of the Indianapolis & Louisville Traction Company, with headquarters at Scottsburg, Ind. Mr. Thomas C. King will succeed him as general freight agent at Columbus.

MR. A. F. SCHOEPEF, superintendent of the Columbus & Springfield and Grove City lines, has been chosen to take the place of Mr. M. J. Loftus, who retired last week as superintendent of the Dayton, Springfield & Urbana line of the Ohio Electric Railway system. Mr. Schoepf is a brother of W. K. Schoepf, the president of the company.

MR. WAYNE HENDRICKS, who has been connected with the Winnebago Traction Company, of Oshkosh, Wis., since 1900, has been appointed superintendent of the Sterling, Dixon & Eastern Electric Railway, Dixon, Ill., succeeding Mr. Lee H. McCray, who has resigned to accept a position with the Atlantic Shore Line Railway, Portsmouth, N. H.

MR. WILLIAM THOMAS LEWIS, station master at the Traction Terminal station in Indianapolis, died suddenly March 20. As an employee of the Indianapolis Street Railway Company for the past 33 years Mr. Lewis served in various capacities, beginning as a mule driver and ultimately becoming superintendent of the entire city system. A few years ago he tendered his resignation as superintendent, but he was influenced to become station master at the new station.

MR. LOUIS PFINGST, inventor of the Pfingst fender and for a number of years prominently connected with the mechanical departments of a number of large city systems, is dead. Mr. Pfingst was born in New York City and at an early age apprenticed himself to learn the car building trade with the Stephenson Company. After serving with this company for a number of years he entered the employ of the Pullman Company. Subsequently he became master mechanic of the Third Avenue Railway of New York and for five years after leaving the Third Avenue Company's employ acted as master mechanic of the West End Street Railway of Boston. It was during his service with the West End Company that Mr. Pfingst perfected his fender, to which and his other inventions he had given all his time since resigning from the West End Company in 1894.

MR. W. B. BROCKWAY has been appointed by President Henry, of the Accountants' Association, a member of the committee of that association on the standard classification of accounts to take the place made vacant by the resignation from that committee of President Henry himself. During the last few months Mr. Brockway, as personal representative of Mr. Ernest Thalmann, one of the receivers of the Knickerbocker Trust Company, has been taking a very active part in the reorganization of that trust company. The reports and schedules prepared by Mr. Brockway during this work have been highly praised by banking authorities as models of clearness and completeness. The work has been arduous owing to the wide ramifications of the business done by the Trust Company, but has been brought to a satisfactory conclusion and the company planned to open its doors on March 26.

MR. E. T. MUNGER has been appointed superintendent of motive power and equipment of the Metropolitan West Side Elevated Railway, of Chicago, succeeding Mr. Benjamin H. Glover, whose resignation was announced in this column March 14. He will be in charge of power houses, transmission lines, substations, third-rail, car shops, terminal depots and rolling stock. Mr. Munger was graduated from the University of Wisconsin in 1892, going with the Hall Signal Company as draftsman and construction foreman. In 1894 he became connected with the National Switch & Signal Company, resigning after a year to accept his first position with the Metropolitan West Side Elevated as foreman of construction in charge of wiring cars, stations and power houses. Two years later he went to the Englewood & Chicago, a storage battery surface line built from Englewood to Blue Island. Here he was in charge of construction and installation. On the completion of the road he entered the telephone business as general manager of the Havana Telephone & Electric Light Company, of Havana, Ill. He returned to the Metropolitan in 1903 as master mechanic, which position he has since held up to the time of his promotion.

MR. CHARLES A. KENWORTHY, manager of the Electric Package Company, died at his home in Cleveland, Thursday, March 12, as a result of an attack of erysipelas, complicated with other troubles. Mr. Kenworthy was forty-five years of age. His boyhood was spent in Akron, where he secured his education. When a very young man he became interested in the express business and held responsible positions with the Adams, United States and American Express Companies. He became connected with the Electric Package Company as auditor in 1898, and in July, 1899, was promoted to the position of manager. Taking advantage of the opportunity thus given, he began the development which has resulted in an extensive system of freight and express business on all the lines entering Cleveland. Mr. Kenworthy was prominent

among the electric railway men of Ohio and Indiana through his interest in the Central Electric Railway Association. He also did valuable work on the legislative committee of the organization. The funeral took place at Akron, Ohio, Sunday, under the auspices of the Knights Templar, of which he was an honored member. A large number of electric railway men from Cleveland and other points attended the services at Akron. Mr. Kenworthy leaves a widow and one son, a boy about sixteen years of age.

MR. R. N. WALLIS, treasurer of the Fitchburg & Leominster Street Railway Company, of Fitchburg, Mass., is first vice-president of the American Street and Interurban Railway Accountants' Association. In view of the resignation of Mr. Henry as president of the American Street and Interurban Railway Accountants' Association, the duties of president of



R. N. WALLIS.

the association during the rest of the year will presumably be performed by Mr. Wallis. Mr. Wallis has been active in the affairs of the association for a long time, and last year presented a very interesting paper at the Atlantic City convention on the subject of depreciation. He was born in Fitchburg, Mass., Dec. 28, 1870. After graduating from the high school of that city he entered the Massachusetts Institute of Technology of Boston, from which he was graduated in 1893. He then entered journalistic work on the staff of the *United States Investor*, with which he was connected for a short time, but on Dec. 1, 1894, he succeeded his father as treasurer of the Fitchburg & Leominster Street Railway Company, a position he now holds. He had previously worked with the company in various minor positions while in Fitchburg, ever since its organization in 1886. Besides his street railway work, Mr. Wallis has found time to interest himself in political matters in Fitchburg.

MR. FRANK R. HENRY, auditor of the United Railways of St. Louis, and president of the American Street & Interurban Railway Accountants' Association, has been elected vice-president and secretary of the Majestic Manufacturing Company, of



F. R. HENRY.

St. Louis, and has resigned from both the United Railways Company and the Accountants' Association. Although Mr. Henry will thus sever his active connection with street railway work, he will remain with the United Railways Company as president and vice-president of a number of the constituent companies. Mr. Henry will enter upon his new duties about the first of April. In his resignation as president of the Accountants' Association, now in the hands of Vice-president Wallis, he expresses his regret at having to withdraw from the association, but says he feels he is conserving the interests of the association by resigning in view of the very limited opportunity that would hereafter be his to look after association matters. For the same reason Mr. Henry has withdrawn as a member of the standard classification committee and Mr. W. B. Brockway has been appointed as his successor. Mr. Henry's active service with the street railways of St. Louis covers a period of 24 years. He was born and educated in St. Louis and entered the service of one of the constituents of the present company when a very young man. He has served from time to time in various capacities in the auditing and other departments, and was auditor of the St. Louis Transit Company, which was succeeded by the United Railways Company. He has always taken great interest in accounting affairs and was an active member in the Street Railway Accountants' Association of America which was succeeded by the body from which he has resigned as president.