Electric Railway Journal

Convention Number

PUBLIC SERVICE RAILWAY OF NEW JERSEY

THE lines of the Public Service Railway are divided into two main groups of properties. The larger group in mileage, earnings and density of population served is located chiefly in the part of New Jersey lying to the west, northwest and southwest of New York City. The smaller part of the system consists of the Southern division which centers at Camden, on the Delaware River, opposite Philadelphia.

Traffic on the extensive Northern divisions may be considered as of two main classes. These include, first, the large volume of distinctly urban business in the cities reached in New Jersey and the local travel between various points on the system, and, second, the traffic bound to and from New York by a combination route of street railway and ferry, tunnel or steam railway. It is noteworthy that a somewhat similar distribution of traffic prevails on the Southern division, where traffic consists in an important measure of passengers bound to or from the greater city of Philadelphia.

While northern New Jersey, in the districts served, is closely settled with attractive residential sections which have been developed largely by the homes of New York business men and is thus to a certain extent tributary to the greater city on Manhattan Island, the lines of the Public Service Railway serve manufacturing centers of importance in Newark, Jersey City, Hoboken, Bayonne, Paterson, Camden, Passaic, Elizabeth, Perth Amboy and New Brunswick. These are the chief cities reached by the railway lines, but there are large manufacturing plants in a number of other communities from which traffic is assured. Newark, the largest city on the system, has a number of suburbs and the extent and variety of its manufacturing industries is one of the most favorable considerations in the outlook for the future. The enormous volume of daily travel between New York and nearby points in New Jersey is, of course, divided between the steam railways and the electric lines, but much of the traffic that is of the commuter class and dependent principally on steam railway facilities for long-distance trips furnishes short hauls between stations and homes to the street railway. The unusual extent of this part of the traffic is due to the almost uniform settlement of the outlying districts between the boundaries of the incorporated communities reached as well as to the constantly increasing population of the cities, towns and villages.

POPULATION SERVED

The total number of communities served by the railway lines is 117 and the population thereof, according to the 1910 census, was 1,742,807. With its railway, gas or electric service the controlling Public Service Corporation reaches 193 organized communities, having a population in 1910 of 2,018,096. To show the proportion in large cities of the total population in the organized communities served by the railway it may be stated that Newark had, in the 1910 census, a population of 347,469; Jersey City, 267,779; Camden, 94,538; Elizabeth, 73,409; Paterson, 125,600; Hoboken, 70,324; Bayonne, 55,545; and Passaic, 54,773. Thus these eight cities had an aggregate of 1,089,437, or 62.5 per cent of the total given. These figures, however, do not indicate the closeness of settlement and full population in the most developed sections. The Essex division serves what is in reality a "Greater Newark," comprising the whole of the well-developed Essex County and several adjoining manufacturing places, with a total population of over 500,000. In this division only one fare is charged except on two lines reaching remote points. Similarly there is a "Greater Jersey City" district with a population of over 500,000. These two groups of closely settled communities, with the others named above that are not included in the compilation for "Greater Jersey City," have a combined population of over 1,300,000, or about three-quarters of the entire population reached by the railway lines in organized communities.

The lines are wholly urban and suburban in character and while the schedule speed on different lines varies materially, this is due principally to traffic conditions. No lines in the system correspond to the interurban properties operated in the Central West. The highways on which the lines are built generally

afford no stretch of territory of as much as 10 miles in any one place where high-speed interurban service could be introduced. The country is so closely developed that comparatively little of the mileage is situated in open, unsettled districts. Most of the lines are short in length and frequent stops are unavoidable.

While, therefore, short stretches of some lines might be adapted for interurban service, most of the mileage is on highways and the vehicular traffic and grades encountered, together with consideration for the closely settled districts through which most of the lines run, cause the restriction of operations to those of the urban and suburban class. At the last session of the Legislature a commission was appointed to study the situation confronting the Morris Canal, and if the bed of this canal should be made available for rapid transit it might permit the construction of a high-speed line between Newark and Paterson.

REVENUE AND TRANSFER PASSENGERS

As the company has extended its transfer system from year to year, the increase in transfer traffic has been greater than that in revenue traffic. The total numbers of passengers of both classes in each year from 1904 to 1910 and the percentage of increase each year as compared with the preceding twelve months are shown in Table I.

TABLE I.—PASSENGERS CARRIED AND PERCENTAGES OF INCREASE EACH YEAR.

	Revenue Passengers.		Transfer Passengers.	
	Total No.	Per Cent. of Increase Over Previous Year.	Total No.	Per Cent. of Increase Over Previous Year.
1910.....	258,746,130	8.6	82,652,558	1.4
1909.....	238,171,257	8.5	81,548,978	9.2
1908.....	219,421,974	4.	74,688,628	4.3
1907.....	211,025,386	6.4	71,638,588	13.7
1906.....	198,326,467	10.2	62,986,021	14.4
1905.....	180,000,197	8.8	55,079,789	10.2
1904.....	165,400,000	...	50,000,000	...
1904 to 1910.	.....	56 4	.....	65.3
Average	.....	9.4	Average	10.9

THE SIX OPERATING DIVISIONS

The lines of demarkation of the six divisions into which the system is divided should be explained. Five divisions, the Hudson, Essex, Passaic, Central and Bergen, are located in the northern group of properties. The railway company has no present physical connection between the group of properties in the northern part of New Jersey and the lines of the Southern division, which center in Camden.

Taking first the northern group of properties, the lines of the Hudson division include in the main the properties that reach the New Jersey shore of the Hudson River. The lines of the Bergen division, however, comprising the most northerly properties in the system, include the properties which terminate at Edgewater, N. J., opposite the ferry operated by the company from West 130th Street, New York City. The lines of the Passaic division include the properties in Paterson, Passaic and the contributory territory. The Essex division includes chiefly the closely settled territory in and near Newark, and districts which are partly suburbs of that city and have been developed partly by the inrush of New York commuters. The Central division includes the most southerly of the northern group of properties, reaching Elizabeth, Rahway, Plainfield, New Brunswick and Perth Amboy. The Southern division comprises all the lines centering in Camden, which receive their traffic from local industries and homes and accommodate passengers using the ferries operated between Camden and Philadelphia by the Pennsylvania Railroad.

Other operations of the railway company include a toll road between Union Hill and Hackensack in the Hudson division, a wagon elevator in Weehawken owned by the People's Elevating Company and the Jersey City wagon elevator. The two latter properties afford conveyance between the high bluffs overlooking the Hudson River and the shore. The two ferry lines owned and operated by the company carry passengers and vehicles across the Hudson River between West 130th Street, New York, and Edgewater, N. J., and between Bergen Point, N. J., and Port Richmond, Staten Island, across the Kill von Kull.

TOPOGRAPHICAL CONDITIONS

Owing to the peculiar topographical conditions in the section of New Jersey in which the greatest number of lines are operated there is a peculiar condition of competition with steam railroads. The New Jersey shore of the Hudson River in the districts reached rises abruptly within a short distance from the river to heights of 200 ft. or more. West of this ridge there are salt marshes, averaging about 2½ miles in width, which are traversed by the rights-of-way of steam railroads and by lines of the Public Service Railway running directly between Hoboken and Paterson and between Jersey City and Newark. On these salt marshes practically no traffic originates. The steam railroads maintain high rates of speed and make faster time than the street railway cars. On the other hand, the fares on the street railway are lower than those charged by the steam properties. For instance, the steam railways charge a single fare of 17 cents from Newark to New York, although the Pennsylvania Railroad adds 10 cents to this for each passenger who chooses to enter the new terminal on Manhattan Island. As the steam railway companies will not sell tickets from Newark to Jersey City or Hoboken, passengers are obliged to buy through tickets to New York at the rate mentioned. The street railway fare from Newark to Jersey City or Hoboken is 10 cents and, as this includes the right to transfer, much traffic is secured which otherwise would be diverted.

West of the salt marshes the land rises again and some parts of Newark reach an altitude of about 200 ft. above sea level. There are other high points on the system. The lines running in the residential community of Montclair reach the highest point. They go to the summit of the Orange Mountains in Montclair, 509 ft. above sea level. A line which passes the station of the Delaware, Lackawanna & Western

Railroad at Montclair extends to Caldwell, which is 418 ft. above sea level and reaches a district in which many people spend the summer. In this district a temporary summer population of about 7,000 people adds to the traffic of the company during the heated season.

MILEAGE IN LARGE CITIES

The extent to which the mileage is located in the principal cities of the territory may be explained by the following statement, giving the miles of track within the corporate limits of the places named: Newark, 102.251 miles; Jersey City, 64.417 miles; Paterson, 37.621 miles; Elizabeth, 29.666 miles; Camden, 42.193 miles; Hoboken, 13.464 miles. The total of 289.612 is about 40 per cent of the aggregate number of miles of track in the system, eliminating trackage at carhouses, crossovers, etc. "Greater Newark" and "Greater Jersey City," as mentioned on page 555 of this chapter, would have 174 and 127 miles of track respectively, or a total of 301 miles. Of the total of 525.19 miles of road located in all divisions, 302.18, or 57.5 per cent, is double track. All the single track mileage is protected by signals operated by trolley contact.

The extent to which the lines secure traffic bound between New Jersey points and New York or from points directly on the New Jersey shore of the Hudson River may be shown roughly by a statement of the number of lines which have terminals on the river and the cars operated thereon during the afternoon rush hours. This statement is Table II.

Table II.—Cars and Lines at Hudson River Terminals in Rush-Hour Period.

	No. of Lines.	No. of Cars During Rush-hour—5:30 to 6:30 P. M.
Jersey City terminal—P. R. R. ferries	9	149
*Hudson terminal, D., L. & W.	9	154
Fourteenth Street Ferry	6	50
Forty-second Street Ferry	3	42
Pavonia Ferry—Erie R. R.	3	24
Edgewater, 130th street	4	16
Total	34	435

*Also the terminal of the Hudson & Manhattan Railroad.

These figures compare with the total of 101 lines and 1,250 cars operated on the system.

As a whole, the territory served is a very prosperous one. It includes the homes of many men of wealth who transact business in New York. There are also congested districts with conspicuous foreign settlements, but without the same degree of congestion that is found in the larger cities of the country. As numbers of people go from New York to nearby towns in New Jersey for the heated season, the total traffic in the summer is greater on some lines reaching country districts than in the winter months. The exodus of permanent residents for the summer, or a vacation trip, causes a reduction in traffic on other lines. The total traffic, however, is larger in summer than in winter. June is the best traffic month of the year.

It will be understood from the reference to the small number of ferries owned and operated by the railway that this company has not attempted to compete with the established ferries doing business between Manhattan Island and New Jersey. In fact, with the exception of the short ferry connecting Bergen Point, N. J., and Port Richmond, Staten Island, no ferries whatever were operated across the Hudson River until the acquisition last year of control of the New Jersey & Hudson River Railway & Ferry Company.

The traffic was developed by a different policy, in accordance with which street railway service was furnished at the points where the traffic existed. This policy secures traffic carried on the ferries operated by the various railway companies connecting New York with different points in Jersey City, Hoboken and Weehawken. It also secures business carried by the Hudson & Manhattan Railroad between Hoboken and Jersey City and points on Manhattan Island.

The largest number of passengers secured at any one point on the Hudson River is recorded at the new Hoboken terminal, where it is estimated that 45,000 passengers a day are carried.

In this terminal one loop is installed in the surface part and one loop in the elevated structure. Four lines are accommodated in the surface part of the terminal and an equal number on the elevated part. The lines that terminate in the elevated part of the terminal, however, are those of the heaviest traffic. It is possible for passengers to pass under cover from this terminal to the Hudson River tunnels or to upper decks of ferry boats. This convenience of transfer is causing a steady increase of the traffic at this point.

A practical method for the collection of the initial fares on the lines leaving the elevated part of the Hoboken terminal has been established. Passengers pay the fare when they enter turnstiles through which they have to pass to enter the train platform. As each person boards the car he is registered by the conductor on a separate terminal register, and the total number of passengers shown by the car returns is checked against the total number indicated by the register returns.

Owing to topographical and business conditions prevailing, there are many picturesque sections in the districts reached. Among these may be mentioned the docks of foreign steamship lines at Hoboken. These furnish some traffic, partly of an immigrant nature. The dock district of Hoboken is also the terminus of the White line, one of the longest lines in the system, which extends from that city to Paterson, 17.6 miles. Hoboken is the site of Stevens Institute.

TRAFFIC DEVELOPMENT

The most remarkable development of territory from a traffic standpoint which is taking place on the lines of the system at the present time is found at West New York, N. J., which is located on the Hudson River, about opposite Fifty-ninth Street, Manhattan Island. This district, illustrations of which are presented on plate VI, has developed entirely in the last seven years and so far has been built up largely by the homes of working people. Some industries, such as silk mills, have also been established there. The section that is developed is a short distance west of the Hudson River. Now, however, the land lying

directly east on the Palisades facing Manhattan Island is undergoing development, and it is expected that people of more means will build in this territory. The district is easily accessible from Hoboken terminal or from New York by way of the Weehawken ferry, where two loops have been constructed in order to accommodate the rush-hour traffic.

The company reaches, by means of the ferry which it operates between 130th Street, Manhattan, and Edgewater, N. J., the crowded district of Harlem. The ferry affords a gateway for automobiles to reach the mountainous districts on the west shore of the Hudson River in northern New Jersey and southern New York. It connects with the cars of the Bergen division and thus affords a means of transportation to some of the finest residential districts and one of the famous golf clubs of the country.

As headways are short on nearly all the lines, little need for shelter stations exists, but several have been constructed. The most attractive type of shelter house is that which was built recently at Morsemere, on the line between Edgewater and Englewood. This is constructed almost entirely of glass. This unusual design was determined after a conference with the residents of the neighborhood, who thought that any other type would be objectionable, but recognized the advantage of an attractive shelter house. A view is shown on plate IX.

CONGESTED CORNERS

A map of the territory showing the lines of the company, which is reproduced on page 559, indicates to those experienced in street railway operation the nature of the traffic problems encountered constantly by the transportation department. About 100 per cent more cars are operated during the evening rush-hour traffic than in the middle of the day. Outside of the closely connected lines nearest the Hudson River there are three main centers of traffic in the Northern divisions, notably in Newark, Paterson and Elizabeth. In Newark the principal congestion arises in the afternoon rush hour from the traffic conditions at the intersection of Broad and Market Streets, which is the principal point in the business district and the busiest junction in the entire system. The number of cars scheduled to cross the intersection of these streets in fifteen-minute periods in the afternoon rush-hour is shown in Table III. This indicates that the largest number scheduled was 562 between the hours of 5:15 and 6:15 p. m. on a typical day, Jan. 23, 1911.

The conditions at this busy intersection are further complicated by the fact that several lines operated on Broad Street are looped around Bank Street, which is one block from Market Street. Realizing the importance of as speedy movement of cars as possible across the intersection of these streets, the city of Newark has co-operated with the company by the adoption of traffic rules which are enforced rigorously by policemen. Except at the corner of Broad and Market Streets, street intersections are not observed as stopping points within a few blocks of this crossing. Trolley stations are designated and are placed at such points as will impede in the smallest possible degree the progress of street railway traffic.

In order that relief at this point may be assured, it has been suggested that a subway be built with two separate levels, so that the Broad and the Market Street cars could be operated without loss of time for crossing. This would provide capacity for twice as much service as is now given at the intersection on the street level. An offer was made to the city by the company involving either construction and operation of such a subway by the railway or construction by the city and operation by the railway, but in the absence of prompt action it was withdrawn.

TABLE III.—CARS SCHEDULED TO CROSS BROAD AND MARKET STREETS, NEWARK, IN AFTERNOON RUSH PERIOD.

Time.	East.	West.	North.	South.	Total.
4:45 to 5:45	187	172	74	75	508
5:00 to 6:00	196	188	80	81	545
5:15 to 6:15	190	199	84	89	562
5:30 to 6:30	175	195	85	92	547
5:45 to 6:45	150	173	87	92	502
6:00 to 7:00	123	148	85	85	441
Cars leaving Bank Street Loop and entering Broad Street, one block from Market Street:					
4:45 to 5:45					52
5:00 to 6:00					57
5:15 to 6:15					61
5:30 to 6:30					53
5:45 to 6:45					45
6:00 to 7:00					39

Another traffic development of importance to Newark is promised in the new line between Newark and Manhattan Island to be operated jointly by the Pennsylvania Railroad and the Hudson & Manhattan Railroad. It has been announced that this line will be opened for operation this fall. The terminal for this line will be at Saybrook Place, and as it will probably cause some concentration of the commuter business, it will produce further congestion at the junction of Broad and Market Streets. The construction of another loop by the Public Service Railway would relieve conditions at the proposed terminal of this line, but while some talk on this subject has taken place, no definite proposition has been made by the company to the city. In order to meet the necessities of this case the city has tried to secure the passage of legislation which would enable the company to obtain the right to construct a loop without acquiring rights from the owners of abutting property.

PATERSON CONDITIONS

A similar condition of congestion, though involving a much smaller amount of traffic, is found in Paterson, where the situation at the intersection of Market and Main Streets involves the constant attention of the transportation department each afternoon. This city has a large foreign element in its population, due to the establishment of silk mills, which make it the leading city in the manufacture of that commodity in the country. The silk mill of the Doherty Mill Company, which is illustrated on plate IX, furnishes traffic for a number of extra cars each afternoon.

Extra cars are also provided to meet afternoon rush hour conditions at the plant of the Singer Sewing

Intersection of Broad and Market Streets, Newark, the Point of Greatest Congestion of Traffic on the System

Plate I

Exit Tracks on Upper Level of Hoboken Terminal

Entrance Tracks on Lower Level of Hoboken Terminal

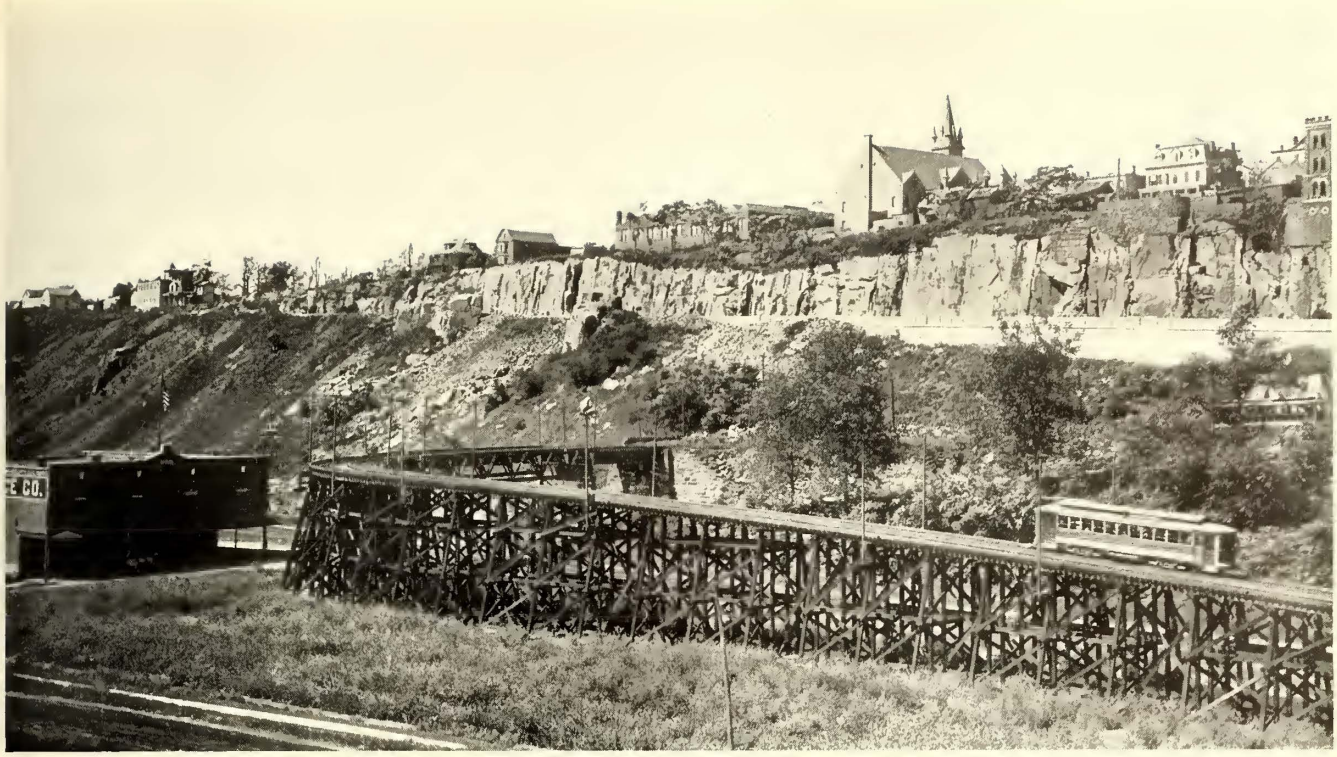
Turnstiles at Entrance to Train Platform on Upper Level of Hoboken Terminal

Escalator Leading to the Upper Level of the Hoboken Terminal

View at Intersection of Broad and Market Streets, Newark

Loop and Tracks at Principal Newark Station of the Pennsylvania Railroad, an Important Center of Street Railway Traffic

Loop at Weehawken Ferry Station of the West Shore Railroad, with Skyline of New York City from Forty-second Street to Seventy-second Street



Hillside Line at Hoboken

Edgewater Terminal Loop, Showing Station of the Ferry Operated by the Company Across the Hudson River Between Edgewater and West 130th Street, New York City

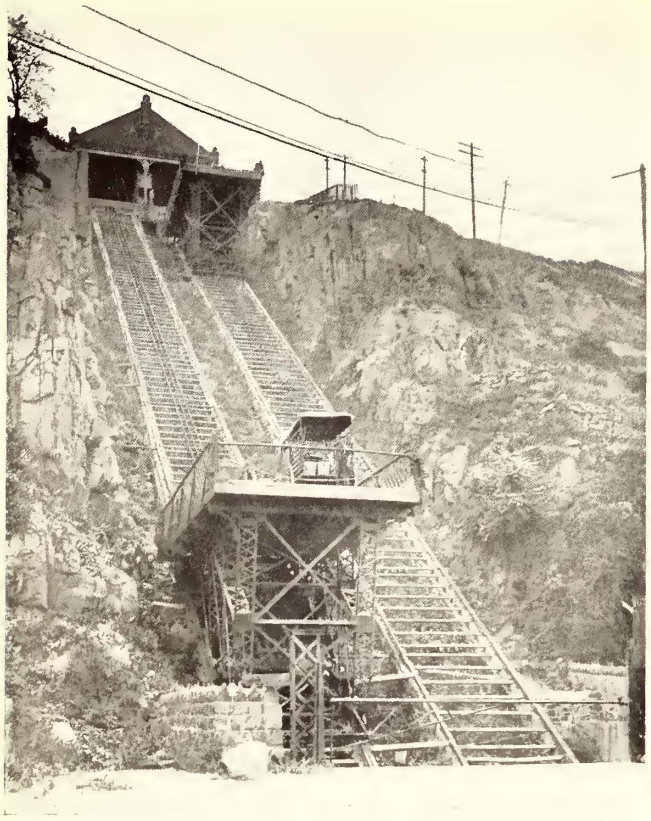
Development of Territory at West New York, N. J., Which Is Located on the Palisades of the Hudson River, Opposite About Fifty-ninth Street, New York City. These Buildings Have Been Constructed in the Last Seven Years

Loops at Camden Ferry Station, with Skyline of Part of Business District of Philadelphia

Scene in Branch Brook Park, Newark, One of the Many Attractive Public Places of Amusement Reached by the Lines of the System

Scene in Outlying District of Paterson, Showing Part of East Side Park—The Bridge Over the Passaic River Is at the Foot of the Hill

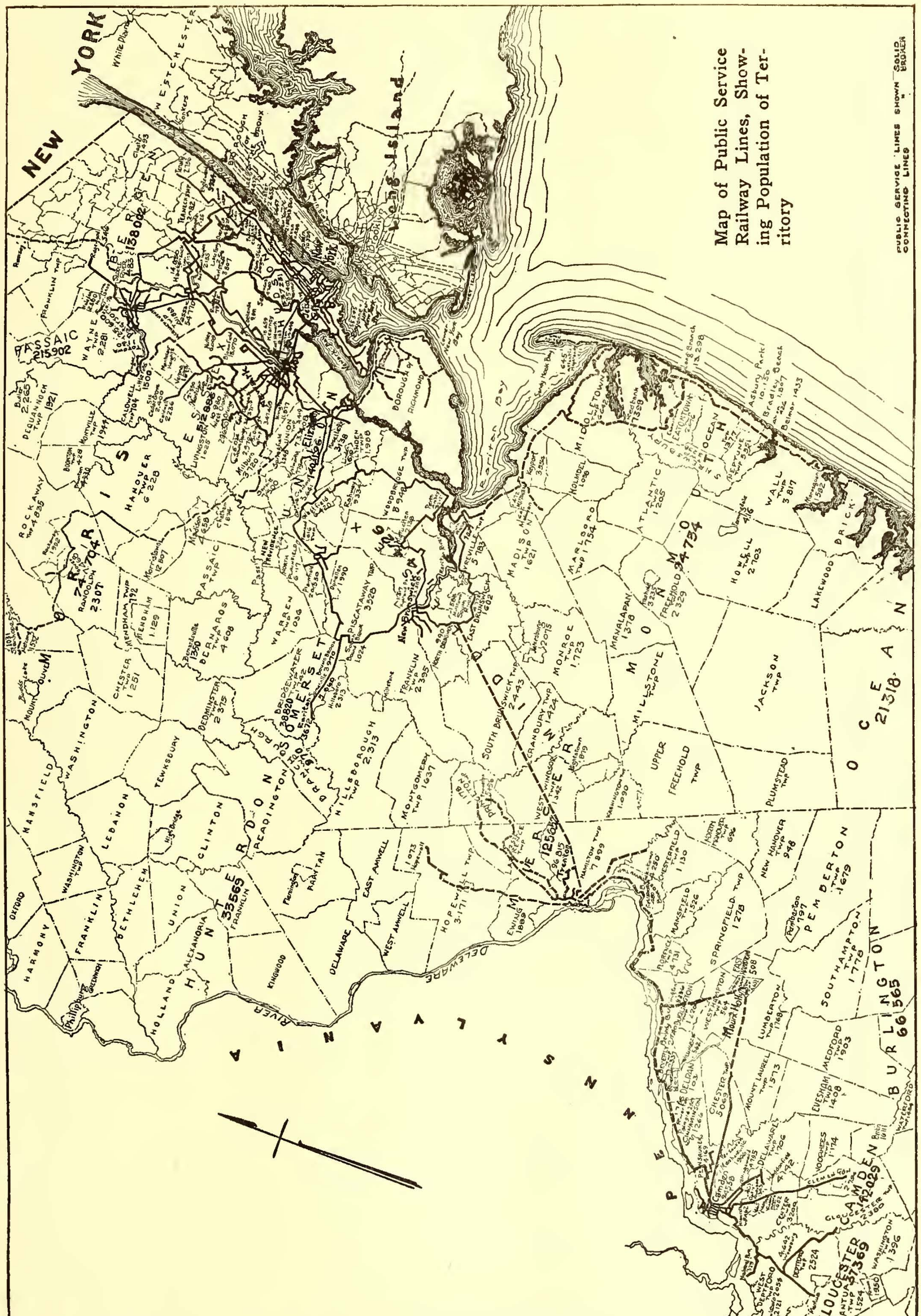
Lake in Woodlynne Park, Camden—This Park Is Owned by the Company



Wagon Elevator Owned by the Company and Located in Weehawken

Section of Track on Private Right-of-Way on the Fourteenth Street Line, Hoboken

Part of Central Business and Factory District of Newark



Map of Public Service Railway Lines, Showing Population of Territory

Public Service Lines shown solid
Connecting Lines " broken

Machine Company at Elizabeth, at the Edison plant in West Orange and at the plant of the New York Ship Building Company in Camden.

A large part of the factory rush-hour traffic, however, is bound in the reverse direction from the large volume of business at this period, so that it is possible to load the cars both ways. For instance, the cotton and silk mills in Jersey City Heights, West Hoboken and Union Hill furnish traffic for cars bound to the ferries to meet the crowds arriving from New York. The hat factories in Orange and other plants in West Orange furnish passengers to Newark for the cars that carry the outward-bound crowds from that city. It is partly owing to these conditions, affording frequent opportunities for good loads on both trips of a run, that the company has been able to extend fare limits steadily. The uniform rate of fare for an adult passenger is five cents. Some lines of excessive mileage are divided into two or more fare zones.

RECAPITULATION OF_____DAY SCHEDULES

OFFICE OF SUPERINTENDENT OF TRANSPORTATION

PILOT No.	LINE	SCH'D. No.	IN EFFECT	NO. OF CARS 7 AM	10 AM	2 PM	6 PM	HEADWAY 7 AM	10 AM	2 PM	6 PM	TRIPS	HOURS	MILES	PLATFORM COST	TIME PER TRIP	SPEED PER TRIP	AVRG. SCHD. SPEED	MILES PER TRIP
	HUDSON DIVISION																		
1	NEWARK AVE.																		
2	PACIFIC AVE.																		
3	MONTGOMERY																		
	GRAND TOTAL																		

FERRIES	HEADWAY OF BOATS 6 AM	7 AM	8 AM	9 AM	10 AM	11 AM	12 N	1 PM	2 PM	3 PM	4 PM	5 PM	6 PM	7 PM	8 PM	9 PM	10 PM	11 PM	12 PM	TRIPS	COST	FIRST TRIP FROM N. J.	FIRST TRIP FROM N. Y.	LAST TRIP FROM N. J.	LAST TRIP FROM N. Y.
P. R. & B. P. FERRY CO.																									
THE RIV. & FT. LEE FERRY CO.																									
FERRY TOTALS																									

	FROM	TO	HOURS	COST
PEOPLES ELEVATING CO.				
JERSEY CITY WAGON "L"				

Week Ending _____ Signed _____

Traffic Conditions—Form for Recapitulation of Schedules

CAMDEN DEVELOPMENT

The city of Camden, while settled principally by persons in business in Philadelphia, has several industries which furnish street railway traffic. The principal plant from which any considerable amount of traffic is received is that of the New York Ship Building Company. The chief center of traffic, however, is at the Camden ferry station of the Pennsylvania Railroad, which operates ferry boats across the Delaware River to Philadelphia.

The Public Service Railway has two loops in this ferry station, and a stub track inside of each loop. The cars load and unload at the same points during the rush-hour periods in the morning and evening. These periods are longer at Camden than in the northerly divisions of the company. The morning rush period, so far as the operation of cars is concerned, lasts from 5 to 7 a. m. It begins unusually early, owing to the necessity for operation of all the cars from the one carhouse located in Camden to the most distant points. The evening rush period starts at 5 p. m. and lasts until 6.45 p. m.

During the principal hour of the evening congestion forty cars are scheduled to leave on the Market Street side of the terminal at the Camden ferry station, and fifty cars on the Federal Street side. The loops have accommodated traffic satisfactorily. The one on the Federal Street side was built in 1907 and two years later the construction of the loop on the Market Street side was completed.

In the last five years operation at Camden has been made safer by the fact that nearly all grade crossings have been eliminated. The schedule speed of cars is limited rigorously in one or two places, and in one village the ordinance requirements prohibit a speed of more than 6 m.p.h. There are a number of points of historic interest on the lines of the Southern division.

Much of the suburban development at Camden is of comparatively recent origin and the low prices of land and low rents are gradually attracting more people from Philadelphia. There are also some colonies of summer campers who add substantially to the revenue of suburban lines for several months during the year. Traffic has been diverted to the street railway lines on account of the increase in commutation rates by steam railroads. Sunday riding is restricted to some extent on some lines owing to the existence of several Quaker settlements in the district.

While a number of private amusement parks and attractive public parks are located along the system, the only parks owned by the company are Woodlynne Park, Camden, and Riverside Park, New Brunswick. The latter park is leased. Woodlynne Park is managed by the superintendent of the Southern division. It is in a tract of 13 acres of land. This park is closed on Sundays owing to the wishes of the authorities. Newark has three public parks, to which there is much travel. The Orange County Reservation, a large district on the top of Orange Mountain, which is preserved in its wild state, is near the lines of

the company. The Eagle Rock Reservation in West Orange, which is visited by thousands of people in the summer, is reached by one line.

No freight or express is carried at any point on the system. Newspapers are carried at a flat rate of 25 cents per 100 lbs. Extra cars are operated to carry the Sunday newspapers.

ADJUSTMENT OF SCHEDULES

Traffic conditions on the Public Service Railway are complex and are the subject of constant study on the part of the superintendent of transportation in order that schedules may be adjusted properly to the requirements of the many diverse districts served.

A statement of lines published in Table IV is taken from a recapitulation of week-day schedules compiled in the office of the superintendent of transportation.

TABLE IV.—RECAPITULATION OF WEEK-DAY SCHEDULES

Office of Superintendent of Transportation

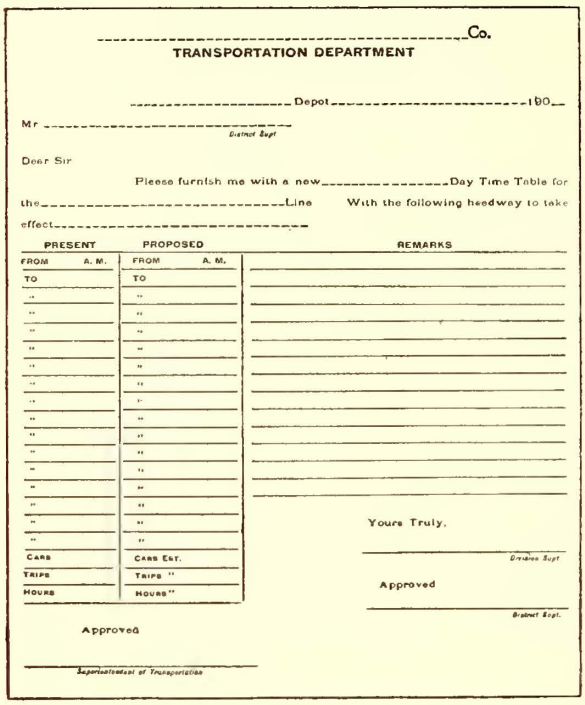
Pilot No.	Line	Average Scheduled Speed	Miles per Trip
	HUDSON DIVISION		
1	Newark Avenue	7.30	6.02
2	Pacific Avenue	7.36	6.08
3	Montgomery	8.40	11.64
4	Erie	6.62	4.05
5	Henderson	5.34	2.67
6	Lafayette	6.07	3.86
7	Greenville	8.85	16.49
8	Twenty-second Street	6.84	1.92
9	Fifth Street, Bayonne	3.73	1.00
10	Pavonia	7.58	7.60
11	Oakland	7.87	4.40
12	Newark and Summit Avenues	7.69	7.75
13	Washington	6.38	3.15
14	Willow	6.49	4.04
15	Grove	6.40	5.24
16	Jackson	8.35	10.55
17	Summit	8.32	8.22
18	Bergenline	8.22	11.57
19	Union Hill	8.10	13.79
20	Fourteenth	8.34	6.79
21	Palisade	11.59	15.14
22	White Line	10.22	35.33
23	Homestead	9.47	13.29
24	Bergen Pike	8.48	27.22
	ESSEX DIVISION		
26	Plank Road	8.01	20.11
27	Turnpike	9.17	17.46
28	Chapel	5.83	1.34
29	Hackensack	11.68	8.13
30	Fourth	5.45	1.44
31	Broad	9.38	18.63
32	Clinton	8.15	7.53
33	Paterson	10.43	31.53
34	Orange	8.00	12.91
35	Roseville	7.22	4.87
36	Central	8.35	8.48
37	Bergen	8.13	9.78
38	Clifton	7.30	7.18
39	Springfield	8.36	15.22
40	Kinney	7.59	9.33
41	Kearney	8.31	13.71
42	Mt. Prospect	9.03	13.01
43	Mulberry	7.56	6.78
44	Bloomfield	9.35	21.47
45	Valley Road	8.72	10.96
46	South Orange Avenue	8.40	18.90
47	South Orange-Maplewood	10.02	5.06
48	Crosstown	7.19	11.58
49	Eagle Rock	6.88	4.30
50	Clay Shuttle		
51	Clinton Hulby	8.57	11.28
	PASSAIC DIVISION		
52	Lakeview	7.07	8.99
53	Rutherford	2.67	.72
54	Singac	8.39	11.12
55	Monroe	6.78	2.34
56	Riverside	6.80	4.61
57	Totowa	7.87	5.41
58	Hudson River	12.40	4.84
59	Haledon	7.69	7.97
60	Main	9.15	16.74
61	Governor	7.66	7.66
62	Park	7.38	3.76
63	Broadway	7.73	6.28
	CENTRAL DIVISION		
67	First	7.78	8.17
68	Third	9.11	13.53
69	South Broad	7.12	3.75
70	Elizabeth	9.08	17.21
71	Main Line	11.01	57.70
72	Netherwood	8.54	4.24
73	Arlington	8.03	7.90
74	Kenilworth	7.11	3.54
75	Fourth	7.93	3.90
76	Fifth	6.40	2.08
77	Rahway	10.29	30.86
78	Easton	9.84	4.92
79	Burnet	8.94	4.36
80	South Amboy	10.54	31.52
81	Trenton Local	8.92	
82	Perth Amboy	10.65	32.02
83	Raritan	11.18	27.96
83	Raritan	11.18	27.96
84	Main Street Methuen	3.87	1.84
85	Codwise	9.15	4.85
86	Elmora	8.99	27.02
87	Amboys	8.86	8.90
	BERGEN DIVISION		
89	Hudson River	13.89	27.54
90	Englewood	12.99	17.75
91	Fort Lee	7.93	7.84
92	Hackensack	10.22	21.64
93	Lodi	11.64	5.82
94	Arlington	4.95	2.24
	SOUTHERN DIVISION		
1	Crosstown	7.10	6.17
2	Broadway	8.16	8.41
3	Haddonfield	10.47	13.82
4	Haddon Heights	11.63	27.20
5	Kaighn Avenue	7.45	2.99
6	North Cramer Hill	8.10	6.76
7	Merchantville	10.91	20.53
8	Pensauken	10.45	12.11
9	Gloucester	10.34	26.30
10	Sixth and Eighth Streets	9.10	7.09
11	Second and Fifth Streets	6.61	3.38
12	Riverton		
13	National Park	7.47	4.67

This shows the number of lines in each division, pilot number of each line, schedule number, the date on which the schedule went into effect, number of cars operated and headway respectively at 7 a. m., 10 a. m., 2 p. m. and 6 p. m., the total numbers of trips, hours and miles, platform costs, the time per trip, the speed per trip, the average schedule speed and the miles per trip. The totals for the principal items indicated are also given in the statement. Copies of this recapitulation are sent to the officials and district superintendents. The longest round trip run for a crew is 57.7 miles on the main line of the Central division.

The methods by which the service is adapted to the requirements of the various communities served constitute one of the most important features of the work of the company. The organization of the superintendent of transportation, who is in charge of these matters, includes a schedule department, whose work may be explained in some detail as the efficiency of its operation is well known. Before the present systematic study of schedules was made, it was customary to send inspectors into the various districts to count the new houses and other structures under construction in order that definite plans might be made to meet the increased traffic that would develop from the improvements found under way. This plan has been changed and now the service is adapted quickly to the transportation conditions that arise from time to time. The supervisors at the carhouses are in closer touch with the actual traffic conditions than any other officials of the company. Requests for changes in schedules, unless received from outside sources, therefore originate with supervisors. They are sent directly to the division superintendent and, if approved, are forwarded to the superintendent of transportation. Local supervisors, however, change schedules as

weather or other traffic considerations make advisable from day to day.

The form used for a request for a new schedule is published on this page. As indicated, it shows the present and proposed schedules with the different headways as they are changed from time to time



_____Co.

TRANSPORTATION DEPARTMENT

_____Depot_____190__

Mr _____
District Supt

Dear Sir

Please furnish me with a new_____Day Time Table for the_____Line With the following headway to take effect_____

PRESENT		PROPOSED		REMARKS
FROM	A. M.	FROM	A. M.	
TO		TO		
"		"		
"		"		
"		"		
"		"		
"		"		
"		"		
"		"		
"		"		
"		"		
"		"		
"		"		
"		"		
"		"		
"		"		
"		"		
CARS		CARS EST.		
TRIPS		TRIPS "		
HOURS		HOURS "		

Yours Truly,

_____
Division Supt

Approved

_____
District Supt

Approved

_____
Superintendent of Transportation

Traffic Conditions—Request for New Schedule

during the day. In this form the total number of cars, trips and hours required are shown under the present schedule, and the totals estimated for the same items under the proposed schedule. These requests are inspected by the schedule department, which reports directly to the superintendent of transportation. It is found that supervisors, in making requests for changes, frequently miscalculate the number of cars to be required. The analysis made by the schedule department develops such mistakes, if any have been made, and also permits the superintendent of transportation to compare the service requested with service given previously on the same line. In making the analysis of the effect of the proposed schedule, the schedule department prepares a headway sheet showing exactly all the trips suggested. It is not the practice to make out this sheet for a short line which may have only two terminals, but the information is necessary to permit judgment as to the effect of a change on most lines. The headway is computed for each trip of every train on the line. This information is used to make the runs into trains and to show all the runs made by each car. This is then divided so as to make runs of 10 hours for as many trains as possible.

For the purpose of keeping the superintendent of transportation informed at the earliest possible moment as to the revenue from passenger traffic on each day, the schedule department telephones the first thing each morning to every division superintendent and secures a statement of the receipts and the car hours run on the preceding day. This information is completed ordinarily by 9 or 9:30 o'clock every morning. In order that no time may be lost, the same information for the corresponding day of the preceding year is placed on the form the night before. This form also shows the average revenue per car hour, the percentage of increase in the total receipts, and the total of car hours. The company's telephone wire reaches all divisions, making it possible to get the information in a few minutes.

REGULAR RUNS

A recapitulation is placed at the bottom of every weekday timetable, showing the number of hours, cars and miles, and the main line headways. This also shows the time of train runs required by the timetable. Eight hours or more constitute a regular run. According to the figures compiled by the company, out of 1,395 total runs on the system, 1,145, or 82 per cent, aggregate 10 hours or over a day; 165, or 11.8 per cent of the total, are 8 to 9 hour runs; 85, or 6.2 per cent, are trip runs. It is found that these figures vary only slightly from time to time.

To show the full process by which graphical records of the number of passengers and seats supplied on the lines are made, the details of the methods employed may be described. Inspectors are sent to some point of compulsory stop, as, for instance, a railroad crossing. They count the number of passengers on each car as accurately as possible. They know the number

P.M. **PUBLIC SERVICE RY. CO.**
CAR TIMING REPORT

Line—North and South **Date, Aug. 11, 1911**
Location—East and West Streets **Direction—North**

Train.	Due.	Arrived.	Minutes Late.	Pass.	Remarks.
8102	4.34	4.37	−4	52	
8103	4.41	4.43	−2	45	
8104	4.49	4.52	−3	46	
8112	4.55	4.58	−3	36	
8105	5.01	5.02	−1	52	
8106	5.07	5.09	−2	40	
8107	5.10	5.15	−5	50	
8111	5.19	5.20	−1	52	
8113	5.25	5.27	−2	45	
8108	5.30	5.33	−3	56	
8114	5.34	5.37	−3	50	
8118	5.38	5.41	−3	65	
8115	5.42	5.43	−1	40	
8110	5.46	5.47	−1	63	
8101	5.50	5.50	0	40	
8109	5.54	5.57	−3	70	
8102	5.58	6.00	−2	68	
8116	6.02	6.06	−4	65	
8117	6.06	6.07	−1	51	
8119	6.10	6.13	−3	56	
8120	6.14	6.15	−1	65	
8112	6.20	6.23	−3	53	
8105	6.26	6.28	−2	62	
8106	6.32	6.32	0	30	

\+ sign. AHEAD.
− sign. LATE.

SIGNED.....

Traffic Conditions—Form of Car Timing Report

of passengers each type of car will seat and are able to determine pretty accurately what the load condition is in each case. The reports made by these men show the train number; the time at which the car was due at the point stipulated; the time at which it arrived; the number of minutes, if any, it is ahead of or behind time, and the total number of passengers carried. Each

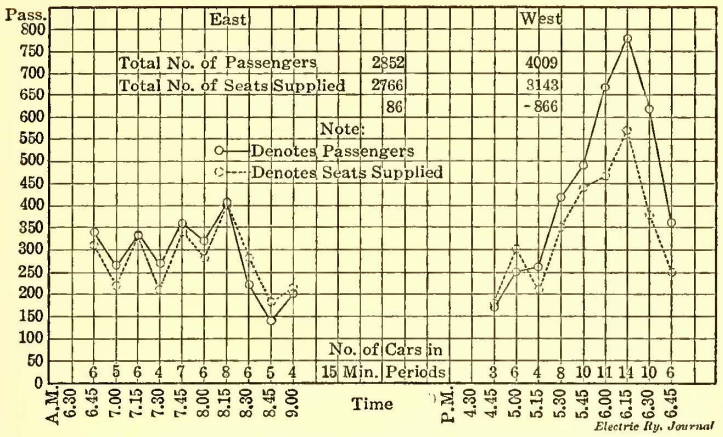


Chart Showing Passengers Carried and Seats Supplied in Morning and Evening Rush Periods

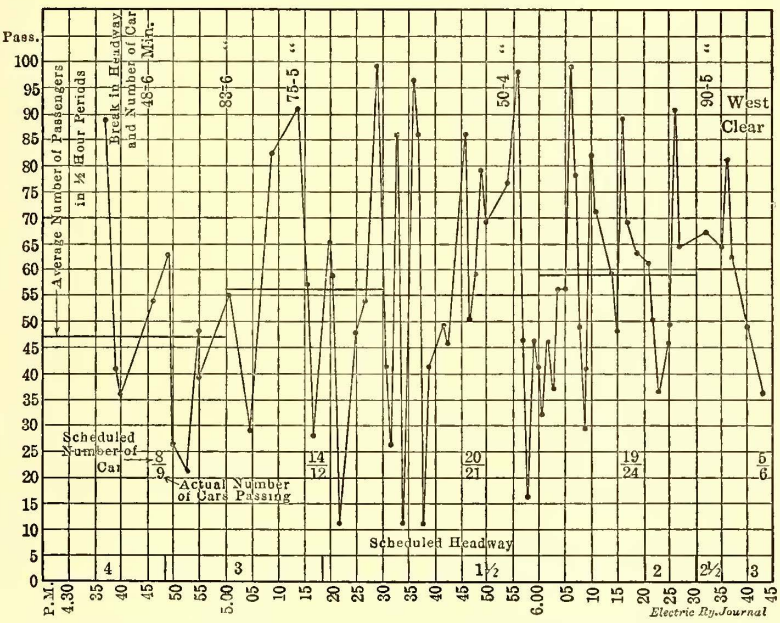


Chart Showing Passengers Carried in Cars in Evening Rush Period

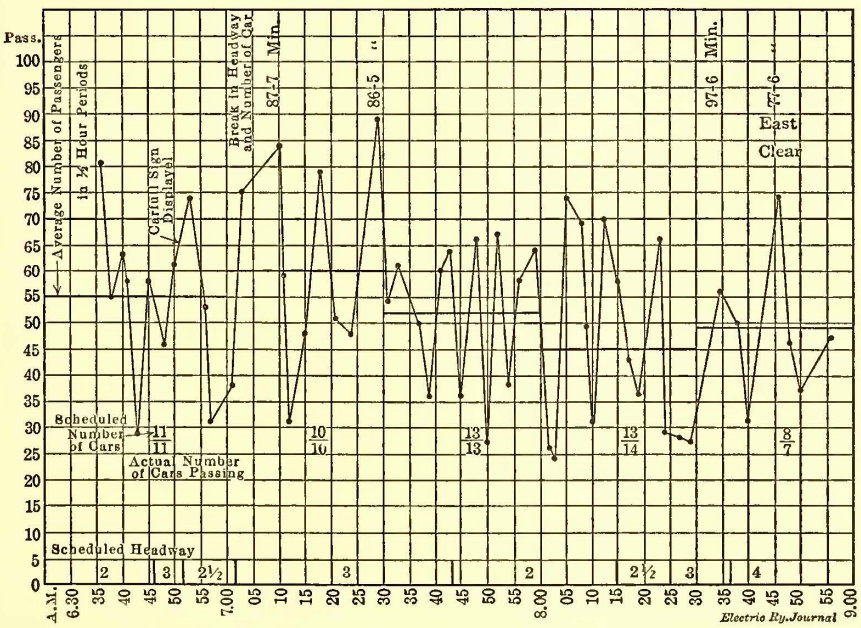


Chart Showing Passengers Carried in Cars in Morning Rush Period

day two men make a record of this nature at some point on a line in the system. As a rule the men take the record only at the time of the morning and evening rush. The division superintendents also place men at different points in their particular territory who sometimes happen to secure information regarding the same line at the same time.

CAR-LOADING RECORDS

Profile charts are made from this information, as published on this page, showing the condition of the weather and approximate number indicating the maximum load and a record of the number of passengers on each car. If the "Car Full" sign was displayed, that fact is indicated. This record shows the average number of passengers carried in half-hour periods, the schedule number of cars in such periods, and the actual number which passed the point designated. The schedule headway at all times during the interval under consideration is also indicated. Where there is a break in the headway scheduled, the number of the car responsible is indicated on the chart. Separate profile charts are made for the morning and evening rush records.

From these charts a third chart is made containing the principal information given on the first charts. This chart shows the total number of passengers and seats supplied on each line during both the morning and evening rush hours. It also indicates graphically a comparison of the passengers carried and the seats supplied in fifteen-minute periods.

The car-timing reports from which these charts are compiled are checked carefully by the schedule department and the charts are sent by the superintendent of transportation to the division superintendent affected, with recommendations as to changes or with instructions to discipline the men who were found by this method to be running ahead of time.

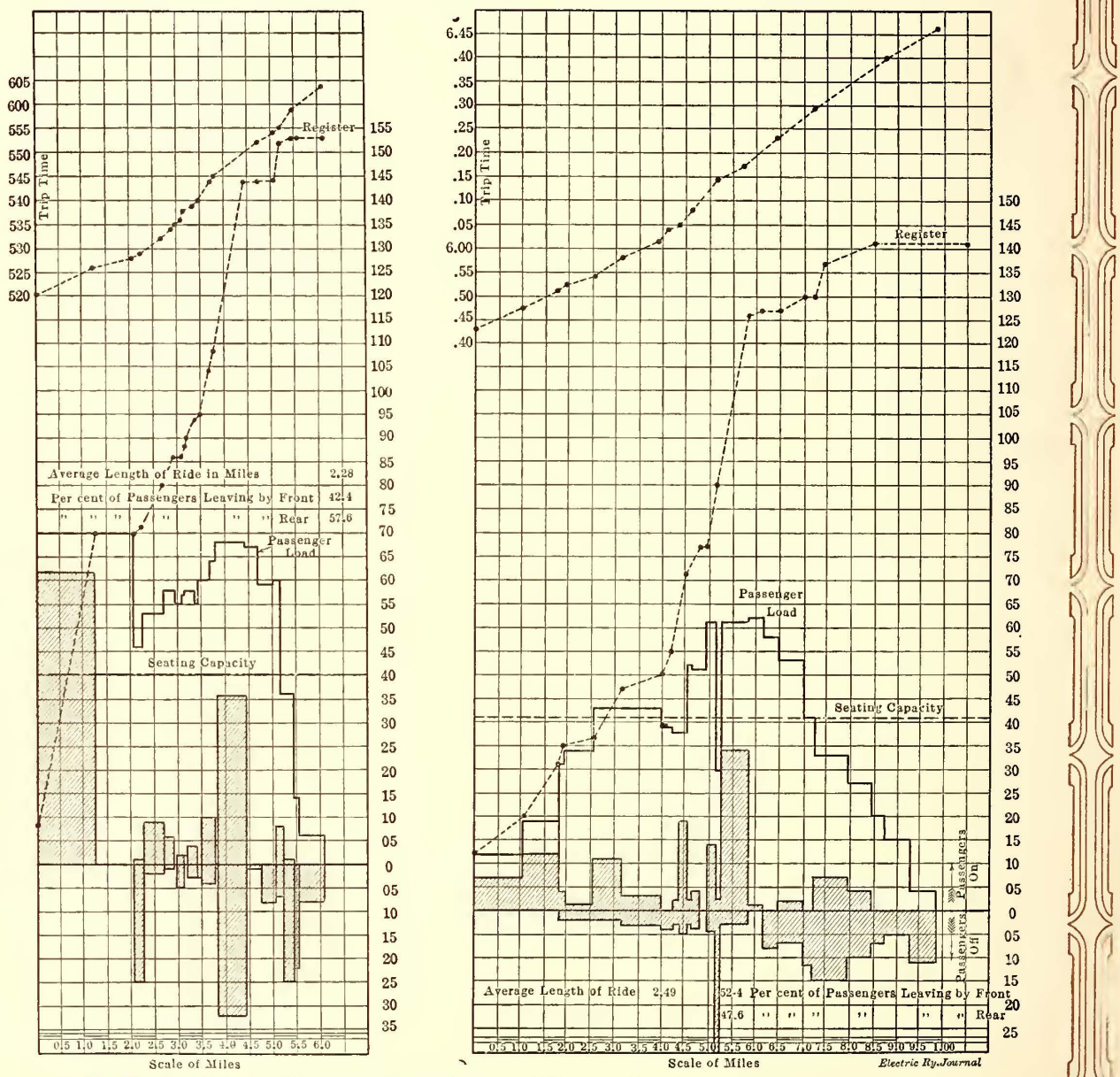
Of the 101 lines of the system, charts of this character are prepared for about 80. An effort is made to prepare a chart for each of these lines at least once a

month, and lines of heavy traffic are investigated at least twice a month. The lines that are not inspected in this way are small lines where traffic is light and changes are infrequent.

Besides the compilation of schedules, the schedule department checks the time of all chartered cars. As the rates for such cars are based on the number of minutes of use, charts have been made to show the running time from different points in the system to other points. One chart is made for each division, and a typical one is published on page 565. No cars are chartered for special use during the evening rush-hour service. The rate for special cars is figured on a basis of 10 cents per minute for actual running time from starting point to destination, and 5 cents per minute for run-off time from carhouse to the starting point. The minimum charge for one car is $8.

It is the practice to make new schedules whenever there is any warrant for their introduction. The object is to furnish the service where and when it is wanted. In addition to the regular week-day schedules, special schedules are made for Saturdays and Sundays, and for all holidays involving special traffic conditions, such as Labor Day. If special picnics or other events are to be held at any point, a special schedule is prepared for that day.

In August of each year a statement is prepared for the electrical department, showing the approximate number of cars by circuits that will be operated during the ensuing year. This enables the power department to make preparations for such increase in generating and distribution capacity as may be necessary.



Traffic Conditions—Diagrams Show Average Rides on Car, but Do Not Include Any Allowance for Subsequent Ride on Transfer

TESTS OF RIDES ON INDIVIDUAL CARS

Charts on this page show the results of tests to indicate the service on various lines. For these tests

two men are placed in a car. One man located at the front door has a stop watch and notes the time of each stop, the streets at which stops are made, the number of passengers leaving by the front door, and the condition of the register after each stop. The other man, located at the rear door, keeps a memorandum of the number of persons boarding and alighting at the rear end and the actual time and streets at which stops are made. The charts published indicate average lengths of rides of respectively 2.28 and 2.49 miles. They do not indicate the average length of ride per revenue passenger on these lines, as no attempt was made to distinguish between revenue and transfer passengers. No effort was made, either, to distinguish between passengers paying full fares of 5 cents each and those riding for half fare or on passes or reduced rate school tickets. As the data were gathered to indicate the average ride per total passenger these questions were not considered. It was found in one case that 42.4 per cent of the passengers left by the front door and 57.6 per cent by the rear door. In another case 52.4 per cent of the passengers left by the front door and 47.6 per cent of the passengers left by the rear door.

A test of another character has been made recently to show the loading and unloading at a busy point on one line. A typical summary showing the result of this experiment is published in Table V. This information is compiled only for cars of the prepayment type. Two men are used in the compilation of the data.

Table V.—Loading and Unloading Tests.
A Jersey City prepayment line.

	Aug. 28.	Aug. 29.
Number of trips	14	8
Total interchange	953	490
Total seconds stopped	1609.6	896.9
Average seconds per stop per passenger total interchange	1.89	1.83
Per cent of passengers leaving car, front platform	45.38	48.54
Per cent of passengers leaving car, rear platform	54.62	51.46

SCHEDULE.

LINE. NO.

IN EFFECT 19 SUPERSEDES NO.

RECAPITULATION

	Present	Previous	Increase	Decrease
CARS				
TRIPS				
HOURS				
MILES				
COST				
TIME PER TRIP				
SPEED PER TRIP				
SCHEDULE SPEED				
MILES PER TRIP				
RUNS				
RUNS AT 10 H'RS				
RUNS AT LESS				

HEADWAY		TIME POINTS
PRESENT	PREVIOUS	

Traffic Conditions—Recapitulation of Traffic Report

	P.R.R. Ferry	Car House	Vine St Ferry	Kaighn Av Fy.	Ship Yard	N. Creamer Hill	Mt. Ephriam Cem	Lee's Gallingswd	Woodlynne Park	W. Gallingswood	Gloucester Fy.	Merchantville	Delair	Audubon	Haddon Heights	Washington Park	Pensauken	Haddonfield	Lawnside	Moorestown	Riverton	National Park	Woodbury	Garden Lake	Clementon	Almonesson	Barton Landing	Mantua	Blackwood	Pancoas Park	Mt. Holly	Burlington
P.R.R. Ferry	0																														
Car House	12	0																													
Vine St Ferry	15	16	0																												
Kaighn Av Fy.	12	21	18	0																											
Ship Yard	22	34	31	13	0																										
N. Creamer Hill	22	28	16	36	43	0																									
Mt. Ephriam Cem	21	14	34	16	10	43	0																								
Lee's Gallingswd	23	16	29	21	34	45	18	0																							
Woodlynne Park	24	17	30	15	10	46	3	21	0																						
W. Gallingswood	23	21	34	19	14	50	7	24	4	0																					
Gloucester Fy.	29	30	38	20	6	51	17	41	20	24	0																				
Merchantville	30	21	44	45	52	52	51	53	54	58	59	0																			
Delair	31	22	45	46	53	53	52	54	55	59	60	27	0																		
Audubon	33	26	47	24	19	55	18	29	9	5	26	47	48	0																	
Haddon Heights	36	29	50	27	22	58	15	32	12	8	29	50	51	3	0																
Washington Park	37	38	51	28	15	59	25	49	28	32	8	64	65	36	39	0															
Pensauken	40	31	54	55	62	62	61	47	64	68	69	36	22	61	64	77	0														
Haddonfield	40	33	54	38	51	62	35	17	39	43	58	59	55	49	52	66	64	0													
Lawnside	41	34	55	32	27	63	20	37	17	13	34	55	56	8	5	42	63	45	0												
Moorestown	45	36	59	60	67	67	66	52	69	73	74	74	42	66	69	82	51	69	78	0											
Riverton	48	41	62	63	70	70	69	71	78	76	77	44	17	69	72	85	39	72	75	59	0										
National Park	50	51	64	41	28	72	38	62	41	45	21	77	78	49	52	13	87	79	57	92	55	0									
Woodbury	51	52	65	42	29	73	39	63	42	46	22	78	79	50	53	14	88	80	58	93	96	27	0								
Garden Lake	52	45	66	43	38	74	31	48	28	24	45	66	67	19	16	53	76	56	11	80	84	67	68	0							
Clementon	55	48	69	46	41	77	34	51	31	29	48	69	70	22	19	56	79	59	14	83	87	71	71	3	0						
Almonesson	59	60	73	50	37	81	47	71	50	54	30	86	87	39	61	22	96	88	66	101	104	35	16	77	78	0					
Barton Landing	66	51	74	75	82	82	81	67	84	88	89	15	57	81	84	97	66	64	87	15	54	110	111	132	133	139	0				
Mantua	63	64	77	54	41	85	51	75	54	58	34	90	91	63	65	26	100	92	70	105	108	39	16	81	82	25	64	0			
Blackwood	68	69	82	54	46	80	56	80	59	63	39	95	96	68	70	31	103	97	75	110	113	44	23	86	96	9	168	37	0		
Pancoas Park	77	68	98	92	99	99	82	84	87	90	96	47	77	96	99	14	85	101	104	32	94	127	128	115	118	136	17	140	145	0	
Mt. Holly	93	84	108	106	115	115	96	100	103	106	122	63	93	112	115	130	101	117	122	48	110	143	144	133	136	152	33	138	161	16	0
Burlington	130	121	145	145	152	152	135	137	140	143	159	100	130	149	152	167	138	154	167	85	147	160	161	178	181	189	70	193	198	53	37	0

Traffic Conditions—Form of Division Chart Used in Calculation of Chartered Car Time

One man watches the front door of each car that stops at the point designated and the other one gets the information desired regarding passengers who use the rear door. The object is to show the interchange of passengers and the average seconds per stop to effect the interchange.

Twice a year statements are prepared for each division showing the number of cars in the different sections of the division during the evening rush hour.

THE CORPORATION AND ITS ORGANIZATION

WHILE the Public Service Railway is the operating company which furnishes the street railway facilities in the closely settled districts of northern New Jersey, it is not so well known publicly as the Public Service Corporation, by which it is controlled.

FORMATION OF THE CORPORATION

The corporation was formed in 1903 to overcome the severe financial straits into which electric railway and other public utility properties had fallen, and it has acquired extensive holdings of securities of the three principal classes of public utilities—electric railway, electric light and power, and gas.

Although the financial condition of the street railway properties had aroused concern for some time prior to the organization of the Public Service Corporation, it was not until a serious accident occurred in Newark that public attention was focused on the need for radical improvement. A car filled with school children was struck by a train of the Delaware, Lackawanna & Western Railroad at Clifton Avenue, Newark, and this had the effect of arousing an insistent public demand for radical rehabilitation of the properties. A number of conferences were held between holders of securities and bankers interested, and one proposition involving the organization of a new company was received and considered. The terms of this proposition, however, involved so large an increase in outstanding securities with so small a cash consideration therefor that, on recommendation of a sub-committee, it was rejected by a general committee.

The sub-commitee, composed of Randal Morgan, John I. Waterbury and Thomas N. McCarter, submitted a new plan in which provision was made for the advance of the necessary funds and the underwriting of the proposed new securities by the Fidelity Trust Company of Newark. The plan, in its general outline as well as details, was conceived by Mr. McCarter, who under the circumstances refrained from advising its acceptance. As Messrs. Morgan and Waterbury, however, recommended the adoption of the plan, and their advocacy of the arrangement was supported by the committee, steps were taken immediately to make the offer effective. Although it was not so stated at the time, it was understood that Mr. McCarter, as the author of the plan, had been asked to guide the affairs of the new corporation as its president and had consented to do so.

The sub-committee, in directing the proposal to stockholders of the several companies concerned, reported that in the calendar year 1902 the earnings from operation of the properties whose condition was primarily responsible for the movement were as follows: North Jersey Street Railway Company, $4,395,225; Jersey City, Hoboken & Paterson Railway Company, $1,951,365; Elizabeth, Plainfield & Central Jersey Railway Company, $250,711; Orange & Passaic Valley Railway Company, $88,134; total, $6,685,435.

After examination of the properties the committee concluded unanimously that no proposal should be considered in the interest of the companies which did not provide sufficient funds to meet the existing liabilities and immediate requirements and also money for betterments, extensions and improvements, and which did not provide further for a reduction of capital to a sum upon which, with the best management and liberal and judicious expenditure of money, fair dividends should not be earned and paid continuously.

The proposition submitted under the name of the Fidelity Trust Company of Newark, which was accepted and carried out, provided for the organization of a new corporation with an authorized capital stock of $25,000,000, of which $10,000,000 was to be issued at par for cash. It was provided that future issues of stock should be made only for cash and at not less than par. The new company, it was proposed, should purchase the stocks of the street railway properties named and issue in payment therefor perpetual interest-bearing certificates secured by a pledge of the stocks acquired. These certificates were to bear 2 per cent interest the first and second years, and rates increasing at one-half of 1 per cent annually until the tenth year. Then the rate was to become 6 per cent and dividends were to continue at that rate thereafter.

It was also proposed that the new company should take over additional properties immediately, offering similar certificates for the stock of the United Electric Company of New Jersey, and acquiring by lease the Essex & Hudson Gas Company, the Hudson County Gas Company, the Paterson & Passaic Gas & Electric Company and the South Jersey Gas, Electric & Traction Company.

The new company, as part of the plan, was to pay the floating debt of the street railway companies, which amounted at that time to about $4,300,000, and was also to provide the amounts necessary to cover the immediate requirements of the companies, aggregating approximately $1,750,000. For this total advance the new corporation was to receive so far as possible the bonds of underlying companies authorized by existing mortgages.

BROAD POWERS OF CHARTER

It was in pursuance of the plan outlined that the Public Service Corporation of New Jersey was organized with broad powers on May 6, 1903. The objects for which the corporation was formed are comprehensive. They include, in brief:

To purchase or otherwise acquire and own, sell, mortgage or otherwise dispose of the shares of the

capital stock of, or any bonds, securities or other evidences of indebtedness created by, any corporations of New Jersey or of any other State, or of the United States, and to exercise all the rights, powers and privileges of ownership of such stock, including the right to vote thereon.

To aid in any manner any corporation any of whose stock, bonds or other obligations are held or are in any manner guaranteed by the company, and to do any acts for the preservation and protection, improvement or enhancement of the value of any such shares of stock, bonds or other obligations, or the property represented thereby; to do any things tending to increase the value of any property at any time held or controlled; to further the organization of subsidiary companies; to issue bonds and to secure them by pledge, deed of trust, or mortgage of or upon the whole or any part of the property, real and personal, and to sell or pledge such bonds for proper corporate purposes; to construct, maintain, extend, enlarge and operate in New Jersey works for the supply and distribution of electricity; to acquire and hold such works with the franchises and rights under which the same are or may be operated by purchase, lease or otherwise; to operate such works and exercise such franchises and rights; to make, accept and transfer leases of works constructed and to be constructed for the purpose of supplying and distributing electricity; to operate such works under such leases and to use the public highways, streets and alleys for the purpose of erecting poles to sustain the necessary wires and fixtures and to lay pipes or conduits and to lay wires therein beneath the public highways and alleys as may be deemed necessary.

It is also provided that the company shall have power to issue obligations other than those mentioned, including perpetual interest-bearing certificates in payment for property, such property including shares of stock acquired by it, or for any other object in its business; to mortgage and pledge any stocks or other obligations or any property which may be acquired; to secure any bonds or other obligations issued or incurred by it; to guarantee any dividends or the principal and interest of bonds or other obligations and the performance of contracts and leases made by other corporations, and to issue its stock, bonds or other obligations in payment for any such guarantee when made by any other corporation, for the improvement or enhancement of the value of any shares of stock, securities, or other property owned by this company or any corporation in which it is interested.

As a primary object of the incorporation the company, it is provided, shall also have power to acquire by lease or other instrument the property and franchises of any corporation for such terms as may be agreed upon and to perform the obligations of any such lease with reference to the maintenance, operation, extension and improvement of the leased property, and to purchase or otherwise acquire and hold, mortgage and transfer or otherwise dispose of, trade, deal in and deal with property of every class and description.

It is further stipulated that the company shall have all the powers conferred by the laws of the State upon corporations formed under the corporation act, and it is expressly provided that the enumeration of specified items shall not be held to restrict in any manner the general powers of the company.

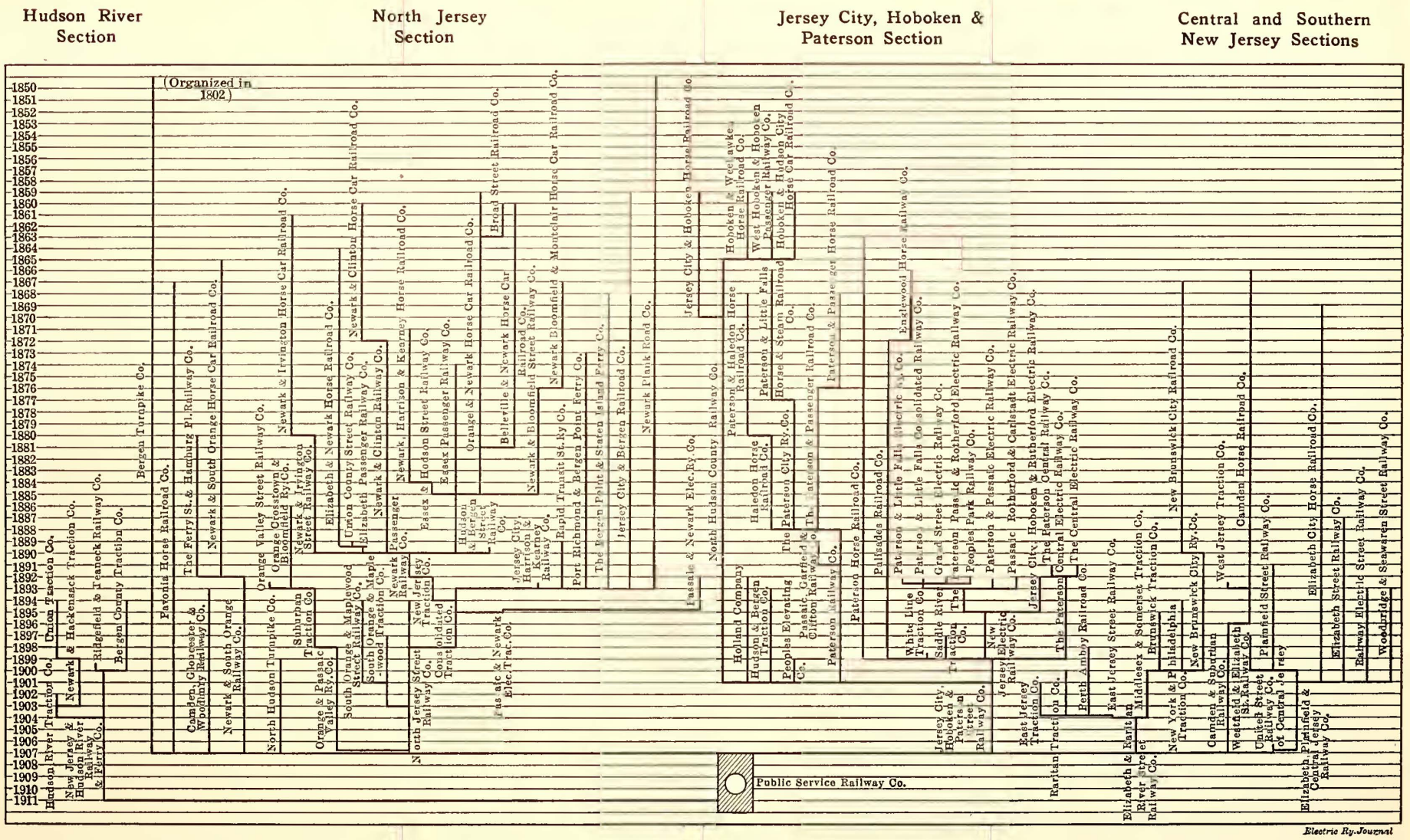
DEVELOPMENT OF THE SYSTEM

It was the intention at first, as may be inferred from the foregoing, that the corporation should control eventually most of the electric railway, electric and gas utilities of New Jersey. In furtherance of this plan, additional properties have been acquired from time to time and the corporation has continued to expand.

In one particular the plans formed originally have been amended. The corporation was designed at first to acquire and operate directly all the properties controlled. With the form of organization which was adopted later, it became mainly a security-holding company. Under this plan the Public Service Railway Company was formed on July 30, 1907, as a consolidation of the North Jersey Street Railway Company, the Jersey City, Hoboken & Paterson Street Railway Company, and the United Street Railway Company of Central Jersey. The Public Service Railway Company has absorbed or leased all the railway properties in the system. Similarly the Public Service Gas Company, a subsidiary, has acquired control by merger or lease of the gas properties. The Public Service Electric Company was formed on June 13, 1910, to carry out the same plan with respect to the electric lighting and power companies. The corporation owns 99.43 per cent of the $38,000,000 stock of the Public Service Railway Company, and, except directors' qualifying shares, all the stock of the Public Service Gas Company and the Public Service Electric Company.

The family tree illustrating the development of the present railway system of the Public Service Corporation is published on page 568. This gives the dates of organizations and names of the underlying properties which have been absorbed or leased by the Public Service Railway. In this diagram no account is taken of the fact that between 1903 and 1907 the properties were controlled directly by the Public Service Corporation. The control of all the properties was transferred later to the Public Service Railway. The family tree is given to indicate the large number of independent operating properties which were finally combined into the present extensive system.

The properties controlled by the Public Service Corporation or its subsidiaries are among the oldest in the country concerned in any way in the operation of public utilities. The earliest company organized which is now a part of the Public Service Railway system is the Bergen Turnpike Company, which was formed in 1802. This company still operates as a toll road, on which the railway company has a line. Other companies were operated originally as stage lines and some properties passed successively through the periods of horse power, cable and then electricity.



Family Tree of the Public Service Railway, Showing the Large Number of Companies Whose Properties Were Combined at Various Times in the Past to Form Systems That Were Merged Later Into One Extensive Organization.

The operation of horse cars was started in Newark and Jersey City in 1860. Three years later the operation of a steam dummy line was begun in Jersey City. This line was operated to the shore of the Hudson River first, but, as the city grew, operation was restricted more closely to outlying sections. The line, however, remained in operation until the eighties. The first electric car to be operated on the entire system, as now constituted, was started experimentally in 1889. It was operated by the Leo Daft system. Several cars were equipped with this system and operated. In the meanwhile the Newark Rapid Transit Railway Company, which had been organized as an electric railway, began construction and started the operation of its lines in Newark on Oct. 25, 1890. The Springfield Avenue line in Newark had been converted previously from horse to cable power, and this was converted for initial electrical operation on Oct. 4, 1890. The final work of conversion to electric operation of the principal properties located in Newark and Jersey City was finished a little later.

REHABILITATION, NOT EXTENSION

Although the corporation was formed with the broad objects stated, it has conducted its affairs along lines which naturally were not foreseen perfectly at the time of organization. For instance, the railway lines have been extended comparatively little. The principal increases in mileage have resulted from the acquisition of properties. The great development in the railway properties in the period following their acquisition by the corporation has been one of rehabilitation. Track and equipment have been reconstructed and modernized. Some of the properties had been extended freely into outlying districts by the earlier companies, and as they reached some lightly settled territory development has been awaited.

A further check upon railway development has been furnished by the new policy of the State regarding franchises. Most of the street railway franchises held by the subsidiary companies of the corporation are perpetual. Several years ago agitation was started in New Jersey for limitation of the life of new franchises and an act on this subject was passed by the Legislature in 1906. This measure limited franchises, except in some localities, to twenty years. The term could be made forty years by a majority vote. The act was afterward amended so that in communities not exceeding 12,000 population franchises could be granted for not to exceed fifty years.

The corporation, notwithstanding the comparatively limited extension of street railway track, has benefited in other ways by the development of territory which resulted from the street railway facilities furnished. It regards the street railway properties in one sense as agencies which insure the settlement of territory, and hence an inevitable increase in the consumption of gas and electricity.

Table VI shows the miles of track operated at the end of each fiscal year.

Table VI.—Miles of Track Operated.

Dec. 31.	
1903	495
1904	646
1905	646
1906	646
1907	648
1908	657
1909	657
1910	713

Table VII shows the proportion of the revenue contributed by the three principal departments into which the corporation's activities are divided. This shows that the railway properties as classified furnished 47.3 per cent of the total gross revenue from all sources for the seven months of operation in 1903. This proportion decreased to 45.6 per cent in 1910. On the other hand the electric properties increased from 18.8 per cent of the total in 1903 to 20.1 per cent in 1910. The gas properties decreased from 32 per cent in 1903 to 29.1 per cent in 1910. Miscellaneous income aggregated 1.9 per cent of the total in 1903 and 5.2 per cent in 1910.

Presumably there have been occasional adjustments, owing to the transition period through which the properties have been passing, that would affect to some extent any deductions that might be drawn from the figures. Some properties of each class have been acquired in various years, so that the figures are not based on ownership of the same properties from year to year. However, they show that the railway system contributed pretty close to one-half of the gross revenue, the electric properties one-fifth, and the gas properties a little under one-third.

Table VIII shows the percentage of increase each year, as compared with the preceding year, in the

Table VII.—Percentages of Gross Revenue Contributed by the Various Properties.

	Electric Properties.	Per Cent of Total.	Gas Properties.	Per Cent of Total.	Railway Properties.	Per Cent of Total.	Miscellaneous Income.	Per Cent of Total.	Total.
*1903	$1,776,557.65	18.8	$3,026,993.50	32.	$4,471,244.37	47.3	$187,403.74	1.9	$9,462,199.26
1904	3,502,811.92	19.7	5,378,440.63	30.3	8,415,278.79	47.4	463,249.75	2.6	17,759,781.09
1905	3,721,631.68	18.7	6,059,446.56	30.4	9,488,358.45	47.7	640,405.91	3.2	19,909,842.60
1906	4,161,917.81	19.4	6,526,316.01	30.4	10,086,933.92	46.9	723,658.34	3.3	21,498,826.08
1907	4,647,219.18	19.7	7,251,480.50	30.7	10,705,392.77	45.3	1,023,951.44	4.3	23,628,043.89
1908	4,584,682.27	18.9	7,349,930.23	30.3	11,086,353.43	45.7	1,246,721.36	5.1	24,267,687.29
1909	5,117,728.04	19.3	7,870,878.58	29.6	12,114,412.19	45.6	1,457,432.29	5.5	26,560,451.10
1910	5,872,237.86	20.1	8,491,882.46	29.1	13,308,725.26	45.6	1,532,347.57	5.2	29,205,194.15

*Operations for seven months only.

Table VIII.—Percentages of Increase in Gross Revenue, as Compared with the Preceding Year.

	Electric Properties.	Gas Properties.	Railway Properties.	Total, Including Miscellaneous.
1905	6.25	12.66	12.75	12.11
1906	11.83	7.70	6.31	7.98
1907	11.66	11.11	6.13	9.90
1908	*1.35	1.36	3.56	2.71
1909	11.63	7.09	9.27	9.45
1910	14.74	7.89	9.86	9.96

*Decrease

gross revenue reported by the three classes of utilities and by the corporation as a whole. It will be noted that the electric properties increased at a higher average rate than the railway and gas properties.

There appears to be no reason to doubt that further expansion of the activities of the corporation will take place in some way in the future, although the lines of development are not as clearly to be foreseen as was believed a few years ago. For instance, tentative arrangements have been made on behalf of the corporation for the acquisition of the Elizabeth & Trenton Railroad, which extends from a connection with the Public Service Railway at New Brunswick to Trenton. Similar tentative arrangements have been made for the acquisition of the Riverside Traction Company, which extends from Trenton westward to a connection with the lines of the Southern division of the Public Service Railway at Camden. These tentative arrangements will be carried to completion if certain desired franchises are granted.

CORPORATE AFFAIRS

The publication of annual reports was begun with a statement for the year ended Dec. 31, 1909, and the organization of the properties on definite lines. Two annual reports therefore have been issued and the main figures in each and the percentages of increase in 1910, compared with 1909, follow in Table IX.

TABLE IX.—COMPARATIVE EARNINGS FOR TWO YEARS, WITH PERCENTAGES OF INCREASE.

	1909.	1910.	Percentage of Increase.
Gross earnings of leased and controlled companies	$25,103,019	$27,672,847	10.2
Public Service Corporation of New Jersey, miscellaneous income	1,457,432	1,532,347	5.1
Total income	$26,560,451	$29,205,194	10.
Operating expenses and taxes	13,331,228	14,611,300	9.6
Net income	$13,229,223	$14,593,894	10.3
Bond interest and rentals of leased and controlled companies	10,111,403	10,558,243	4.4
Balance	$3,117,820	$4,035,651	29.4
Fixed charges of Public Service Corporation of New Jersey	1,689,372	1,835,356	8.6
Surplus	$1,428,448	$2,200,295	54.
Less amounts set aside as reserves by Public Service Corporation of New Jersey	.....	$125,000	...
By the Riverside & Fort Lee Ferry Company	.....	5,000	...
		$130,000	
Net divisible income	$1,428,448	$2,070,295	44.9

Payment of dividends on the stock of the Public Service Corporation was begun on June 29, 1907, when 1 per cent was disbursed. A rate of 4 per cent per annum was maintained from that time to Sept. 30, 1909, when a quarterly dividend at the rate of 1¼ per cent was paid. That rate was continued until March, 1911, when the rate of 1½ per cent quarterly was established, placing the stock on a 6 per cent annual basis.

The corporation has, in addition to its $25,000,000 capital stock, all of which is now outstanding, $20,200,000 authorized perpetual interest-bearing certificates, issued in exchange for the stock of underlying companies in accordance with the plan of 1903, of which $19,970,440 are outstanding; $19,183,285 are in the hands of the public and the remainder are owned by the corporation. The corporation also had an issue of $4,000,000 of 5 per cent three-year collateral notes which were called for payment on Oct. 1, 1911.

Of an issue of $50,000,000 of 5 per cent general mortgage bonds, due on Oct. 1, 1959, $30,000,000 are now outstanding.

In connection with the sale recently of a block of the general mortgage bonds a contract was made with the purchasing bankers by which the corporation agreed to provide out of earnings each year for rehabilitation, renewals and depreciation, other than customary and proper maintenance charges, or for construction, extensions or acquisition of properties, the following sums annually: In 1910, $250,000; in 1911, $400,000; in 1912, $600,000; in 1913, $800,000; in 1914, $1,000,000; in 1915 and thereafter annually during the life of the bonds, from $1,000,000 to $1,500,000, the exact sum to be determined by the earnings.

The annual report for 1910 shows total outstanding debt of the Public Service Railway and subsidiary companies of $67,256,000, of which $9,239,000 was owned by the corporation, leaving $58,017,000 in the hands of the public. These figures did not include the outstanding funded debt of the New Jersey & Hudson River Railway & Ferry Company and subsidiaries, a total of $4,542,000, of which $67,000 bonds were held by a subsidiary and $4,475,000 were in the hands of the public.

The total outstanding funded debt of the corporation and subsidiary companies, according to the 1910 statement, was $178,967,217, of which $14,525,135 was owned by the corporation and $164,375,082 was in the hands of the public.

In addition to this the railway system had outstanding $1,016,000 equipment trust notes and $165,185 real estate mortgages. Other miscellaneous obligations of subsidiary gas and electric companies brought the total of miscellaneous obligations outstanding to $1,538,935, all in the hands of the public. The subsidiary companies, whose dividends were guaranteed through leases by either the railway, electric or gas companies, had $78,308,950 capital stock outstanding, of which $21,926,650 was owned by the company and $56,382,300 was in the hands of the public.

Of the subsidiary companies of the corporation which are not leased, the capital stock outstanding was $54,657,550 and the amount thereof owned by the corporation was $53,548,850, leaving $1,101,500 in the hands of the public.

From June 1, 1903, to Dec. 31, 1910, the total expenditures charged to capital account on the systems operated by the corporation and subsidiary companies were as follows: Railway, $22,474,714; electric, $9,184,984; gas, $10,848,303; total, $42,508,001. Of the total amount, 52.9 per cent was expended on the railway properties, 21.6 per cent on the electric system and 25.5 per cent on the gas properties.

PERSONNEL OF THE CORPORATION

The officials of the Public Service Corporation are as follows:

Thomas N. McCarter, president.
George J. Roberts, first vice-president.
John J. Burleigh, second vice-president.
Randal Morgan, third vice-president.
Anthony R. Kuser, fourth vice-president.
Edwin W. Hine, secretary.
H. C. Stevenson, assistant secretary.
James P. Dusenberry, treasurer.
R. D. Miller, assistant treasurer.
T. W. Van Middlesworth, assistant treasurer.
Frank Bergen, general counsel.
L. D. H. Gilmour, assistant general counsel.
E. A. Armstrong, assistant general counsel.
L. S. Hoffman, general solicitor.
P. S. Young, comptroller.
H. V. Drown, general claim agent.
Percy Ingalls, general agent.
George Barker, real estate agent.
John L. O'Toole, publicity agent.

The board of directors is composed of the following: Frank Bergen, Anthony R. Kuser, Samuel T. Bodine, Lewis Lillie, John J. Burleigh, Horatio G. Lloyd, Walton Clark, Thomas N. McCarter, Thomas Dolan, Uzal H. McCarter, John F. Dryden, Randal Morgan, James P. Dusenberry, F. W. Roebling, J. Horace Harding, George J. Roberts, Wm. C. Heppenheimer, John F. Shanley, Edwin W. Hine, P. F. Wanser and Edgar B. Ward.

The members of the executive committee of the board of directors are: John J. Burleigh, Thomas N. McCarter, Walton Clark, Uzal H. McCarter, Edwin W. Hine, Randal Morgan, Anthony R. Kuser, George J. Roberts and Lewis Lillie.

The operating officials of the subsidiary Public Service Railway are given below:

R. E. Danforth, general manager.
P. S. Young, comptroller.
M. R. Boylan, general auditor.
C. B. McCourt, assistant to the general auditor.
L. D. H. Gilmour, assistant general counsel.
N. W. Bolen, superintendent of transportation.
J. W. Brown, assistant superintendent of transportation.
J. A. Pearson, purchasing agent.
R. S. Inglehart, general storekeeper.
H. V. Drown, general claim agent.
H. D. Briggs, assistant general claim agent.
E. J. Dunne, superintendent distribution.
H. A. Benedict, mechanical engineer.
D. G. Knight, superintendent buildings.
D. Beatty, superintendent trucking.
Martin Schreiber, engineer maintenance of way.
M. White, superintendent of maintenance of way.

Operating affairs of the companies are considered by executive committees formed of officials of the various properties, which meet on Monday afternoon of each week. The committees are composed of the president, the first vice-president, the second vice-president, Walton Clark, a director; an assistant general counsel, the comptroller, the general managers of the railway, gas and electric companies, the secretary and the general agent. The committees pass on all questions relating to the operating companies before they are submitted for the consideration of the board of directors of the corporation.

THE PUBLICITY DEPARTMENT

The publicity agent is directly responsible for all matters of publicity relating to the railway, gas and electric properties. The work of this official has been developed along somewhat unusual lines. He gives talks on practical operating questions before civic, religious and social organizations.

So far as the street railways are concerned, these talks relate to such topics as the problem of congestion in rush hours. For instance, it is shown that 65 per cent of the total passenger traffic of the company is handled in five hours. In talks before various Newark organizations emphasis is laid on the fact that nineteen out of the twenty-one lines in that city are affected by the congestion at Broad and Market Streets. Reference is also made to other matters of service, to the detrimental results of unregulated vehicular traffic, the effect of franchise taxes, and the benefits to the community arising from the development of outlying property. During the coming winter the attention of the public will be specifically directed to means for the prevention of accidents.

The point of view of the corporation on various questions of interest to the public has been explained in newspaper advertisements. No regular advertisements of railway schedules are placed in the newspapers, but the commercial departments of the gas and electric companies are advertised largely.

The publicity department also prepares folders and attends to the printing of such timetables as are issued for the public. If some unusual event is to occur advertisements are placed in the newspapers directing attention to the service that will be furnished. The publicity agent also writes articles describing different features of the property or improvements which are of interest and sends these to newspapers which it is believed will publish the material because of its news value. As the publicity agent is a practical newspaper man, he is able to judge the value of the articles he distributes. No article is sent to any newspaper unless it is believed that the information is well worth publication as a matter of general interest. In the event of accidents accurate information is given to newspapers upon request.

A complaint department has been opened on the first floor of the Public Service Building, where it is readily accessible to the public, and verbal or written complaints are solicited by the company. These are received by the publicity agent and the complaints are referred to the departments affected for investigation and action. A prompt report is secured and a letter is written to the person who made the complaint. A card record of all complaints is kept.

OFFICE BUILDING

AT the time that the gas, electric and railway properties now constituting the Public Service Corporation were consolidated the executive and the departmental offices of the company were widely scattered and their equipment also left much to be desired. Hence one of the first steps taken after the details of the new organization were decided upon was , concentrate the headquarters of the several departments under one roof. The location chosen was in a building about to be erected by the Prudential Life Insurance Company at the corner of Bank and Broad Streets. This place is in the heart of Newark's business section and the building is adjacent to others owned by the Prudential Life Insurance Company and harmonizes with them in exterior design. The interior, however, was laid out for the special purposes of the Public Service Corporation, which leased it for a term of years. Furthermore, no efforts and expense were spared to install those conveniences which would make it possible for the employees of the company to work under the most agreeable conditions. Although the office building is eleven stories high, it was found necessary to place some of the offices in an extension which is part of an adjoinng building also owned by the Prudential Insurance Company.

GENERAL BUILDING EQUIPMENT FEATURES

The construction and equipment of the building are of almost palatial character. The exterior is of granite; the main corridors, halls and assembly rooms are wainscoted in marble and the general and executive offices are finished in plaster, with oak trimmings. A fireproof construction is used, but the building also has hose connections and fire extinguishers on every floor. The porters of the building have been trained by the chief janitor to answer all fire calls on whistle signal. Under the fire drills which have been instituted each man understands the work which he is expected to do. Surprise tests have shown that calls in the main building can be answered in 1 minute and calls in the extension in 1½ minutes.

There are four high-speed passenger elevators and one freight elevator in the main building and two slow-speed passenger elevators in the extension, where only a three-floor service is required. Three of the four elevators in the main building have a rated carrying capacity of 2500 lb. each. The fourth elevator is of extra heavy type so that it may be used for carrying up safes, parts of vaults and other bulky articles. During the luncheon period from 11:30 to 1 these four elevators carry about 700 persons each way. The freight elevator is used for carrying conductors' cash boxes from the basement to the cashier's counting room on the third floor. Other vertical transportation facilities include two dumbwaiters, one between the kitchen mezzanine and the pantry on the eleventh floor and the other between the kitchen and the larger pantry on the tenth floor.

A great variety of electric lighting systems and fixtures has been installed to make the company's home in itself an excellent advertisement of its lighting business. Among the lighting systems in regular use are carbon lamps, tungsten lamps, concealed lighting, Moore vacuum tubes and Cooper Hewitt mercury-vapor lamps. The showrooms, of course, contain additional methods of electric lighting. The entire building is also furnished with emergency gas connections with many varieties of fixtures. Steam heat is used throughout and fans are provided for summer.

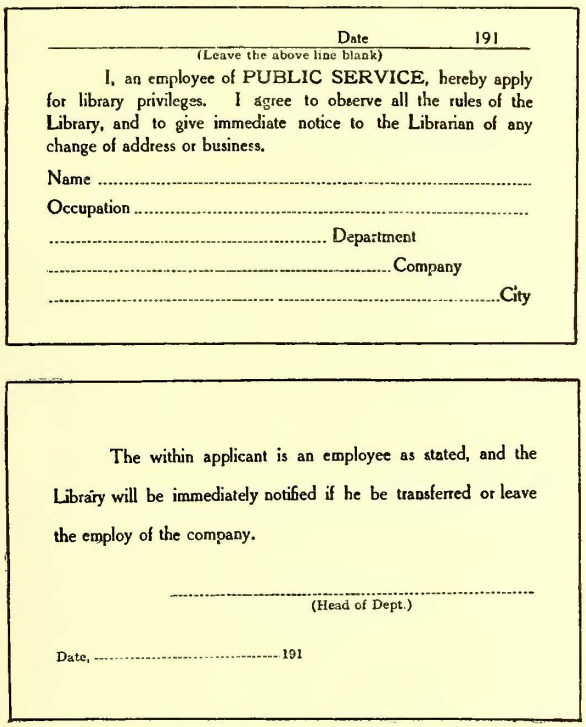
Fresh air is secured through ventilators which are open to the outside of the building during the summer. These ventilators are supplied from a blower-driven air-purifying equipment in cooler weather. Every floor is also equipped with vacuum outlets for cleaning. High-class toilet rooms are installed on all floors except the sixth, where a comfortable retiring parlor is provided for women employees who may be taken ill. One significant item in connection with the toilet room feature is the fact that some 600 individual towels and 85 to 100 roller towels are used every day. This means that every employee receives at least one towel a day. An artesian well furnishes excellent drinking water through faucets and marble basins in the hallways on every floor. A refrigerator system is installed partly for the restaurant service and partly for demonstrations in the showrooms. The refrigerating and vacuum plant machines are in the basement.

ELEVENTH FLOOR AND MAIN RESTAURANT

In describing the purposes of the building it is desirable to begin with the eleventh and tenth floors because they contain the restaurant and certain other features which are of common interest to all of the employees in the building. The manner of conducting this restaurant represents such a radical step in welfare work by a public service company that it deserves a detailed description. Originally the corporation planned to grant the restaurant an annual subsidy of $25,000 to enable it to supply the employees with a midday meal at cost price. On further consideration, however, the corporation decided to furnish meals absolutely free of charge. This decision has evidently met with ardent approbation from the employees, as is shown by the excellent attendance records. The luncheon time of 45 minutes has been found ample because little time is required to go to and from the dining rooms and there is no delay whatever at the tables. The restaurant serves about 650 lunches a day and of this number about 550 are required for the main dining room on the eleventh floor. The rank and file are divided into three shifts or messes so that individuals dine at the same time and the same tables every day. The first group stays from 11:30 to 12, the second from 12:15 to 12:45 and the third from 1 to 1:30. This leaves

15 minutes between the messes for resetting the tables, changing linen, washing dishes, etc. The cool and quiet location of the restaurant on the top floor of the building is in striking contrast to the average restaurant on the sidewalk level. Even the warmest summer days are made comfortable by the use of ceiling fans.

The dining room for the heads of departments and junior officers and the private dining room for the president, directors and other executives are on the tenth floor. These rooms have parquet floors and in



Date 191

(Leave the above line blank)

I, an employee of PUBLIC SERVICE, hereby apply for library privileges. I agree to observe all the rules of the Library, and to give immediate notice to the Librarian of any change of address or business.

Name .....

Occupation .....

..... Department

..... Company

..... City

The within applicant is an employee as stated, and the Library will be immediately notified if he be transferred or leave the employ of the company.

..... (Head of Dept.)

Date, ... 191

Office Building—Front and Back of Library Application

other ways are somewhat more elaborately furnished than the main dining room. The dining room of the department heads and junior officers is furnished with small round or rectangular tables so that parties of officials can confer during their luncheon. No distinction, however, is made in the character of the meals served in all of the different rooms. The food is of the highest quality and its preparation compares favorably with the average high-priced restaurant. The accompanying specimen menus will give a clear idea of the high standard of these meals. As no one must give tips or other gratuities, it is no exaggeration to say that the restaurant feature means a saving of $1 to $3 per week per employee. The large number of diners makes it feasible to offer great variety in the vegetables, meats, desserts, drinks and other constituents of the bill of fare. Cold meals are served when the heat is unusually oppressive. The restaurant is open for midday meals every working day except Saturday half holidays during July and August. It employs twenty-three waiters, nine cooks and assistants and eight pantrymen, including dish-washers. The labor charge is not excessive since these men are at liberty to work elsewhere in the late afternoon and evening.

Cold Consommé in Cup	Mock Turtle à l'Anglaise
Fried Chicken, Maryland	Stuffed Philadelphia Chicken,
Spinach à l'Anglaise	Giblet Sauce
Boiled Potatoes	New Carrots & Peas Persillade
Cold Lamb, String Bean Salad	Fried Sweet Potatoes
Cantaloupe	Assorted Cold Cuts,
Buttermilk Iced Tea	Lettuce Salad
Milk Tea	Fresh Pineapple Ice Cream
Coffee	Buttermilk Iced Tea
July 25, 1911	Milk Tea
	Coffee
	Aug. 3, 1911.

Office Building—Two Menus of Employees' Restaurant

The description of the restaurant would be incomplete if some reference was not made to the splendid culinary outfit and general kitchen facilities, which are of the most modern character. The system of preparing food here is a revelation in modern cookery when contrasted with the unskilful and unsanitary practices of many pretentious restaurants. Cooking, frying and similar operations are carried out on the mezzanine of the eleventh floor under the direction of an excellent chef. This kitchen contains ranges operated by live steam and gas, a mechanical potato peeler, double-bottomed soup pots, a motor-driven meat chopper and a steam cooker. The latter has separate air-tight compartments so that the odors of the various foods cannot intermingle. A pipe line from the basement leads to six refrigerators, one of which is used exclusively for fish on Fridays and for fruit on other days. The principal ice-boxes for meat storage are in the basement. A special dumbwaiter and an iron stairway serve for conveying material between the kitchen and the main pantry.

The pantry for the main dining room is at the rear of the eleventh floor. This section contains motor-driven dish-washing machinery, metal closets for dishes, large urns for cold and hot tea, coffee, etc., and a table on which sandwiches are prepared and other preliminary table work done. Owing to the length of the main dining room, four side pantries are used for extra dishes, tableware and napkins to facilitate the work of the waiters.

The eleventh floor also contains the elevator machinery, and a winding stairway leads to the tower, from which a fine outlook can be had over Newark and vicinity.

TENTH FLOOR—DINING ROOMS, ASSEMBLY HALL, LIBRARY, ETC.

The tenth floor contains the dining room of the junior officers and also a dining room for the executive officers. Lunch is served from 12.30 to 2 o'clock.

This floor also has an assembly room which seats 235 persons. It serves as a smoking room for the employees during their luncheon period, but its principal use is as a meeting center for various employees' associations. A bulletin board is installed to post notices of meetings, to give a list of technical magazines which are on file in the library and for miscellaneous matters of interest to the men. Several valet facilities, such as a barber shop and shoeblack stand,

adjoin the assembly room. This service is given at low prices because the concessionaires are not required to pay rent. A clothes-checking room, principally for winter and stormy weather, is also provided.

The company's free technical library is also on the tenth floor. In these days anyone can enjoy the use of vast collections of popular books and periodicals. It is much more difficult, however, for ambitious workers to obtain ready access to any large number of the purely technical books and periodicals of which they are in real need. This library is therefore proving of great value to the best men in the service. It is conducted along much the same lines as the average public circulating library. The reference room is open from 9 a. m. to 5 p. m. on week days and from 9 a. m. to noon on Saturdays, but it is closed on all holidays. The contents are available for circulation among all properly registered employees who have obtained application cards from the librarian or their local superintendent. Books are issued for home use if the application is approved by the head of the department. Circulating books may be kept for two weeks with the privilege of renewal for the same period. Unbound periodicals, except the current issue, may be kept for seven days without renewal. A fine of 2 cents a day is imposed for each volume kept beyond these limits. Should a borrower keep a book or paper for ten days beyond the allotted time, a messenger is sent for it at the cost of the user. The books loaned relate principally to gas, electric railway, electric lighting and other engineering subjects, although there are some standard textbooks of more general character. The librarian is always prepared to secure on request special data on any technical topic. Under certain conditions books are delivered upon written or telephone application free of cost.

NINTH FLOOR—EXECUTIVE OFFICES

The executive headquarters of the Public Service Corporation are on the ninth floor. They comprise the rooms of the president, vice-president, board of directors and other executive officials of the company. The directors' room has an annex containing tub and shower baths. A notable feature is the luxurious reception room which has been provided for callers. The same floor contains the offices of the general agent of the gas and electric interests of the Public Service Corporation and of the subsidiary Camden Coke Company. There is also an auxiliary office of the publicity department for use when its representative desires to be free from the large number of visitors who call at the regular quarters, which are located near the main entrance on the ground floor.

EIGHTH FLOOR—OFFICES OF THE LAW AND ELECTRICAL DEPARTMENTS

The eighth floor contains the offices of the general counsel of the corporation and of the real estate department, the principal law library and the drafting room of the electrical department. The latter is illuminated by Cooper Hewitt mercury-vapor lamps. It has a private winding stairway to the blueprinting room below.

SEVENTH FLOOR—ELECTRICAL AND MISCELLANEOUS OFFICES AND TELEPHONE

The general manager, general superintendent, illuminating engineer, plant engineer and purchasing agent of the Public Service Electric Company have rooms on the seventh floor. The treasurer and stock transfer clerk of the Public Service Corporation and the superintendent of the building are also on this floor, which contains in addition the telephone exchange. In the telephone department a chief, four girls and three men are employed to handle the wires which connect all parts of the Public Service system throughout the State. About 300 lines are now operated from this board.

SIXTH FLOOR—MISCELLANEOUS OFFICES

The sixth floor contains the offices of the general manager of the Public Service Gas Company and of the paymaster of the Public Service Railway, the drafting room of the gas company and the women's retiring room.

FIFTH FLOOR—ACCOUNTING OFFICES

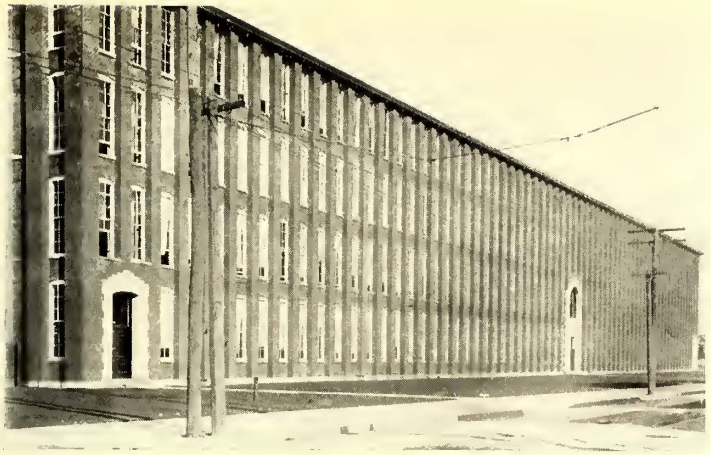
The fifth floor is used almost entirely for accounting purposes. It accommodates the comptroller of the Public Service Corporation and the general auditors of the gas and electric companies. It is also the headquarters of the "New-Business Department" of the gas and electric companies.

FOURTH FLOOR—GENERAL CLAIM DEPARTMENT

The fourth floor is devoted entirely to the general offices of the claim department, which is organized to handle the claim business of the gas, electric and railway companies. These offices include those of the general claim agent and assistant, the general solicitor, trial attorneys, etc. An auxiliary law library is provided for the special use of the railway department so that it is unnecessary for any of the claim attorneys in charge of railway business to go to the main law library on the eighth floor except in special cases.

THIRD FLOOR—RAILWAY OFFICES

As shown in the accompanying plan, the third floor of the main building and the L extension are used exclusively by the Public Service Railway Company. A common waiting room leads to the offices of the general manager, the superintendent of transportation, the mechanical engineer, the traffic agent and the general office staff. The offices of the superintendent of distribution, the superintendent of timetables and the railway cashier open directly on the corridor of the main building. In the extension, as indicated, are the offices of the superintendent of the Essex division of the employment department, the way department and the purchasing department. The rooms for the Essex division of the claim department are located on this floor in the extension, as indicated.



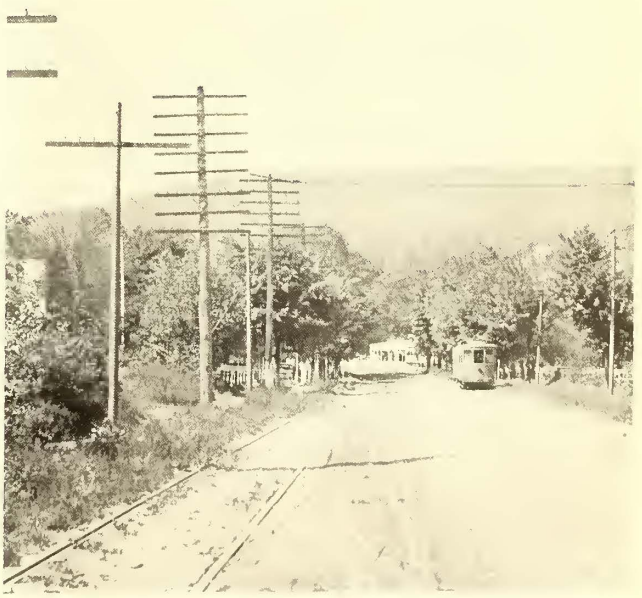
Industrial Plant at Paterson, Which Furnishes Evening Rush-Hour Traffic for Extra Cars

Shelter Station at Morsemere—The Sides Are Constructed Principally of Glass

Loop at Edgewater, Showing Line Which Connects Hudson River Ferry and the Palisades

Scene on Market Street, Newark, Near the Most Congested District

One of the Hudson River Ferry Boats Operated by the Company



Scene on Maplewood Line, Showing Orange Mountain in the Distance

Plate X

Street Scene in Residential Community of Hackensack

Intersection of Through and Crosstown Lines in Bloomfield, One of the Districts Reached by the Lines Radiating from Newark

Part of the Central Business District of Paterson, Showing Intersection of Market and Main Streets, the Point of Heaviest Traffic Movement in That City

Headquarters of the Public Service Railway and Allied Companies

Entrance to Main Floor on Broad Street Side of Public Service Building

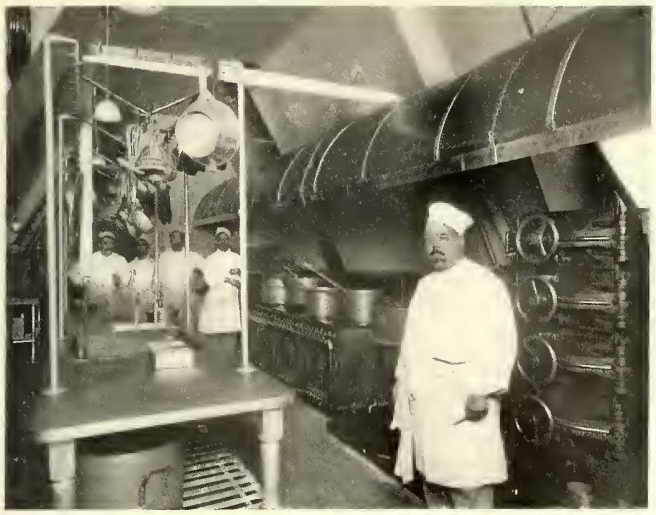
Part of Showroom on Main Floor of Public Service Building

Employees' Auditorium and Smoking Room in Public Service Building

Main Dining Room for Office Employees in Public Service Building

Dining Room in Public Service Building for the President and Directors

Dining Room in Public Service Building for the Heads of Departments and Junior Officers

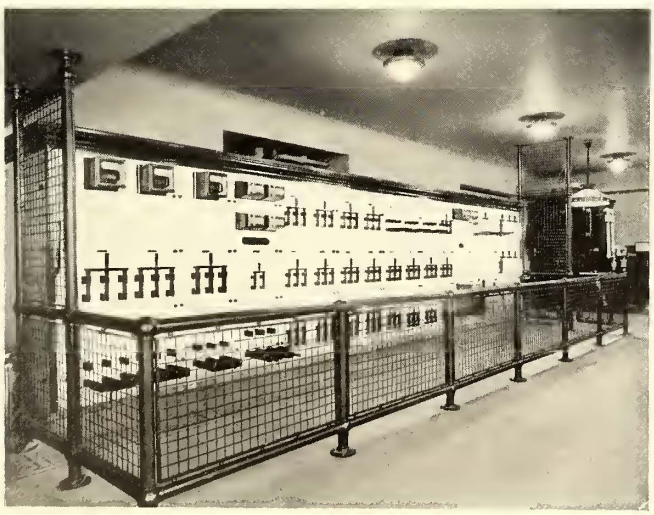


Part View of the Kitchen of the Public Service Employees' Restaurant

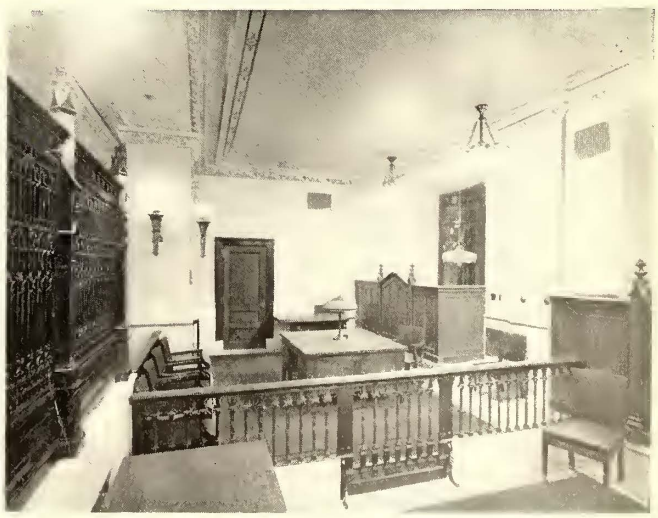
Part of the Pantry on the Tenth Floor for the Employees' Main Dining Room

Working Exhibit of the Complete Electric Kitchen, Located in the Basement

Compartments in the Basement for Testing the Absorption of Light by Wall Papers of Different Colors



Main Switchboard in the Basement of the Public Service Building

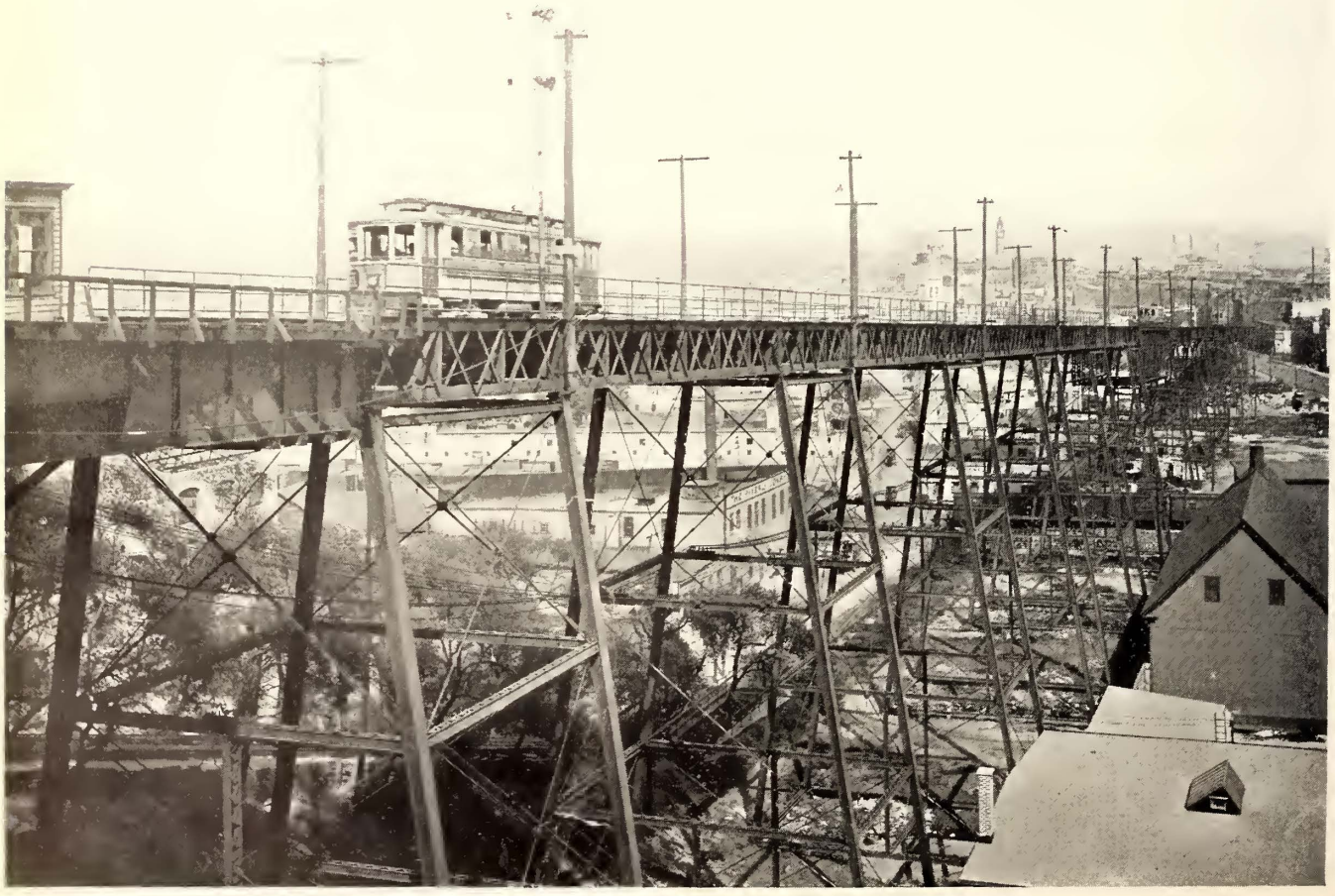


Offices of the Publicity Department Near the Broad Street Entrance

Plate XVI

Over-Crossing at Little Ferry

Plank Road Bridge Over the Hackensack River



A Portion of the Jersey City Viaduct for Surface Cars

There is also a space on this floor marked "Storage" which is used for valet service and for locker rooms where the building employees change their uniforms.

SECOND FLOOR—CLERICAL FORCES OF THE RAILWAY, GAS AND ELECTRICAL DEPARTMENTS

The rear part of the second floor of the main building consists of one large room for the bill clerks and bookkeepers of the electric and gas companies. Each man has a private locker for his set of ledgers so that there may be no dispute about whether one clerk has tampered with another's books. The complaint bureau and the credit department of the gas and electric companies adjoin this room. The second floor, including the extension, also houses the clerical force of the general auditor of the Public Service Railway Company; the new business promotion staff for gas, electric, power, lighting, automobile and other service, and the mailing room of the gas and electric companies.

FIRST FLOOR—PUBLICITY DEPARTMENT, SHOWROOMS, ETC.

The regular offices of the publicity department are at the Broad Street entrance on the first floor near those of the general cashier and of the consumers' meter department. This office receives and investigates general complaints, answers inquiries and gives information to press representatives on the different phases of the company's activities. The greater part of this floor is devoted to beautiful showrooms, where may be seen an enormous variety of gas and electrical fixtures, especially for lighting. In one of these showrooms each electrical fixture is separately wired so that its illuminating effect in actual service can be demonstrated. A handsomely furnished reception and waiting room is available for prospective customers or for other visitors who may wish to keep appointments with friends in order to go on shopping tours, etc.

THE BASEMENT—SHOWROOMS, BUILDING CONTROL APPARATUS, ETC.

The basement contains the machinery for the heating, lighting, ventilation, cleaning and plumbing of the building. There is also a Howard master clock for synchronizing all clocks throughout the building and a white marble switchboard for all of the power and lighting circuits. The basement gas and electric showroom differs from that on the main floor in having a large variety of heavy exhibits. Two of the most striking features are the all-gas and all-electric kitchens which are installed side by side. Each kitchen is operated on alternate weeks by a skilful housekeeper who shows how baking, cooking and other home food manufacture can be done with either of these modern powers. Other exhibits are household washing machines, refrigerators and complete automobile electric charging outfits. An ingenious scheme for demonstrating the fidelity with which the different kinds of artificial illumination approach the quality of sunlight is afforded by a darkened showroom which has a number of ground-glass compartments. Each cell contains some prominent type of gas or electric illuminant, with the exception of one compartment which has a passage for receiving daylight. Other features of the showroom are vacuum cleaners and an electric player-piano.

The basement also contains the mailing department of the corporation, where about 45,000 pieces of United States mail are handled every month. Two boys distribute and collect mail throughout the building all day long. The company also maintains a delivery system for private mail to all offices throughout the system. The rest of the basement floor is used by the collectors of the gas and electric companies.

WAY DEPARTMENT

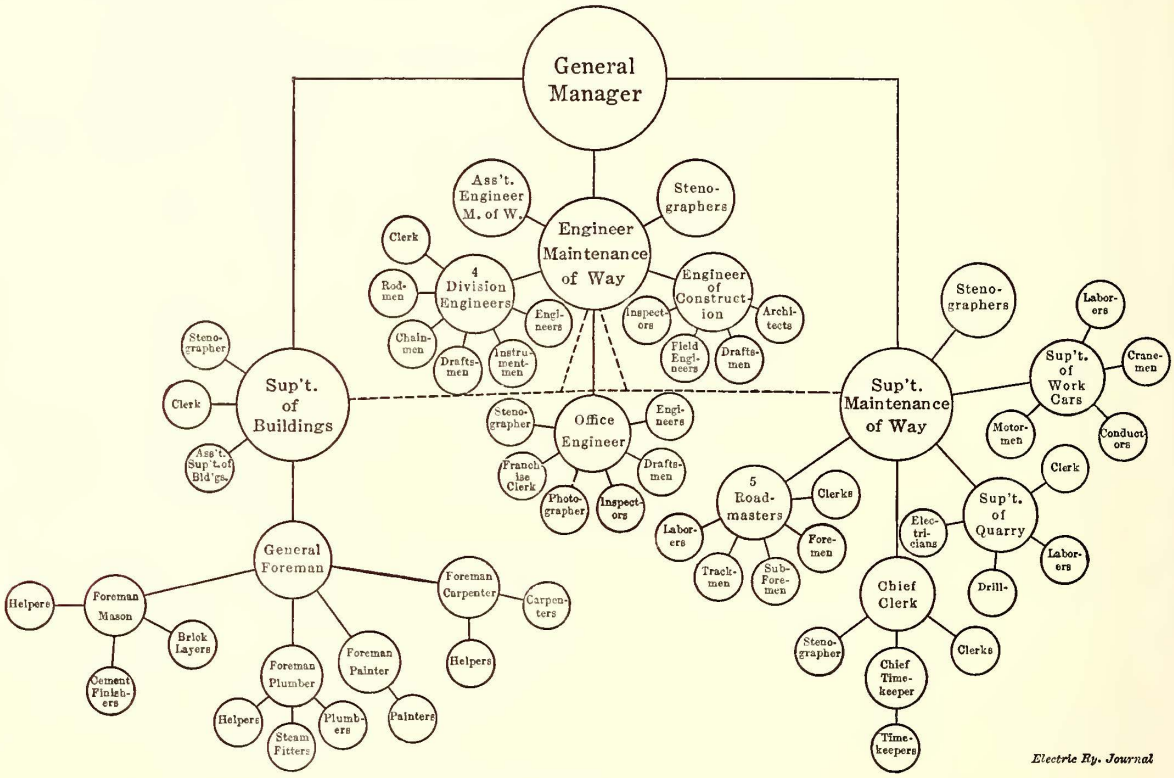
THE way department of the Public Service Railway not only has charge of all of the track work of the system, but it is also responsible for all stationary structures on the property except those used for the generation, transmission and distribution of electrical energy. The work of the way department may be summarized as embracing the construction and maintenance of tracks, bridges, viaducts, culverts, toll roads, wagon elevators, docks, ferry houses, boats, way department yards and buildings, service cars, carhouses, car shops, office buildings, passenger terminals and stations, and the residences of caretakers of the company's property.

A peculiarity of the organization of this department is the absence of one superior officer. As shown in the accompanying chart, the department has three co-ordinate officers, all of whom report directly to the general manager. These officers are the following: Superintendent of way, engineer of maintenance of way and superintendent of buildings. The forces under these officials, however, are always available for work in any other branch of this department. This relationship is indicated by the broken lines between the three co-ordinate officers. All authorizations are issued directly by the general manager in accordance with the requisitions which are made upon him by the officer who is responsible for the specified work.

DUTIES OF CO-ORDINATE OFFICERS

The superintendent of way executes and maintains the work for which designs and specifications are made by the engineer of maintenance of way, subject to the approval of the general manager. In addition to the regular maintenance of track and bonding, this officer has charge of the storage yards, the stockrooms, the supply trains, the quarry and other facilities for carrying on the business of the department. The activities of this branch and of the engineering forces are carried out according to the following divisions: Essex, 199.95 miles; Hudson, 152.05 miles; Central, 158.88 miles; Southern, 118.70 miles; Bergen and Passaic combined, 49.33 miles and 80.672 miles respectively. The central division also has charge of the 25 miles of single track which the Public Service Railway is now operating for the Elizabeth & Trenton Railway. Each division has a roadmaster, who reports to the superintendent of maintenance of way. The roadmaster has a clerk and foremen of the different subdivisions. The number of subforemen and of the track men and helpers in their charge depends, of course, upon the amount of work in hand, but the general form of the organization is the same under all conditions.

The engineer of maintenance of way prepares the plans and specifications for carhouses, terminals, bridges, track layouts and extensions, etc., and employs inspectors to insure compliance with the terms



Way Department—Organization Diagram

of all such specifications and contracts. He also has charge of the photographic facilities which are maintained for the use of all departments of the railway service. This officer has an assistant engineer of maintenance of way, an office engineer to take care of the clerical forces of the department, the drafting room and records, an engineer of construction and five division engineers, who follow up the work in the field, such as track and building work.

The superintendent of buildings is responsible for the maintenance of carhouses, terminals, stations, bridges, viaducts, trestles, wagon elevators, docks, ferry boats and residences. He has one general foreman for each of the principal building trades, such as carpentry, masonry, painting and plumbing. Each general foreman is responsible for his class of labor in the entire territory, with the exception of the distant isolated Southern division at Camden, where one foreman has direct charge of all the different classes of building work mentioned. Every general foreman has one assistant foreman.

OTHER ORGANIZATION DETAILS

The number of men employed by the way department fluctuates greatly throughout the year. The superintendent of maintenance of way employs from 150 to 3000 men; the engineer of maintenance of way employs from 40 to 75 men, and the superintendent of buildings from 30 to 135 men.

One of the most important features in the operation of the department is the weekly report which is prepared for the general manager to keep him in close touch with every detail of its work. This report briefly describes all projects in hand, whether pending or completed. It will be observed from the accompanying abstract of one of these reports that subjects of general interest, claim department matters, franchise operations and the work of the separate divisions are treated in the order named. Furthermore, these items are accompanied by references to the party or parties who are responsible for any delays in the work. Thus, the reference, under general pending matters, to the sprinkler system at the Market Street carhouse shows that the work was being held up because the real estate department had not yet secured extra land needed for a tank.

A few words under the sub-head "Work Done During the Week" serve to show the general progress which is being made on each task in hand. For instance, it is reported that one contractor is driving the pile foundation for the Passaic Wharf carhouse and that another is installing a heating plant at the Plank Road storeroom. The report on the Hoboken terminal shows that the work has been completed on the first floor but that the sash for the second floor is still missing. The exact progress of a job is presented in such cases as the making of drawings and the inspection of material. The general matters are concluded under the sub-head of "Work to Be Done." This explains what jobs are in hand and why they are being delayed.

ABSTRACT OF ENGINEERING REPORT TO THE GENERAL MANAGER.

Newark, N. J., July 1, 1911.

Dear Sir:—Below please find report of Office of Engineer of Maintenance of Way as of July 1, 1911:

GENERAL

PENDING	NO WORK DONE DURING THE WEEK
Sprinkler system, Market Street carhouse.	Waiting on Real Estate Dept. to get extra land for tank.
Crows Mill Bridge.	Making repairs to temporary bridge.
Ferry property, N. Y. and Edgewater.	Submitted estimate. Instructed to include in annual estimate—1912.
Shelter Palisade and Hillside Avenue.	Property owners' consent obtained.

WORK DONE DURING THE WEEK	
Hackensack River Bridge, Hudson River Road.	Work has been started.
Passaic Wharf carhouse.	Contractor driving pile foundation.
Bergen Point ferry slip.	Preparing material for erection.
Plank Road storeroom.	Contractor installing heating plant.
Sip Avenue terminal.	Revised formal contract signed.
Hilton carhouse.	Two bays completed, ready for trusses. Foundation completed and laying brick on other bays.
Hoboken terminal inclosure.	Waiting for sash for second floor. Iron work completed on first floor.
Curbing Monroe Street, Ridgewood.	Cement curb laid on west side. Curb will be completed this week.
Special work for Summit and Pavonia Avenues, Jersey City.	New special work drawing completed and work ordered.
Wye for Greenville carhouse.	New special work drawing 50 per cent completed.
Inspection of lumber from the Trexler Lumber Company.	Seventy-five per cent completed.

WORK TO BE DONE	
Photographs of sections between Milltown and Trenton.	Maps completed, negative made and received June 30.
Carhouse layout book of capacities.	Delayed on account of other rush work.

CLAIM DEPARTMENT

SURVEY FINISHED AND MAP TO BE MADE

Jas. Van Auken, Broad Street, Lackawanna Avenue, Newark.
Frederick Huth, Bergen Street and Winans Avenue, Newark.

SURVEY AND MAP TO BE MADE

George Weiss, Tenth Street and Fourteenth Street, Newark.
Jacob Bab, Belmont Avenue and Montgomery Street, Newark.

FRANCHISE REPORT

PETITIONS WRITTEN AND SENT TO MR. GILMOUR SINCE LAST REPORT

JERSEY CITY

8949-C—Warren Street Extension with auxiliary connections.
8951-C—Relocation of single track with auxiliary connections in Jersey Avenue.

NUTLEY

8937-C—Revised relocation of existing Nutley carhouse connections.

CERTIFICATES OF STATE FORWARDED TO MR. GILMOUR

JERSEY CITY

8949-C—Warren Street Extension with auxiliary connections.

HUDSON DIVISION

PENDING	NO WORK DONE DURING THE WEEK
Hudson division map	About 50 per cent completed.

WORK DONE DURING THE WEEK	
List of bridges.	Preparing report.
Bergen pike tracings.	About 75 per cent completed.
Elias cut-off.	Grades being taken.

PHOTOGRAPHIC DEPARTMENT

WORK DONE DURING THE WEEK	
Little ferry.	One negative at the site of viaduct.
Hudson claim.	One negative Montgomery car No. 1318.
Bridges and culverts.	Four negatives on Bergen Pike.
System maps.	Printing.

ESSEX DIVISION

PENDING	NO WORK DONE DURING THE WEEK
Erie siding, Passaic.	Awaiting decision of Erie officials.

WORK DONE DURING THE WEEK	
S. O. & M. T. Company.	Survey under way.
D., L. & W. loop, Montclair.	Sketch to Mr. Hand, of the D., L. & W., for his information.

CENTRAL DIVISION

PENDING	NO WORK DONE DURING THE WEEK.
Line and grade on Raritan Avenue, Highland Park.	Held by orders from Mr. White.
Measurement of pavement, George Street, East Bound Brook.	Will be measured when job is finished, 20 per cent is measured.
Line and grade elimination of curves, Roselle.	Waiting for house to be moved.

WORK TO BE DONE

List of bridges.	Thirty-seven per cent completed. Will start to have list typewritten about the end of next week.
List of electric welds.	Note of work being taken as work progresses. Welder returned yesterday.

SOUTHERN DIVISION

PENDING	NO WORK DONE DURING THE WEEK
Request of Camden Water Department for permission to connect into our 18-in. drain from carhouse.	Agreement presented to Mr. Hertline, of the Water Department. No action taken, pending consultation with Mr. Bailey.
Compilation of bridge data.	Seventy per cent completed. Held up by more urgent work.

WORK DONE DURING THE WEEK

Railroad crossing at Pennsylvania Railroad at Westfield Avenue.	Met representative from Mr. Snowden's office in reference to repairing joints and surfacing crossing. Trouble thought to be due to leak in pipe of Stockton Water Company. Railroad representative to consult with the water company.
Grading track East Atlantic Avenue, Haddon Heights.	Arrangements being made to consult with Mr. Benj. Lippincott, a former resident of Haddon Heights, who was influential in having the road constructed, with the idea of securing additional information.
Haddon Avenue and Newton Avenue special work, Camden.	Fifty per cent completed.
Electric welds Broadway, Kaighn Avenue, Fifth Street, Second Street and State Street, Camden.	Measurements made with representative of Barber Asphalt Company and completed.

NORTH PATERSON EXTENSION

PATERSON STATE LINE

PENDING	NO WORK DONE DURING THE WEEK
Connections on Wagaraw Road to Arnold silk mill.	Work held up pending action of County Freeholders.

WORK DONE DURING THE WEEK

Third Street reversed curve, North Paterson.	New property map received from real estate department. Curves and poles located. Road bed graded and ties in place.
Ballasting and surfacing.	Eighty-three per cent complete.
Monuments.	Ninety per cent in place.

Yours very truly,

Engineer Maintenance of Way.

The next main heading in the weekly report mentions the survey and map work done for the claim department. Following this are reports relating to franchises for extensions, relocations, connections, etc. The report on the separate divisions is followed by notes on the photographic department and on the construction of new sections, such as the Paterson line.

These weekly reports refer to several hundred subjects each, but despite this their concise arrangement makes it easy for the general manager or other executive officers to follow at will any job, from the largest to the smallest. This weekly log also tends to eliminate friction between subordinate officials, because all know that anyone's delinquencies will be brought to the attention of the general manager in short order.

OFFICE FACILITIES

The executive headquarters of the way department are on the third floor of the Public Service Building, Newark, in proximity to the offices of the general manager. These headquarters include the printing, filing and drafting rooms and the offices of the following way department officials: Superintendent maintenance of way; engineer maintenance of way; assistant engineer maintenance of way; superintendent of buildings; office engineer; construction engineer and engineer of the Essex division, which includes the city of Newark. The offices of this department are uniformly 15 ft. square. They are finished in oak, equipped with Derby office furniture to match. The drafting room, which is 30 x 60 ft. in size, is located along the entire rear of the building, to obtain the benefit of natural light on three sides. As shown in the illustration of the interior on plate XXII, this room is provided with office desks, filing cabinets and drafting tables (including four of the Keuffel & Esser adjustable type), and all field engineers' supplies, except stakes. The extent of the field work may be judged by the circumstance that there are now in use eight transits and six levels. The blueprinting for all the railway departments is done on the Federal arc-lamp machine shown on plate XXII, which in one minute can print a strip up to 3½ ft. wide and 3 ft. long. The blueprinter and the vats for washing and drying prints are placed in a compartment which adjoins the drafting room. A dark room is also provided for photographic work.

All of the drawings of the way department are made to the following standard sizes for economy and convenience in filing: Class A, 7 in. long and 11 in. wide; class C, 15 in. long and 26 in. wide; class E, 22 in. long and 39 in. wide; class H, 42 in. long and 39 in. wide; classes K, L and J are roll length, respectively 11 in., 22 in. and 33 in. wide. There are now on file about 8000 drawings, which are indexed geographically in the following convenient way: The files are first divided according to the names of the operating divisions, then subdivided by townships and then further subdivided alphabetically, according to the name of the street, road or highway. Photographs and negatives are stored in the same manner.

JOB ORDERS, CONTRACT FORMS, ETC.

A chief clerk has charge of all correspondence, authorizations, job orders and similar papers. The job-order system is used to account for all labor done by all departments and is described in detail in the chapter relating to the accounting department.

Copies of the approved job order are made for the issuing office, the auditor, the assistant storekeeper in charge of way supplies, the chief timekeeper and the subordinate officer who was responsible for the original requisition. The purpose of giving the storekeeper a copy of the order is to enable him to have the material ready before it is requested. Since the storekeeper knows where the material is required, he is able to save considerable mileage by co-operating with the superintendents of the supply trains. A copy of the job order is given to the timekeeper to enable him to allocate the proper labor charges without asking any questions of the man in charge of the job.

At the end of the month the auditor sends to the

chief clerk of the way department a list of the actual cost of the individual job orders. The comparison of these costs with the original estimates offers a sure method of finding the calculating ability of those who were responsible for the original requisition. It also serves as a check against gross mistakes in future estimates. It is easy to discover those sections which are costing too much for maintenance, because every section of track has a permanent job order number, against which the expenditures are charged. Analyses of the latter kind are usually made by the engineers once a year.

The weekly report to the general manager, previously described, is based in part on the daily construction-work report, the headings of which are reproduced in the engravings on this page. This report gives the authorization number of each job, the amount of track and paving completed to date and on the one day preceding the date of the report, the number of subforemen, laborers, teams, cars and the time estimated for the completion of the job.

STANDARD FORM OF AGREEMENT

One of the most important documents used by the way department is the accompanying agreement form, which is used in connection with all contracts. This document is the result of the careful collaboration of the engineers of the Public Service Railway Company, put into legal phraseology by the chief attorneys of the corporation. It is so drawn that it could readily be used by other railways for the same purpose. The agreement embraces a preamble and seventeen articles and is published below:

THIS AGREEMENT made this.....day of..... in the year of our Lord one thousand nine hundred and .....(191..,) between

(hereinafter called Contractor), party of the first part, and Public Service Railway Company, a corporation of the State of New Jersey (hereinafter called Owner), party of the second part:

Witnesseth: That the said parties hereto have mutually bargained and agreed, and by these presents do mutually hargain and agree, to keep, ohserve and perform all and singular the stipulations, undertakings and agreements hereinafter specified, each party agreeing as to tbe matters and things said party is to do.

First.—Owner proposes to have built and constructed for its use and purposes
situated at
in the State of New Jersey.

Second.—The Contractor is to furnish all the material and do all the labor required for said work in the erection and completion of the
in all respects according to the drawings and specifications hereto annexed and made a part hereof, which said drawings and specifications are to he read, considered and deemed as if they were herein particularly set out.

Third.—Said Contractor is to commence work herein required
and complete the same on or before the

Fourth.—Contractor shall immediately take away and remove any material furnished for use in the performance of said work deemed defective by the Owner; either before or after it is put in place, and furnish in the place and stead thereof suitable material; and shall in like manner do over in a proper and satisfactory manner any work imperfectly done in the opinion of the Owner in and about said work. Notice as to such material or such work from the Engineer of the said Owner specifying wherein the defect, improper or unsatisfactory material or work consists shall he deemed sufficient notice to said Contractor.

Fifth.—All work to be done and material furnished under this agreement shall be subject to inspection and performed to the entire satisfaction of the Engineer of the Owner, and no money shall at any time become payahle in pursuance of tbis agreement until a certificate shall have been given by said Engineer to the effect that said Contractor is entitled to such payment under the provisions of this agreement. It is understood that the said Engineer may act herein by his duly appointed Assistant or Inspector.

Sixth.—Said Owner is to pay said Contractor for the said work, in the instalments and manner hereinafter specified, the sum of

Seventh.—In case tbe said Owner shall desire any changes in either the work or material, it shall be at liberty to have the same made, and said Contractor does hereby agree to make such changes. The same shall only he on the written order of the Engineer of the said Owner; and if the same involve any additional material or labor, such order shall so statc the same, and the amount of cost to he paid therefor, in addition to the aforesaid contract price; and should the same require any less material or labor, the same shall in like manner he specified in said order; and the amount of payment to he ahated therefor from the said contract price shall be likewise therein specified.

Eighth.—The Owner will pay to the said Contractor the said sum so specified in manner following, that is to say: Within five days after the close of any calendar month an estimate shall be made by the Engineer of the said Owner of all the work performed and the material furnished for said month, and the amount thereof based upon the said contract price less
per cent, to be forthwith paid to the said Contractor; and within after the final completion of all the work to the entire satisfaction of the said Owner, the balance owing to said Contractor shall he paid to said Contractor in cash.

Ninth.—The time for the full performance and completion of this contract is a matter of essential importance to the said Owner and required by it in its business, and upon which various enterprises and transactions are dependent, and it has heen hargained and agreed by and between it and tbe said Contractor that any delay beyond the time herein specified for the completion of the work herein contracted to be done by the said Contractor will cost the said Owner a sum of
per day; and it is therefore expressly agreed in consideration thereof, that from the balance of the sum owing said Contractor upon the completion of this contract, there shall be retained by said Owner as and for compensation for such delay a sum of dollars for each day in excess and beyond the time herein limited; provided, however, that if said Contractor shall finish and complete said work on or before the day of next, said Owner shall and will pay said Contractor an additional sum to said contract price equal to
dollars for each day before said limited time the same is finished as aforesaid.

Tenth.—It is further agreed and understood by and between tbe parties hereto that in case delay he occasioned the said Contractor from strikes of workmen, lock-outs in the shops where the material is produced, or strikes upon the railroads interfering with the transportation of materials, or delay occasioned by flood, fire or disaster, then and in every such case the delay incident to said strikes, lock-outs, fire, flood or disaster shall be allowed the said Contractor and not included as a part of the time in wbicb said Contractor is to finish and complete said contract as herein specified.

Eleventh.—In case the Owner shall fail to furnish any material or thing on its part to he furnished or supplied the said Contractor for the finishing and completing of the said contract, and such failure shall continue after five days' written notice from said Contractor to said Owner of such failure, that then and in such case the numher of days said failure shall continue after the expiration of five days after said notice shall he allowed to the said Contractor as additional time for the completion of said contract.

Twelfth.—This Agreement and the drawings and specifications are intended to fully co-operate and complement each other; and in case of any dispute as to the meanings of said drawings or said specifications, the same shall he referred to the Engineer of the Owner for decision, whose decision shall be final and binding, and it is hereby accepted by said Contractor.

Thirteenth.—Said Contractor shall and will discharge the said work, material and land whereon the same are erected from any and all lien, claim or demand from any person or persons whomsoever, so that the said Owner shall and may have, possess and enjoy the same free from any and all liens, claims or demands of any other person or persons whomsoever claiming by, through or under said Contractor.

Fourteenth.—Said Contractor shall and will indemnify, protect and save harmless the said Owner from any and all claims, costs, suits, demands, damages or proceedings whatsoever for or on account of any accident to any person or persons, whether working for the said Contractor or otherwise however; and for any like claim, suit, demand or damages for or by reason of

PUBLIC SERVICE RAILWAY COMPANY—MAINTENANCE OF WAY DEPARTMENT

DAILY CONSTRUCTION WORK REPORT FOR_____

LOCATION	AUTH. NO.	TO BE DONE		DONE TO DATE		YESTERDAY'S WORK DONE		WORKING FORCE TODAY					DAYS TO COMPLETE	REMARKS
		FT. TRACK	FT. PAVING	FT. TRACK	FT. PAVING	FT. TRACK	FT. PAVING	NO. FOREMEN	NO. SUB-FOREMEN	NO. MEN	NO. TEAMS	NO. CARS		

Way Department—Heading of Daily Construction Work Report

any injury to any property caused or occasioned by any act or omission of said Contractor or persons acting for him.

Fifteenth.—Said Contractor further agrees before any payment may be required to he made hy said Owner under these Presents, that the said Contractor will cause to be made, executed and delivered to the said Owner his bond or honds in the sum of dollars with sufficient surety satisfactory to said Owner conditioned for the faithful performance and carrying out to the perfect satisfaction of said Owner of all the stipulations, undertakings, contracts and agreements herein contained, and to indemnify, protect and save harmless the Owner from any and all damages, demands, costs or expenses incurred for or on account of or hy reason of any liens, claims or demands whatsoever, either for material or from lahorers, mechanics or others, or from any suit, action, claim, demand or damage arising from accident to any person or persons whether employed upon said work or not; or from any injury or damage to any property occasioned by said Contractor or person acting for or under said Contractor; so that the said Owner shall and will he saved and forever held harmless from, hy reason or on account of anything done or permitted to he done hy said Contractor, or any person or persons acting for said Contractor, or any matter or thing which may he improperly omitted to he done under said Contractor, by any person or persons acting for said Contractor

Sixteenth.—This contract on the part of said Contractor shall not be assigned or transferred to any other person or persons whomsoever.

Seventeenth.—Should the Contractor fail or neglect to furnish either sufficient workmen or material, or hoth, for the efficient and reasonable performance in due time of the work herein provided, and such failure and neglect shall continue for a space of three days after the service hy the Owner on the Contractor of a written notice, specifying wherein such failure or neglect consists, that then and in such case said Owner may supply such workmen or said materials, or both, and the cost and expense incurred hy said Owner therefor may he deducted from any sum due or owing or which there may thereafter become due or owing under this contract, and no money shall be payable to said Contractor until all of said cost and expense is paid and satisfied to said Owner. In case such cost and expense exceeds the sum due or to become due under this contract, said Contractor will pay said Owner such cost in cash.

Instead of supplying such workmen or material, or hoth, said Owner may at its option at the end of said three days give notice in writing to Contractor that the Contractor's right to continue said work on this contract has ended, and said Owner may engage some other person or persons to do the same at the cost and expense of said Contractor, using for that purpose any of said contract price remaining; any cost in excess thereof the said Contractor is to pay said Owner. If there should remain any of said contract price after paying said Owner such cost and expense, it shall he paid to said Contractor. The remedies and provisions herein reserved hy the said Owner are in addition to any legal remedies possessed by it, and are to be deemed and taken as cumulative remedies, and not to exclude any other lawful remedies not herein specified.

And to the faithful performance and fulfilment of all and singular the ahove mentioned stipulations, undertakings and agreements, said parties hereto do hereby bind and oblige themselves and their legal representatives each to the other and the legal representatives of such other

In witness whereof, the said parties have caused these Presents to he properly executed on behalf of each; dated the day and year first ahove written.

PUBLIC SERVICE RAILWAY COMPANY,

By

Approved: Vice-President

Attest:

Gen. Mgr.

As to form:

Ass't Counsel.

Secretary.

YARDS, STORAGE AND SERVICE CARS

The storage and supply train headquarters of the way department are at the Passaic Wharf, which is located on the Passaic River, Newark. This yard has recently been enlarged from 12 acres to 35 acres. In fact, the last addition was purchased on Aug. 24 of this year. The property consists of reclaimed meadow land, which has navigable water on one side and a siding to the Pennsylvania Railroad on the other. Water shipments are brought alongside a 400-ft. dock, which is equipped with unloading machinery for cars and boats.

Among the structures at this installation are an electric sand-dryer equipment and storage warehouse, shops and tie-preservation plant. Sand is brought to the sand dryer by means of scows, carrying from 300 cu. yd. to 600 cu. yd. each. The total capacity of the dryer is about 200 cu. yd., which is sufficient to supply all sand required for traction as well as for all construction throughout the system, with the exception of the Southern division. The wet sand is placed on a belt conveyor which delivers it to the rotating shell of the sand dryer, where it comes into direct contact with the flames of a furnace. The hot air from the furnace is forced through the shell by means of a blower, and the hot gases are carried up the flue. A bucket conveyor delivers the dried sand to storage bins. The entire sand-drying equipment as described was furnished by the American Process Company, New York.

The shops at Passaic Wharf have rip-saws, borers and other woodworking tools for cutting and trimming lumber before it is delivered at the place of installation. This advance preparation insures good supervision, eliminates much waste and permits more accurate work than could be obtained with hand tools in the field. All other work for the track department, except minor blacksmith operations, plate drilling and rail bonding, is carried on at the nearby Plank Road shops of the rolling-stock department. The company does not believe in the home manufacture of special work, because it finds that lower prices can be secured in competition, especially when the cost of maintaining a plant and storage room is considered.

The Passaic Wharf tie-preservation plant, which shown in one of the illustrations on plate XXIV, may be used for either creosoting or the carbolineum superficial methods. The illustration shows the conveyor carrying ties into an immersion tank. When the superficial treatment is employed this plant takes care of 1000 ties a day. Large timbers employed for trestle and bridge service are brush-treated at the locality where used.

The Passaic Wharf property is well supplied with stationary and movable hoisting machinery and service cars. Some of this equipment is shown on plates XXI and XXIII. One view on plate XXIII shows an electrically controlled stationary crane and clam-shell buckets loading sand on a standard motor-equipped supply car. This stationary crane is also used for discharging boats. Another view presents a derrick car in action, and incidentally a part of the outside special-work storage. A third view illustrates a Brownhoist 10-ton crane at work at Passaic Wharf.

Plate XXI, of the storage yards at Plank Road, shows how neatly the rail may be piled with the use of power cranes.

A very interesting addition to the service-car equipment is embraced in two special-work crane cars which have recently been furnished by the Brown Hoisting Machinery Company, as illustrated on plate XXI. The body framing is of steel with a wood floor containing steel plates or ribs to minimize wear. When the 23-ft. 6-in. boom of these cars is extended each crane will lift 3000 lb., and when it is raised 6000 lb. The cranes can work with their grab buckets without interfering with any load on the car due to the condition that the crane is elevated about 2 ft. above the floor. Hence there is no longer required an extra car for carrying rails. The boom heel is also ele-

vated, thus permitting material to be placed under the boom when the car is in transit. Another special feature is the addition of a 22-cu. ft. grab bucket for loading excavated material from the track onto the work cars. At present, in excavating for new track work, the earth is thrown to one side, and the work cars haul the dirt away at night, the dirt being loaded by hand. It is intended to handle the dirt with the grab buckets of the new cranes, from the use of which a considerable saving in money and time is expected. These cars are carried on Peckham No. 100 trucks.

Among the portable equipment used in track construction is a Ransome concrete mixer for making concrete in the fields; Champion portable stone crushers, made by the American Roads Machinery Company, for crushing old stone for use as ballast or in concrete mixtures; Universal 4 ft.-gage road rollers for rolling the subgrade between rails; Buffalo wide-gage rollers for subgrade-pavement work; three bonding cars for applying the brazed bond of the Electric Railway Improvement Company; one Kerwin corrugation grinder, owned by the company, and one Gherky corrugation machine, which is operated under contract. Illustrations are presented also of a Watson-Stillman portable hydraulic rail bender, which can bend rails weighing as much as 130 lb. per yard, and a Long & Allstatter stationary rail bender. Until recently it was the company's practice to use the portable rail bender for curving rails in the field at the place of use. It is now customary, however, to make exact measurements on the job, after which the rails are bent with the stationary machine at Passaic Wharf. The stationary bender is driven by a G. E. 550-volt, 15-hp motor through bevel gearing and a silent chain. The accompanying table shows in detail the number and class of every service car in use.

THE QUARRY

For several years past the company has operated a quarry at Fairview, which is located on the Bergen Turnpike, between West Hoboken and Hackensack. This quarry has recently been enlarged from 10 acres to 25 acres, giving a visible supply of 1,500,000 cu. yd. of trap rock. The crushing equipment consists of one No. 4 and two No. 6 Allis-Chalmers crushing plants, which have a combined capacity of 600 cu. yd. a day, which is practically equal to that of the storage bins. The blasted rock is brought to the crusher in narrow-gage railway cars instead of by teams, as was the former practice. One of the interesting features of the plant is that all apparatus, except the air drills, is electrically operated, the combined motor capacity of the crushers and air compressors being about 500 hp. Another interesting feature is the use of manganese steel for the conveyor buckets and for the inner shelves of the screens. This type of reinforcement has proved very effective in reducing the frequency and total cost of renewals.

The cost of delivering crushed stone from the Fairview quarry alongside of any job within a radius of 20 miles averaged 47 cents per cubic yard, but was lowered to 38 cents per cubic yard by changing to trail-car haulage. Both figures include labor, power, maintenance of line and track equipment and general expenses. Another economy was effected by making use of returning empty cars for the distribution of supplies from Passaic Wharf.

The operation of this quarry has proved satisfactory to the company from two important standpoints. It has produced a considerable saving over the cost

TABLE X.—SHOWING THE NUMBER OF WORK CARS OF THE PUBLIC SERVICE RAILWAY, EXCLUSIVE OF TWO NEW CRANE CARS

NORTHERN DIVISION WORK CARS

No.	End	Motors	Control	Trucks	Assignment or Type
5602	D	4–80	2-K-6	2 McCord	M. of W. Open Box.
5603	"	4–68	2-K-6	2-P-14-B-3	M. of W. Box.
5604	"	4–68	2-K-6	2-P-14-B-3	M. of W. Semi-Box.
5605	"	4–68	2-K-6	2-B-27-G	"
5606	"	4–68	2-K-6	2-P-14-B-3	"
5607	"	4–68	2-K-6	2-P-14-B-3	"
5610	"	2–1000	2-K-10	1-B-21-E	M. of W. Flat.
5620	"	4–80	2-K-6	2-P-100	M. of W. Rail Car.
5621	"	4–80	2-K-6	2-P-100	"
5622	"	4–80	2-K-6	2-P-100	"
5623	"	4–80	2-K-6	2-P-100	"
5624	"	4–80	2-K-6	2-P-100	"
*5625	S	4–80	1-K-6	2-P-100	M. of W. Crane.
5626	D	4–56	2-K-6	2 Baldwin	M. of W. Semi-Box.
5628	"	Trailer	...	2 Hewitt	M. of W. Dump.
5629	"	"	...	"	"
5630	"	"	...	"	"
5631	"	"	...	"	"
5632	"	"	...	"	"
5633	"	"	...	"	"
5634	"	"	...	"	"
5635	"	"	...	"	"
5636	"	"	...	"	"
5637	"	"	...	"	"
5638	"	4–101	2-K-6	"	M. of W. Open Box.
5639	"	Trailer		"	M. of W. Dump.
5640	"	"		"	"
5641	"	"		"	"
5643	"	4–101	2-K-6	2-P-100	M. of W. Rail Car.
5644	"	4–101	2-K-6	2-P-100	"
5645	"	4–101	2-K-6	2-P-100	"
5646	"	4–101	2-K-6	2-P-100	"
5647	"	2–800	2-K-10	1-B-21-E	M. of W. Flat.
5652	"	Trailer		1-P-6	"
5653	"	"		1-P-6	"
5655	"	"		2-P-14-B-3	"
5657	"	2–52	2-K-2	1-P-9	M. of W. Battleship.
5660	"	2-W-3	2-K-10	1-B-21-E	M. of W. Semi-Box.
5661	"	Trailer		1-P-6	M. of W. Flat.
5662	"	"		"	"
5663	"	4–57	2-K-35	2 Taylor	M. of W. Rail Car.
5664	"	4–57	2-K-35	"	"
5665	"	4–57	2-K-35	"	"
5666	"	4–57	2-K-35	"	"
6003	D	Trailer		1 McGuire	M. of W. Tank.
6006	"	4–67	2-K-6	2-P	M. of W. Loco.
6009	"	Trailer		2-P-8	M. of W. Flat.
6011	"	"		1 White	"
6012	"	"		1-P-8-9	M. of W. Crusher.
6013	"	"		1-P-6	"
*6014	"	"			M. of W. Crane.

*Brown, 3-ton Hoist.

SOUTHERN DIVISION WORK CARS

No.	End	Motors	Control	Trucks	Type
5913	D	2–49	2-K-10	1-B-21-E	M. of W. Dept.
5921	"	Trailer		1 L+F	M. of W. Flat.
5922	"	"		1 Robinson	"
5923	"	"		1-B-21-C	"
5924	"	"		1-B-21-C	
5925	"	"		1-B-21-E	
5926	"	"		1 St. Louis	"
5927	"	"		2-B-27-G	"
5930	"	4–56	2-K-14	2 Baldwin	M. of W. Dept.
5931	"			1-P-6	M. of W. Crusher.

per cubic yard, but more important still, it has eliminated all dependence upon outside quarries. It follows that track work has no longer to be delayed because of the failure of contractors to make deliveries. It is now planned to operate the quarry through the winter months, so that plenty of crushed rock will be available for spring operations, and even for sale to outside parties. The quarry is in charge of a superintendent, who reports to the superintendent of maintenance of way. He is assisted by a clerk, a general electrician, a machinist, a dynamo man and a boss driller. About eighty-five men are employed during the busy season.

SOUTHERN DIVISION HEADQUARTERS

The Southern division headquarters, which is at Camden, is not only a considerable distance from the rest of the Public Service System, but it is also operated on a 5-ft. instead of a 4-ft. 8½-in. gage. The general supply center of all departments of the Southern division is at Camden, in charge of the local division engineer and roadmaster.

BRIDGES, TRESTLES AND CULVERTS

The lines of the Public Service Railway are operated over 282 bridges, trestles and culverts, distributed according to the operating divisions as follows: Southern, 30; Hudson, 31; Passaic, 34; Essex, 65, and Central, 122. These structures embrace almost every possible type, many of them having been built long before they were taken over by the present management. The illustrations and descriptions will therefore be limited to a few modern designs which are typical of each class.

Among the most interesting structures are the drawbridges over the Hackensack and Passaic Rivers between Jersey City and Newark. All of these bridges are of the combination railway and highway type, but those over the Hackensack River are longer. The two cities named are joined by three lines, known as the Plank Road, Turnpike and White. The longest bridge is on the Plank Road crossing of the Hackensack River. It is 1675 ft. in length, and is made up of eight Pratt truss spans carried on concrete piers, and one draw span 300 ft. long carried on concrete center piers. The width of 60 ft. affords room for a 10-ft. sidewalk on each side and a 40-ft. double-track roadway. The pavement is wood block. The cost of this bridge was about $1,500,000. The Plank Road bridge now being built over the Passaic River will be 1000 ft. long and 60 ft. wide. The Turnpike and White Line routes also have pairs of bridges approaching in size those operated over the Plank Road line.

Two different schemes are used for maintaining the connection of the rails on these and other drawbridges. One method is to use Lorain funnel rails, in which design the rail ends in an exaggerated throat. This permits the operation of cars even if the movable rail does not mesh exactly with the stationary rail. The second method is to employ lift rails, as in steam-railroad practice. The application of lift rails is shown on plate XVII.

In place of derailing switches near bridges, a secondary overhead wire and circuit breaker are placed 1000 ft. away from each side of the draw span, so that when a car reaches this auxiliary overhead wire the opening of the breaker cuts out the main trolley wire. The second wire is provided partly for car lighting and partly to give the conductor the option of running his car slowly to within a few feet of the draw. Further details of this scheme are given in the article on the distribution department.

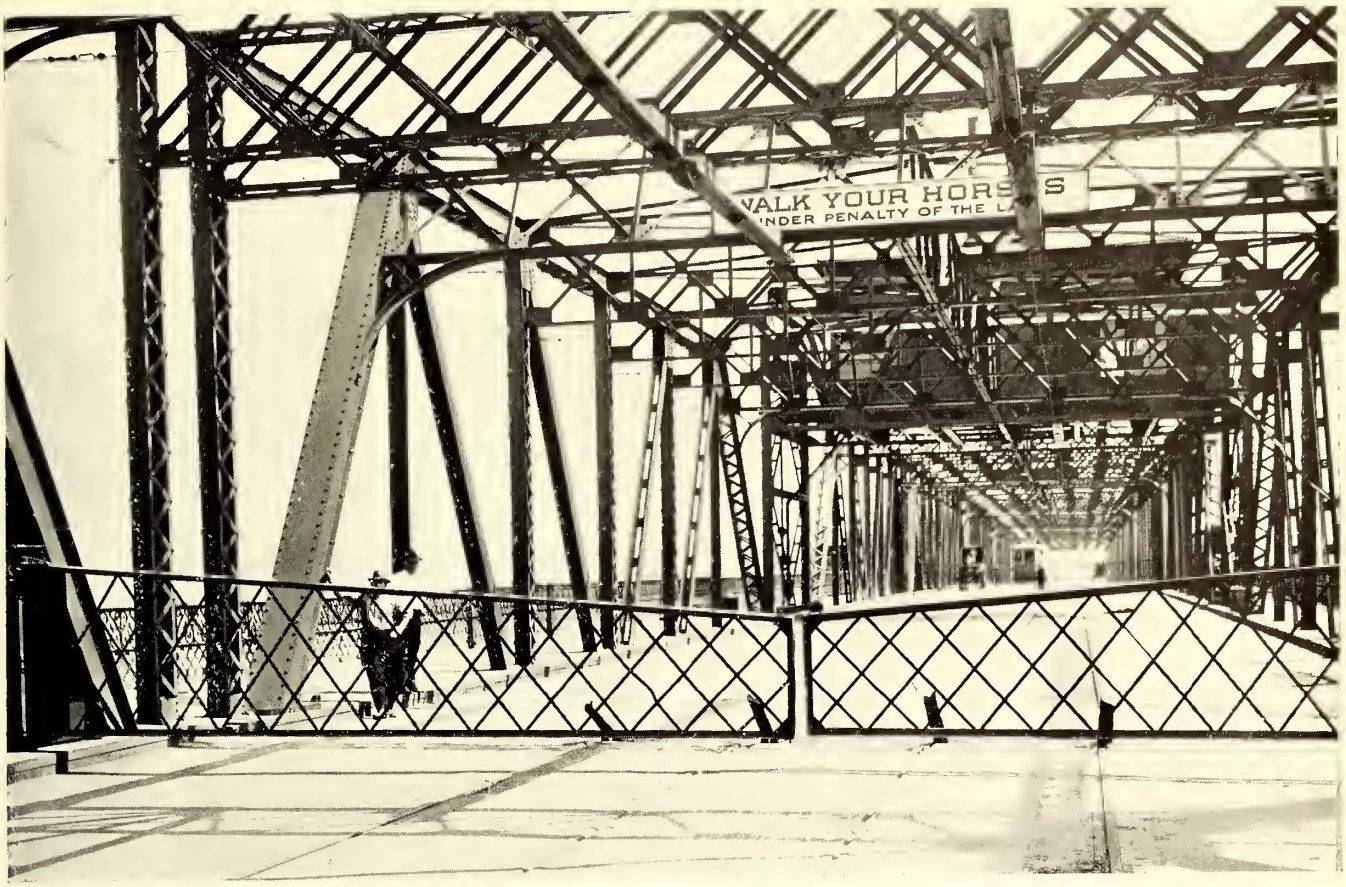
One illustration on plate XVI shows the largest viaduct on the Public Service system, as seen from the Palisades looking toward the Hoboken terminal. The viaduct is a double-track structure which runs for 2.04 miles from the Hoboken terminal to Pavonia Avenue, Jersey City. It is 30 ft. wide and has been furnished with iron railings and walkways on each side for use by passengers in blockades or other emergencies. That portion of the viaduct near the Palisades is 90 ft. high and is of the open-truss type, with floor beams, as constructed originally for cable operation. The modern section from the Palisades to Jersey City is a plate-girder design, each of the four rails being supported by one girder.

The company's longest double-track trestle and drawbridge crosses Timber Creek, Gloucester County, on the Southern division. This trestle is 1700 ft. long. It has been entirely rebuilt by the present management with untreated white-oak piles and creosoted-pine deck. The reconstructed trestle is 3 ft. higher than the original structure, to give greater security from the high tides common in this location.

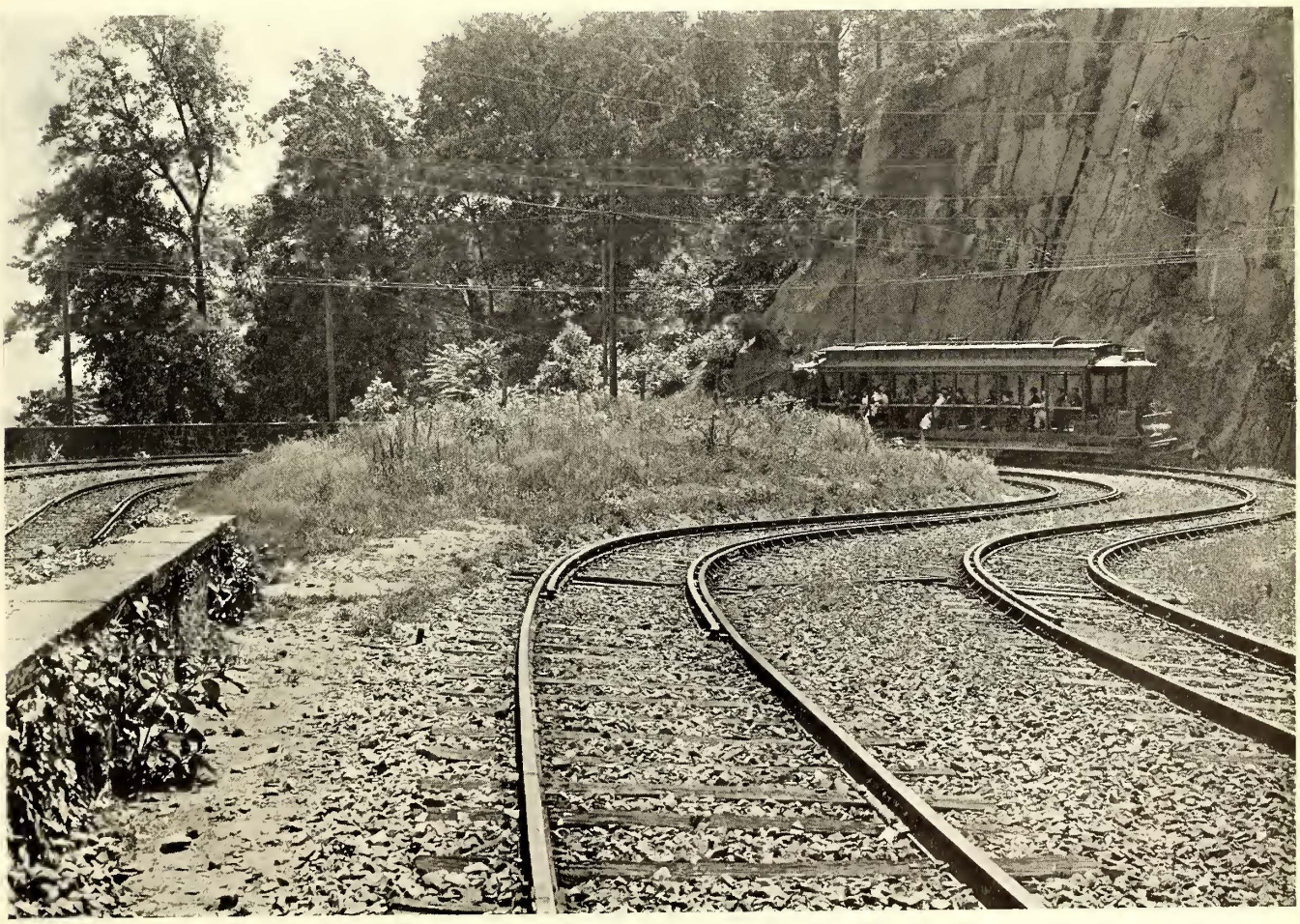
The illustrated over-crossing at Little Ferry on the Bergen turnpike is typical of the structures now erected for this purpose. Originally this line was discontinued, being broken up by railroad crossings at five places. At present it has two viaducts and two permissible grade crossings. The only break is at Little Ferry, and this, too, will soon be eliminated. The standard over-crossings are of the plate-girder and concrete abutment type, figured for the following railway loads regardless of speed: 20,000 lb. per axle when the axles are spaced as follows: 4 ft. 6 in., 14 ft. 6 in., 4 ft. 6 in., 14 ft. 6 in., etc., or 20 ft. 6 in. between the rear and front axles of cars in a train.

For bridges of spans up to 75 ft. the company uses either reinforced concrete or steel incased in concrete, because such designs conduce to lower maintenance. For long spans, plate-girder bridges are preferred to open-girder designs, particularly on account of greater ease in painting. Open girders have been found rather annoying at some railroad crossings owing to corrosion from locomotive gases. The small truss members, especially, are rapidly weakened by the gases if they are not carefully watched and frequently painted.

Some bridges are entirely maintained by the company, some are jointly maintained with municipalities, and others by a municipality alone. Monthly inspection reports are rendered by the roadmasters on all bridges, viaducts, trestles, etc. The roadmasters'



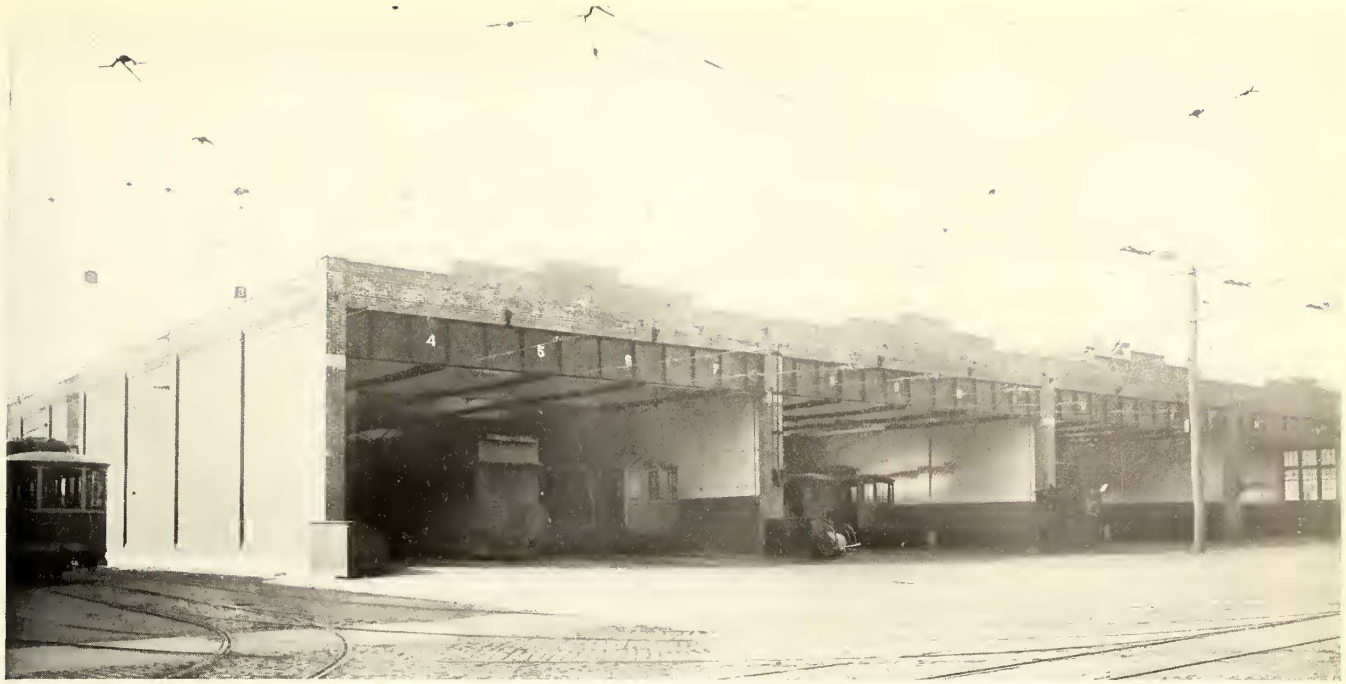
Lift Rails at Draw of Plank Road Bridge Over the Hackensack River



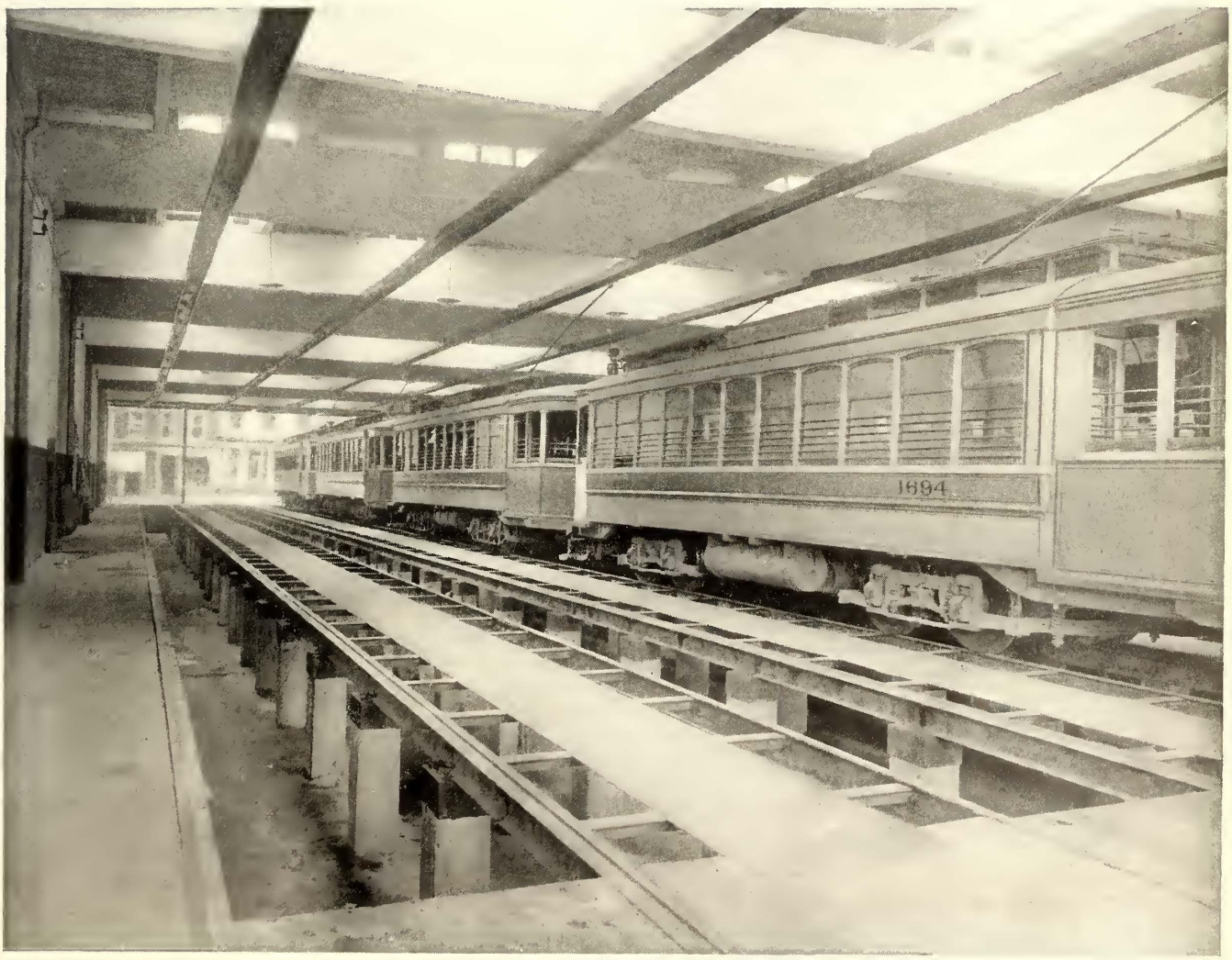
Manganese Curve on the Hudson River Line at Edgewater, Opposite New York City

An Example of Paving in Newark, Where the Railway Company Was Permitted to Use Granite Along the Rails, the Rest of the Street Being Paved with Asphalt

View Taken During Construction of Hudson River Line, Along the Palisades of the Hudson River, Opposite West 130th Street, New York City



Exterior of the West Hoboken Carhouse, Showing the Standard Type of Construction Employed by the Company for an Operating Carhouse



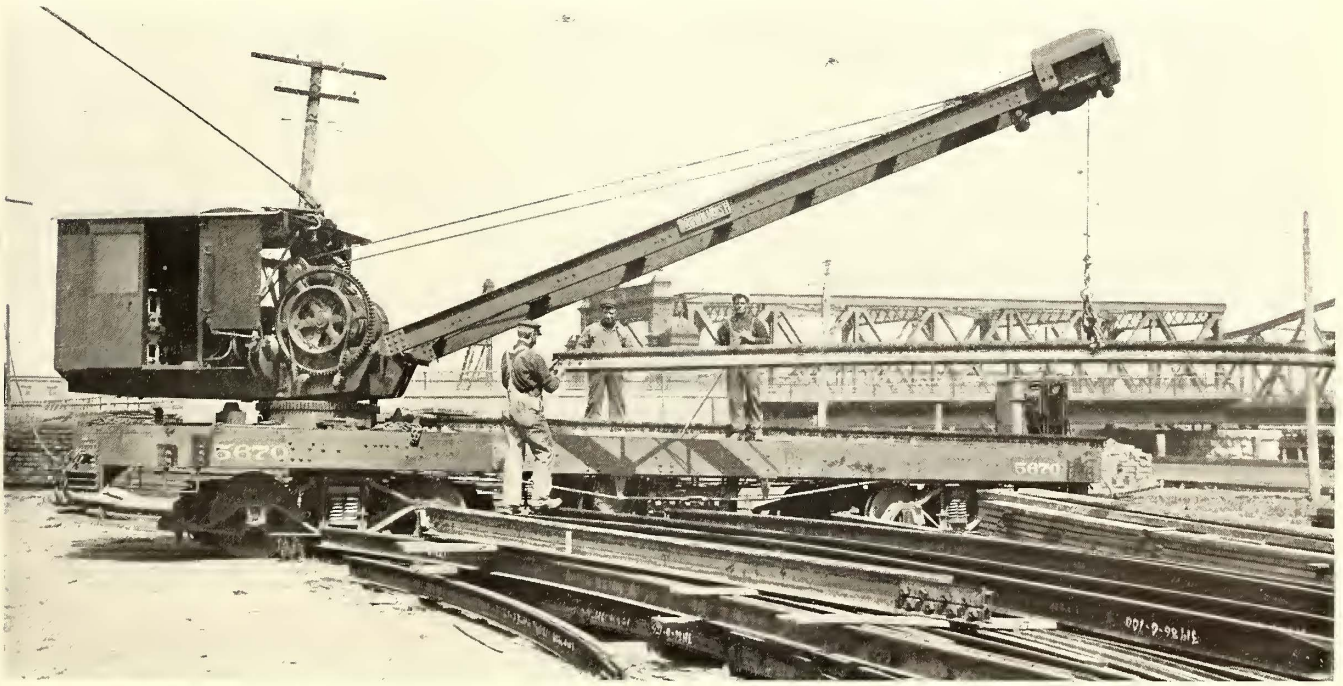
Interior of the West Hoboken Carhouse, Showing the Style of Open Pits with Metal Devil Strips, Roof Construction and Lighting, Etc.

General View of the Quarry at Fairview

Industrial Railway and Side-Dump Cars for Transporting Rock to Breaker at Fairview Quarry

Rails Piled Into Position by Means of a Crane Car

Handling Special Work with Old-Type Crane Car



Storing Special Work with New-Type Crane Car

Drafting Room of Way Department

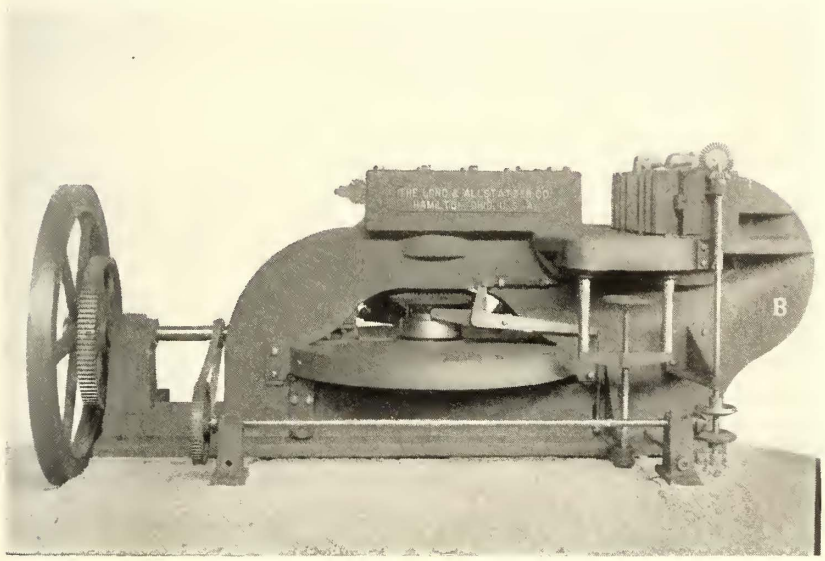
Blue-Printing Room of Way Department

Side View and Sectional View of Old Cast-Welded Rail Joints

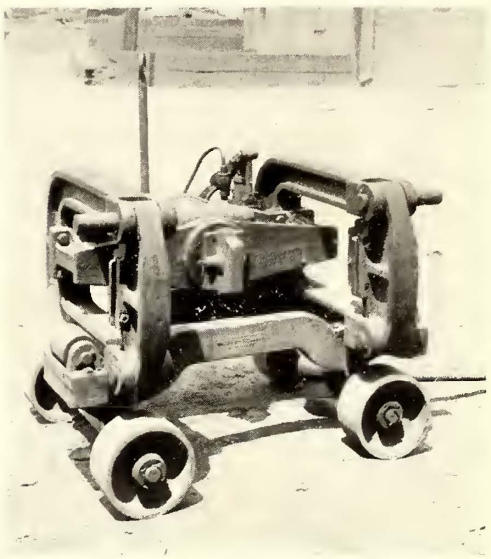
View of Old Cast-Welded Rail as Rehabilitated by Means of Insert Piece and Electrically-Welded Joint

Derrick Car and Shovel at Passaic Wharf

Rail Grinder in Service



Stationary Rail Bender



Portable Rail Bender

Views of Stationary Derrick Delivering Ballast to Work Car at Passaic Wharf

Tie-Preserving Plant at Passaic Wharf

Rock-Crushing Plant at Fairview

Dump Car, Rock Crusher and Conveyor at Fairview Quarry

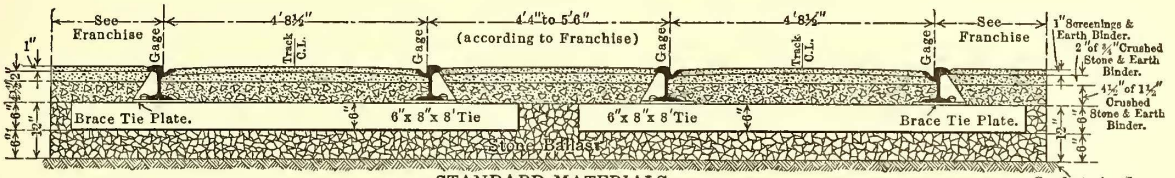
reports are checked by the engineer maintenance of way and by the local transportation superintendents. Extensive changes in these way structures are left for the annual statement of the engineer maintenance of way. All recent culverts are of concrete.

Wagon elevators form an unusual feature of an electric-railway system. They have been found useful in Jersey City and Hoboken, however, owing to the steep grade between the Hudson River shore and the cliffs of the Palisades directly beyond it. The roads between the two levels are so steep that many wagon

TRACK CONSTRUCTION STANDARDS

The present trackage of the Public Service Railway amounts to 760.98 miles, 125 miles of which is unpaved. There are 227.92 miles of T-rail, 287.81 miles of tram rail, 211.15 miles of grooved rail and 34.10 miles of carhouse and yard trackage.

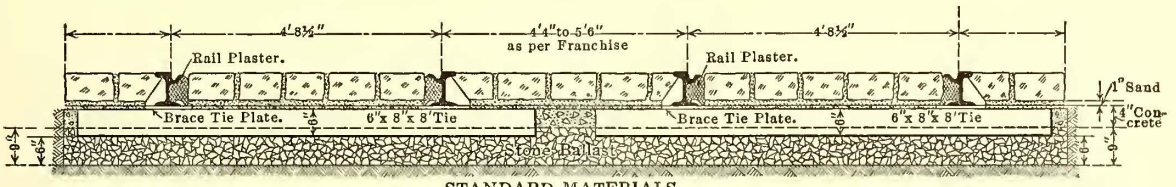
The paved track is divided as follows: 460 miles of stone block, 120 miles macadam and 55 miles of wood block, brick, asphalt, etc. It is interesting to note that since the properties were consolidated under the Public Service interests in the fall of 1903 there



STANDARD MATERIALS.

Macadam:- As shown-when thoroughly Rolled and Compact.
Ballast:- 1½"Broken Stone or Slag.
Ties:- Spaced 2'Centers.
Braces:- Two to every second Tie.
Spikes:- 9/16" x 5"Standard, Four to each Tie.

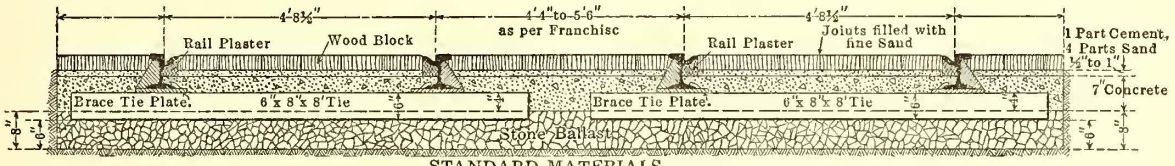
Electric Ry. Journal



STANDARD MATERIALS.

Blocks:- Granite, 8"to 12"long, 3½" to 4½" wide and 4¾"to 5¾"deep. 30 per Sq.Yd.
Sand:- Cowbay.
Concrete:- 1 Part Portland Cement, 3 Parts Sand, 5 Parts 1¼"Crushed Stone or Slag.
Ballast:- 1½"Broken Stone or Slag.
Rail Plaster:- 1 Part Portland Cement, 3 Parts Earth or Clay.
Ties:- Spaced 2'Centers.
Spikes:- 9/16" x 5"Standard, Four to each Tie.
Braces:- Two to every second Tie.

Electric Ry. Journal



STANDARD MATERIALS.

Wood:- Blocks, 8"long, 3½"wide, 3"deep.
Sand:- Cowbay.
Concrete:- 1 Part Portland Cement, 3 Parts Sand, 5 Parts 1¼"Crushed Stone or Slag.
Ballast:- 1½"Broken Stone or Slag.
Rail Plaster:- 1 Part Portland Cement, 3 Parts Earth or Clay.
Ties:- Spaced 2'Centers.
Spikes:- 9/16" x 5"Standard, Four to each Tie.
Braces:- Two to every second Tie.

Electric Ry. Journal

STANDARD MATERIALS.

Blocks:- Main Granite, Half 8"to 12"long, Half 4"to 6"long, 3½ to 4½"wide, 5"to 6"deep, Laid Alternately.
Asphalt:- Composition as per Specifications of Municipality wherein laid.
Binder:- Composition as per Specifications of Municipality wherein laid.
Sand:- Cowbay.
Concrete:- 1 Part Portland Cement, 3 Parts Sand, 5 Parts 1½"Crushed Stone or Slag.
Ballast:- 1½"Broken Stone or Slag.
Rail Plaster:- 1 Part Portland Cement, 3 Parts Earth or Clay.
Ties:- Spaced 2'Centers.
Spikes:- 9/16 x 5 Standard, Four to each Tie.
Braces:- Two to every second Tie.

Electric Ry. Journal

Way Department—Cross-Sections of Girder Rail Construction with Macadam, Granite Blocks, Wood Blocks and Asphalt with Granite Strips

and automobile drivers prefer to pay elevator tolls instead of making the wearisome climb. Both the Jersey City and Hoboken elevators have a vertical travel of about 90 ft., and are operated by cables driven by electric motors. The elevator tolls are as follows: Upward trip, 10 cents for a single horse and wagon or small automobile, and 15 cents for a two-horse wagon or a large automobile; downward trip, 5 cents and 10 cents, respectively, for the two groups of vehicles.

have been reconstructed or otherwise modernized some 225 miles of track, equivalent to 30 per cent of the entire system or running track. The weight of rail throughout the entire system varies from a 60-lb. running rail to a 127-lb. guard rail.

The standard rail for city service is the Lorain section No. 116-434, weighing 116 lb. per yard. It is 7 in. high, has a ½-in. web and a groove 1½ in. deep. The Public Service Railway's extensive experience with both 9-in. and 7-in. rails has led it

strongly to advocate the lower rail. A 7-in. rail is cheaper because less excavation is required, while the use of electrically welded joints gives as good gage-holding qualities as the higher rail.

All classes of track construction, whether open or paved, have a rolled subgrade. The ties, which are laid 2 ft. centers, are 6 in x 8 in. x 8 ft. in size, and are impregnated with 10 lb. of creosote per cubic foot. Joints are always staggered, and two combination brace tie-plates and rail braces are used for every other tie. There are four 9/16 in. x 5 in. spikes per tie. In open track, the ballast consists of 1½-in. trap rock or slag, and in paved track of 4-in. concrete, which is placed between the ties and flush with their tops. This concrete consists of one part Portland cement, three parts sand and five parts 1½-in. stone or slag.

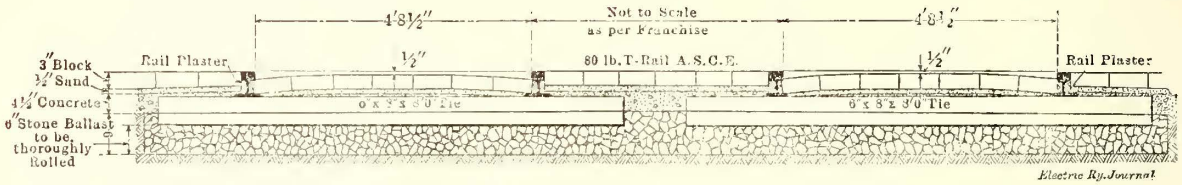
The kind of paving depends largely upon the franchise obligations and upon the practice of the municipality. The preference of the company is for granite block, as this is ultimately the most economical material. In no case would it recommend laying along the rail such materials as asphalt, bitulithic or amisite. Generally these sheet pavements are used only in combination with granite or trap-rock paving blocks. If stone block is objectionable on account of roughness, wood block is installed between and outside the rails, as shown in one of the cross-sections on page 583. Other cross-sections show the track standards on streets paved with granite, macadam and asphalt respectively. The brick construction is practically the same as that shown for wood block.

An example of high-class stone paving block is that applied on some streets in Newark, which was done in 1910 under what is known as the Newark specification. This provides for a 4¾-in. to 5¼-in. deep granite block, 8 in. to 12 in. long and 3½ to 4½ in. wide, quarried to lay up with a ⅜-in. joint. This paving rivals brick for smoothness and appearance and is superior to it in life. Plate XVIII includes a view of this paving as laid on Bloomfield Avenue, Newark.

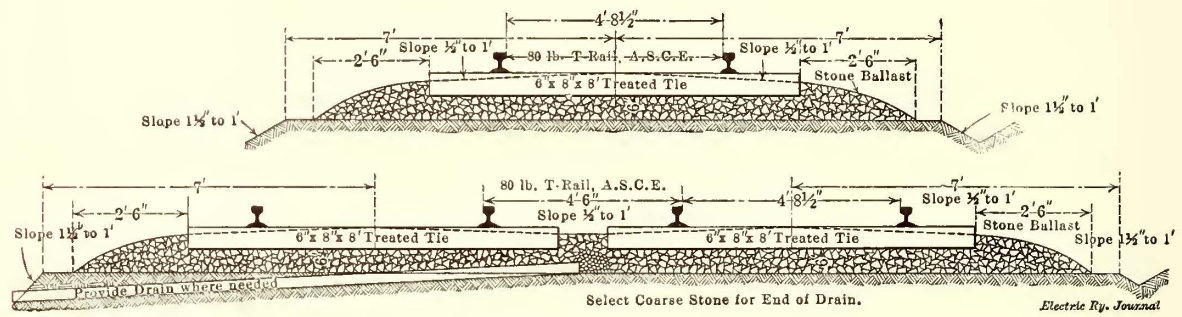
An interesting example of wood-block paving is afforded in Bayonne, where the railway company substituted wood block between the rails on an asphalt street. This construction has now been in use for six years with entire satisfaction, whereas paving renewals would have been required long ago if asphalt had been used throughout.

Since 1908 the standard rail joint for paved streets has been the Lorain electrically welded joint. It is expected that 45,000 of these joints will have been installed by the end of 1911. There is still in use a considerable amount of track which was cast-welded previous to 1903 with the joints so cupped that urgent repairs were often necessary, requiring the cutting in of short pieces of rail. Recently, however, a very successful method has been employed to reclaim this old rail. First, the cast-welded joints are cut out, as shown in plate XXII. Then a new piece of rail is installed, the joint being electric-welded with a single steel bar and four welds, as shown in plate XXII. After the electric weld is made, the head of the rail is ground off to a smooth surface. Where the cast-welded joints are not so badly cupped as to require renewal, they are ground down with a Kerwin-Detroit or a Nichols grinder. It is surprising how much some of the cast-welded track has been improved by renewing and repairing the joints in the manner described, and by regaging and resurfacing the track. With these methods, the track, in many cases, is given a probable further life of four to five years, while otherwise it would be absolutely necessary to lay out money for new construction immediately in order to permit safe car operation.

The standard rail section for T-rail in paved streets is the 7-in., 80-lb. rail recommended by the American Electric Railway Association. The standard T-rail for open construction is the 80-lb. A. S. C. E. section. With the latter construction the company uses No.



Way Department—Standard T-Rail Construction for Paved Streets



Way Department—Standard T-Rail Construction for Single and Double Track on Private Right-of-Way

0000 Continuous joints and the Electric Railway Improvement Company's brazed bonds. Cross-sections are presented on this page of open single and double-track construction as carried out on the North Paterson extension, and of T-rail construction in a paved street.

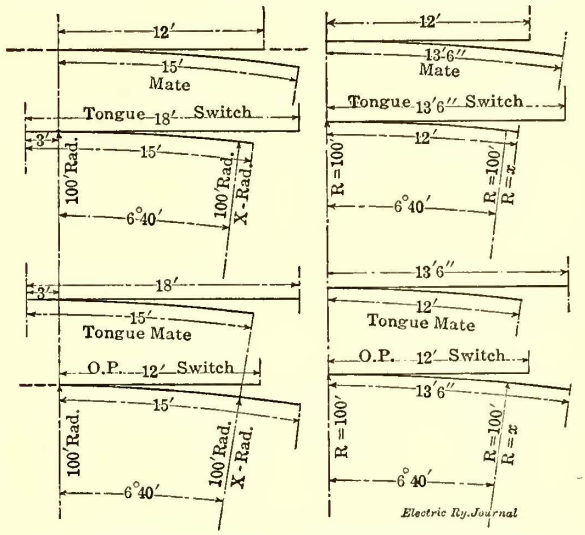
SPECIAL-WORK

It is obvious that a company operating through such an extended territory as the Public Service Railway must have a great variety of special-work. There are 102 grade crossings of steam railroads alone, and each crossing requires from one to twelve sets of crossing frogs. A typical grade crossing is shown in an accompanying drawing. These crossings are equipped with derailing switches, which are operated by the conductor by means of a lever and rods. The rods run through buried ducts. The cars are stopped at these crossings until the conductor has crossed the track and pulled the lever. These derails are made by the U. S. Switch & Signal Company. The steam-railroad crossings are of the built-up type, with rolled manganese steel on the foreign track, the other crossing rails being of open-hearth steel.

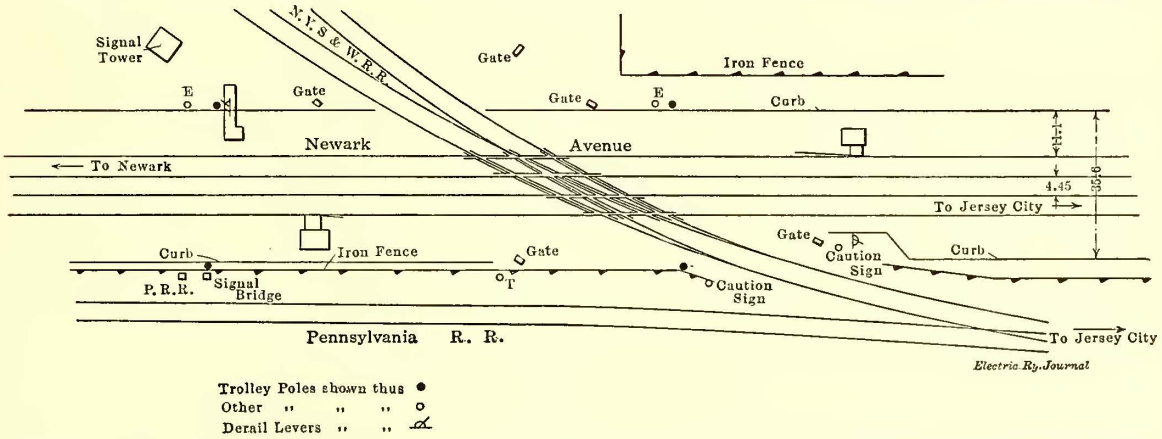
Formerly a great variety of switches was used in making up special-work layouts, but standard designs are now employed to great advantage. It has been found possible to install the straight 100-ft. radius switch in many cases, thereby leading to important economies in permitting the interchange of switch pieces and in minimizing storage room. The accompanying drawings show layouts for a 100-ft.-radius switch and mate, one for regular hardened center and the other for manganese work. As a rule hardened center special-work with some solid manganese-steel curved rail has been used, but now many 7-in. solid manganese switches and mates are being installed.

In recent years electrically controlled switches of the Cheatham and American Automatic Switch Company's types have been placed at important junctions in Newark and at the Jersey City terminal. At the latter place they are under the control of a tower man. The company expects largely to increase the number of automatic switches at an early date.

At the most important street intersection on the Public Service Railway, namely Broad and Market Streets, Newark, the special-work is subjected to a rush-hour traffic of 500 cars an hour, so that it is one of the most congested street railway crossings in the world. The ordinary hardened-center type crossing became useless after six months at this location. The solid manganese crossing now installed has been in place for more than two years and still appears good for some time. One of the views on plate XVII shows a manganese section of running and guard rails on the horse-shoe curve of the Hudson River line which descends the Palisades directly opposite 129th Street, New York. The minimum radius of these curves is 60 ft. and the maximum grade on which they are located 6 per cent.



Way Department—100-ft. Radius Switch Pieces for Hardened Center and Solid Manganese Construction Respectively



Way Department—Derail Positions at Grade Crossing with New York, Susquehanna & Western Railroad, Newark Avenue, Jersey City, N. J.

In recent years electrically controlled switches of the Cheatham and American Automatic Switch Company's types have been placed at important junctions in Newark and at the Jersey City terminal. At the latter place they are under the control of a tower man. The company expects largely to increase the number of automatic switches at an early date.

The special-work installation at Five Corners, Jersey City, is notable as an important transfer point, since it is the intersection of the Turnpike, Belt, Oakland Avenue, Pavonia and Summit Avenue lines. The wood-block paving at this important intersection has borne the brunt of exceptionally heavy team traffic

for the past four years with excellent results. These blocks are laid on a concrete base 6 in. deep.

BOATS AND FERRY HOUSES

The way department maintains five ferryboats under the superintendent of buildings. Details of these boats are presented in Table XI.

TABLE XI.—DATA ON FERRYBOATS.

Name.	Gross Tons.	Length. Ft. In.	Engine Equipment.	Passenger Capacity.
Edgewater	709	146 6	850-h.p. compound, 22x30 in., 24-in. stroke.....	2,000
Leonia	643	145	2 engines = 500 hp, 16x30 in. cylinders, 12-in. stroke.	1,800
Englewood ...	484	135	420-hp beam engine, 36-in cylinder, 9-ft. stroke.....	1,000
Bayonne City..	414	125	328-hp beam engine, 30-in. cylinder, 9-ft. stroke.....	900
Public Service.	305	102	382-hp beam engine, 32-in. cylinder, 8-ft. stroke.....	900

The first three boats operate between the terminal at Edgewater, and the terminal at West 130th Street, New York City. The last two boats operate between the terminal at Bergen Point, Bayonne, N. J., and the terminal at Port Richmond, Staten Island.

TERMINALS AND CARHOUSES

The Public Service Railway now has twenty-eight operating terminals in addition to eighteen carhouses which are used only for storage. These operating structures do not include the River Street (Hoboken), Exchange Place (Jersey City), and Market Street (Camden) ferry terminals. The Jersey City and Camden terminals are old structures, but those in Hoboken are of comparatively recent date.

The Fourteenth Street terminal consists of three loading tracks, which are built over plank-covered piling beyond the curb line at the Hudson River, and one unloading track with a concrete platform. There is no terminal building, but all tracks are under shelter. The interesting features of this installation are the solid manganese curves which have been in service for some four years and still show little wear, in striking contrast to ordinary open-hearth steeel, which had but two years' life under the same conditions.

The second Hoboken terminal merits particular attention, as it is one of the finest street-railway stations in service. This building adjoins the passenger terminal and ferry house of the Delaware, Lackawanna & Western Railroad, and it is also directly over the station of the Hudson & Manhattan Railroad. From this junction point the traveler is able to take a ferry boat or tunnel train to New York City or along the New Jersey shore, board the Delaware, Lackawanna & Western trains, use the viaduct cars of the Public Service Railway to Jersey City Heights and West Hoboken, or board the local surface trolleys. Thus, in all, five distinct services are provided from one location. The eight incoming trolley lines now bring about 70,000 passengers a day to this terminal. About 180 cars per hour are operated during the morning and evening rush hours, but it is possible to care for 400 cars per hour daily.

A complete preliminary description of this structure was printed in the ELECTRIC RAILWAY JOURNAL of Aug. 7, 1909, but it may be of interest to summarize the principal features of the completed installation.

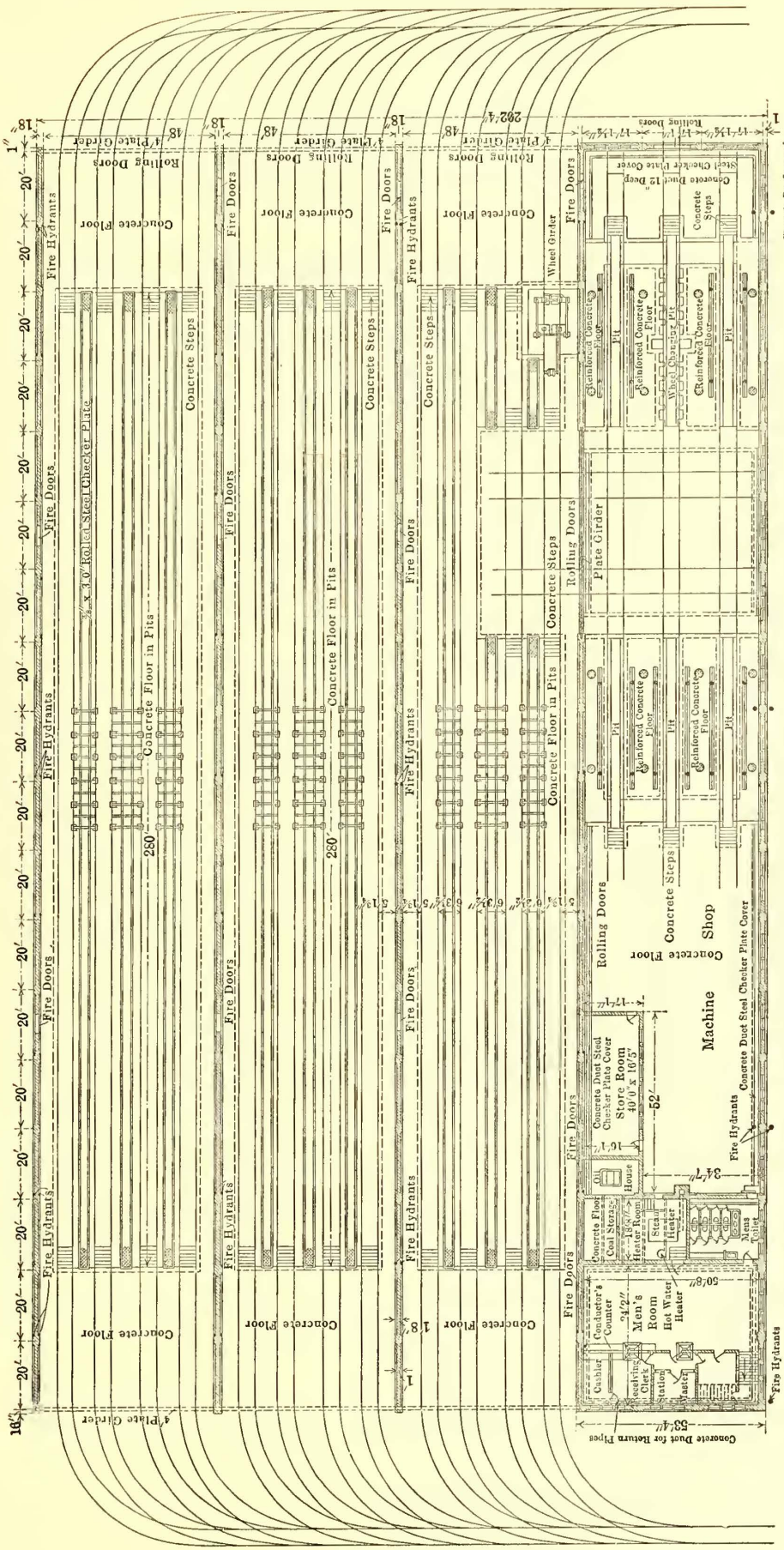
The terminal is a two-story structure with stairways to the street and to the tunnel station, and an escalator for passengers from the underground lines. The ground floor has one unloading and four loading tracks, all of which pass over a common loop. The upper floor track arrangement for the viaduct cars is similar, except that there is one unloading track less. The unloading tracks on both floors are isolated from the loading track by a fence to prevent alighting passengers from riding back. All boarding passengers must enter through ticket choppers' gates, as the terminal is operated on the pay-as-you-enter system.

The station is a structural-steel frame with irregular sides 397 ft. x 373 ft. x 145 ft. x 53 ft. The area of the first floor is 43,767 sq. ft. and of the second floor 46,053 sq. ft. Both the floors and roof are of concrete, reinforced with metal fabric. Heavy copper ornamental cornices extend on three sides of the building. The bottom ironwork of the second floor is entirely incased in concrete. Part of the structure is incased with wired glass and copper. The stairways are of ornamental cast iron. The skylights in the roof and marquise are of copper Anti-pluvius puttyless type, with wired glass. The lower floor is open, but has an ornamental steel fence with folding and sliding gates. The inside treatment is of tile and plaster, with copper trimmings and metal sash. This floor has facilities rooms, offices, toilets, etc., for the employees. The principal conveniences for passengers are on the upper floor, which has a waiting room of 2000 sq. ft. area, toilets, retiring room, news-stand and operating offices.

The track work is of Lorain 9-in. standard hardened-center construction, except that at the west end, including the loops, solid cast-manganese steel is used.

Another important traffic connection with the Hudson & Manhattan Railroad will be established by the Sip Avenue, Jersey City, terminal, which is now under way. The company expects to handle 6000 passengers an hour here during the rush periods. As shown in the plan, on page 585, passengers from the underground line will reach the street level by means of an escalator or stairway, thence proceeding to the waiting room and prepayment-loading tracks of the trolley cars. As in the Hoboken terminal, the unloading track will be isolated from the other tracks by a high fence. The track work will consist of solid manganese switches and mates with open-hearth curves.

As shown on the plan mentioned, the open parts of the property will be inclosed by an iron fence. The waiting room will be of brick, steel and glass. Brick utilities rooms for the employees of the transportation department will also be erected near the exit from the terminal. A marquise for the protection of alighting passengers will be attached to the commercial building which is to be erected opposite the unloading track for the gas and electric subsidiaries of the Public Service Corporation. The cost of this building will be about $125,000, and of the whole improvement, including the terminal, about $175,000.



Way Department—General Plan of Combination Carhouse and Shop at Hilton

CARHOUSE AND SHOP DESIGN

The operating and storage carhouses embrace both open and closed types of construction, varying greatly in accordance with the ideas of the old underlying companies. The present management, however, favors the closed carhouse. Buildings of this type have been approved for construction at Hilton, South Orange and at Washington Avenue, Nutley. The last-named installation is the only one on which work has not yet been started. The characteristics common to all these buildings are the use of brick walls and mill-type roofs, the provision for sprinkler fire protection, the unusually high percentage of pit room, the two-way exits, the reservation of one bay for offices and a self-contained maintenance plant and of an employees' club room on the second floor.

HILTON INSTALLATION

The Hilton carhouse is on a 12-acre property, only part of which will be used at present. The present installation is 362 ft. long by 202 ft. wide, made up of three storage and inspection bays and one shop bay. The storage bays hold

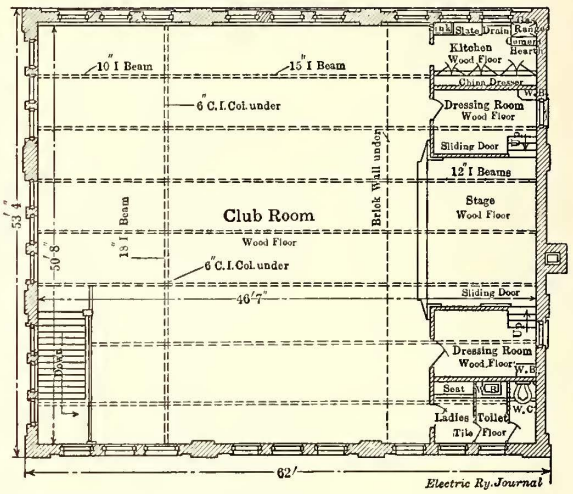
100 45-ft. cars and the shop bay 12 45-ft cars. Cars are always operated in one direction, entering at one end of a bay and leaving at the other. Fully 80 per cent pit room has been provided in the three storage bays by building pits in every track except for 40 ft. from each end. The concrete floors of the pits and devil strips have ample drainage to permit cars to be washed in any position. Cars can be shifted easily into the shop from the adjoining bay by means of a transfer table.

All of the shop tracks have car hoists except the track over the wheel-changing pit. The machine shop, storeroom and heating plant are located between these overhauling tracks and the facilities rooms, which include the men's waiting room, the cashier's, receiver's and superintendent's offices, toilets and lockers. This arrangement places all shop and transportation business on the first floor. The upper story contains a 60-ft. x 50-ft. employees' assembly room for social purposes, a stage with dressing rooms, lunch room, reading room, etc.

The Hilton carhouse is built up of brick walls 12 in. thick with 20-in. pilasters every 20 ft. The division walls are of the same construction, with approved fire-door openings. The track entrances and transfer-table section between the first car bay and the shop are protected by Kinnear rolling steel shutters. The roof is of mill construction, in which steel trusses support 6-in. x 12-in. purlins, over which 3-in. spline planking is laid. The roof proper is of five-ply Barrett specification tar and gravel with copper flashings. Antipluvius wired-glass skylights are installed, two for every other panel of each car-storage bay and three for every other panel of the shop section. The outside wall of the shop also has large windows.

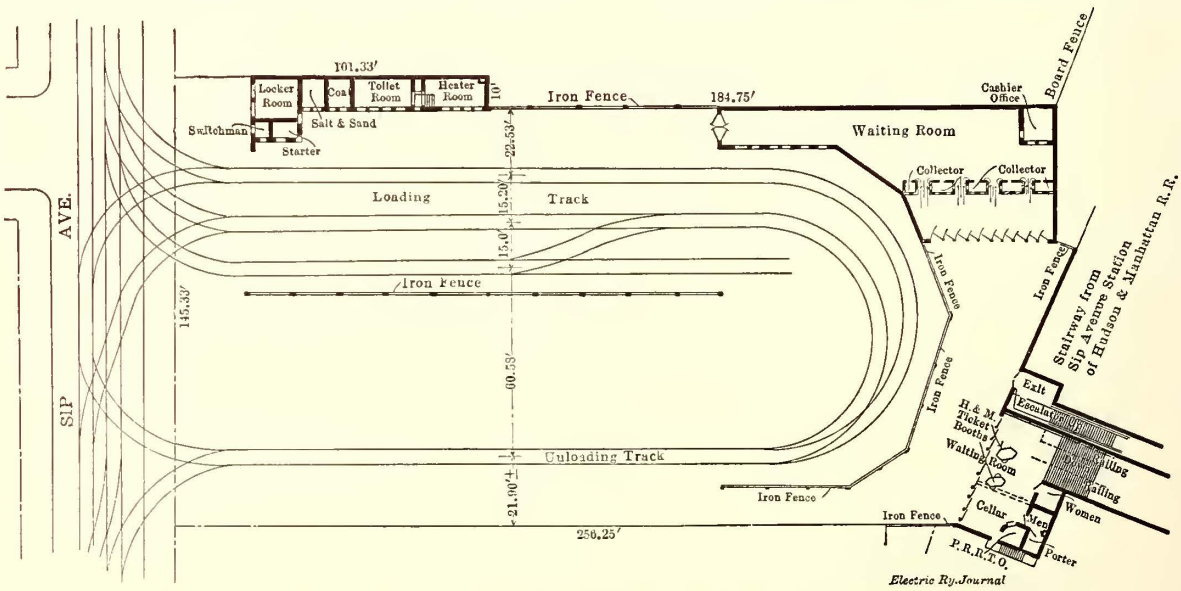
There are four tracks in each storage bay. The pits, which are not heated, consist of a concrete floor and piers with creosoted wood-block caps for anchoring the rails. The walks between the tracks are of 5/16-in. checker plates 3 ft. wide. These are supported on angle irons which are riveted to the running rails at intervals of 3 ft.

The fire protection at the Hilton installation consists of roof and aisle sprinklers; a 50,000-gal. steel gravity tank set on a 100-ft. tower, and a 1000 gal. per hour capacity underwriters' centrifugal fire pump. The yard has fire hydrants in hose houses of approved type. The property is also equipped with an auxiliary fire alarm in circuit with the city system. Other fire-protection appliances include fire extinguishers and fire pails. Numerous hose connections are provided for car washing.



Way Department—Employees' Social Rooms on Second Floor, Hilton Carhouse and Shop

The selection of mill construction instead of reinforced concrete was dictated by the important condition that mill construction was some 25 per cent to 30 per cent lower in first cost and also by the fact that the underwriters refused to give a lower insurance rate for cars stored in a reinforced concrete building than for storage in a mill structure of the type described.



Way Department—Plan of Covered Passenger Terminal, Sip Avenue, Jersey City

POWER GENERATION

THE Public Service Railway Company buys all the electrical energy required for the operation of its cars from the Public Service Electric Company, which operates all of the generating stations and substations for both railway and lighting service. As explained in the chapter on overhead construction, the Public Service Railway has jurisdiction over the distributing system from the point where the low-tension, direct-current feeders leave the substations. All energy supplied to the railway company is metered at the low-tension busbars in the substations.

GENERAL SCHEME OF POWER GENERATION AND DISTRIBUTION

The power generation and distributing system of the Public Service Electric Company is divided into the Northern, Central and Southern divisions. The Northern division includes Essex, Hudson, Bergen and Passaic Counties, in which are situated the large cities of Newark, Jersey City, Hoboken, Paterson and the Oranges. The Central division includes the cities of Elizabeth, Perth Amboy, Rahway, Cranford, New Brunswick and Plainfield. The Southern division includes Trenton, where lighting service only is given, and the territory around Camden, where energy for both lighting and railway operation is supplied. The largest part of the load of the entire system is carried by the power stations of the Northern division. All of the generating stations in the Northern division are tied together by 13,000-volt transmission lines, as are all the stations in the Central division, and the Central and Northern divisions in turn are tied together by a transmission line connecting Newark and Elizabeth. The Camden territory of the Southern division is operated independently of the Northern and Central divisions.

When the Public Service Corporation was formed in 1903 it acquired a total of twenty central stations and twenty-four substations. The central stations had a mixed equipment of 60-cycle alternating-current machines for lighting distribution, 25-cycle alternating-current machines for railway distribution, and a number of 500-600-volt direct-current generators for supplying energy directly to the railway feeders. The problem which confronted the engineers of the Public Service Corporation was to re-design the entire power generation and distribution system so as to attain economical and reliable operation and to provide ample reserve in case of failures of any class of apparatus in any of the separate stations. Inasmuch as a large amount of 25-cycle and 60-cycle generating machinery had been acquired at the time of the consolidation, it was decided to retain both the 60-cycle and 25-cycle generating apparatus and distribution systems in Essex and Hudson Counties, where by far the largest proportion of the total load is carried. In Bergen and Passaic Counties 60-cycle alternating current is used for both the railway and lighting systems, and all of the distribution in the Central and Southern divisions is also 60-cycle alternating current.

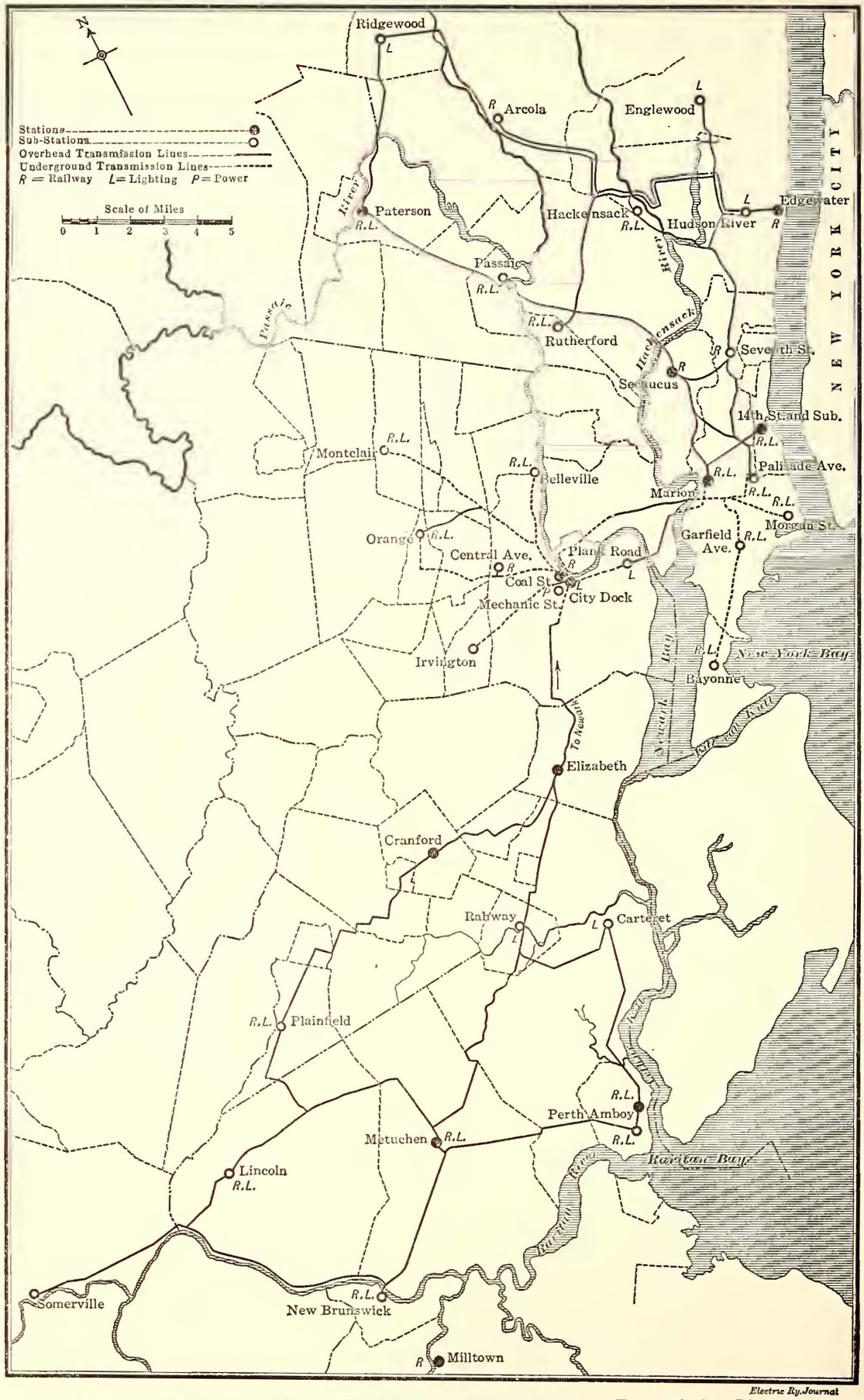
As the transmission system in Essex and Hudson Counties is almost entirely underground, there is but little complication in maintaining separate distribution systems for the two frequencies.

The railway loads in Newark, Jersey City and Hoboken are so heavy that it would not be feasible to operate rotaries of 2000-kw, which is the company's standard size for 25-cycle machines, from the same transmission lines which supply the lighting circuits on account of voltage fluctuations. Where the transmission lines are carried entirely overhead, as in the Central division and in Bergen and Passaic Counties in the Northern division, the use of two frequencies would involve excessive complication of circuits and pole lines. In such territory, however, the railway loads are comparatively light and do not interfere with proper regulation of the lighting units which are supplied from the same 60-cycle transmission lines. To provide spare capacity for either the 25-cycle or 60-cycle systems a 3000-kw frequency changer was installed in the Newark station three years ago. This machine has proved very valuable in cases of sudden and unexpected failures in the generating apparatus or transmission lines of either frequency.

It will be noted from a study of the maps showing the distribution systems of the three divisions that a large number of substations are operated and that apparently they are too close together for the highest total economy. This has come about very naturally, however, on account of combining the lighting and railway service in the same company. These substations are all located in the centers of lighting distribution, where it has been necessary to establish substations of quite small capacity in some cases in order to give the best regulation and to keep down the amount of feeder circuits. With these centers established and with the operators necessary for the lighting substations it has required only the construction of larger buildings and the installation of railway rotaries with an additional transmission line back to the generating station. The result from an operating standpoint is very satisfactory, as a large number of feeding points are provided and it is possible to maintain high voltage over the whole length of the suburban lines with a minimum amount of copper.

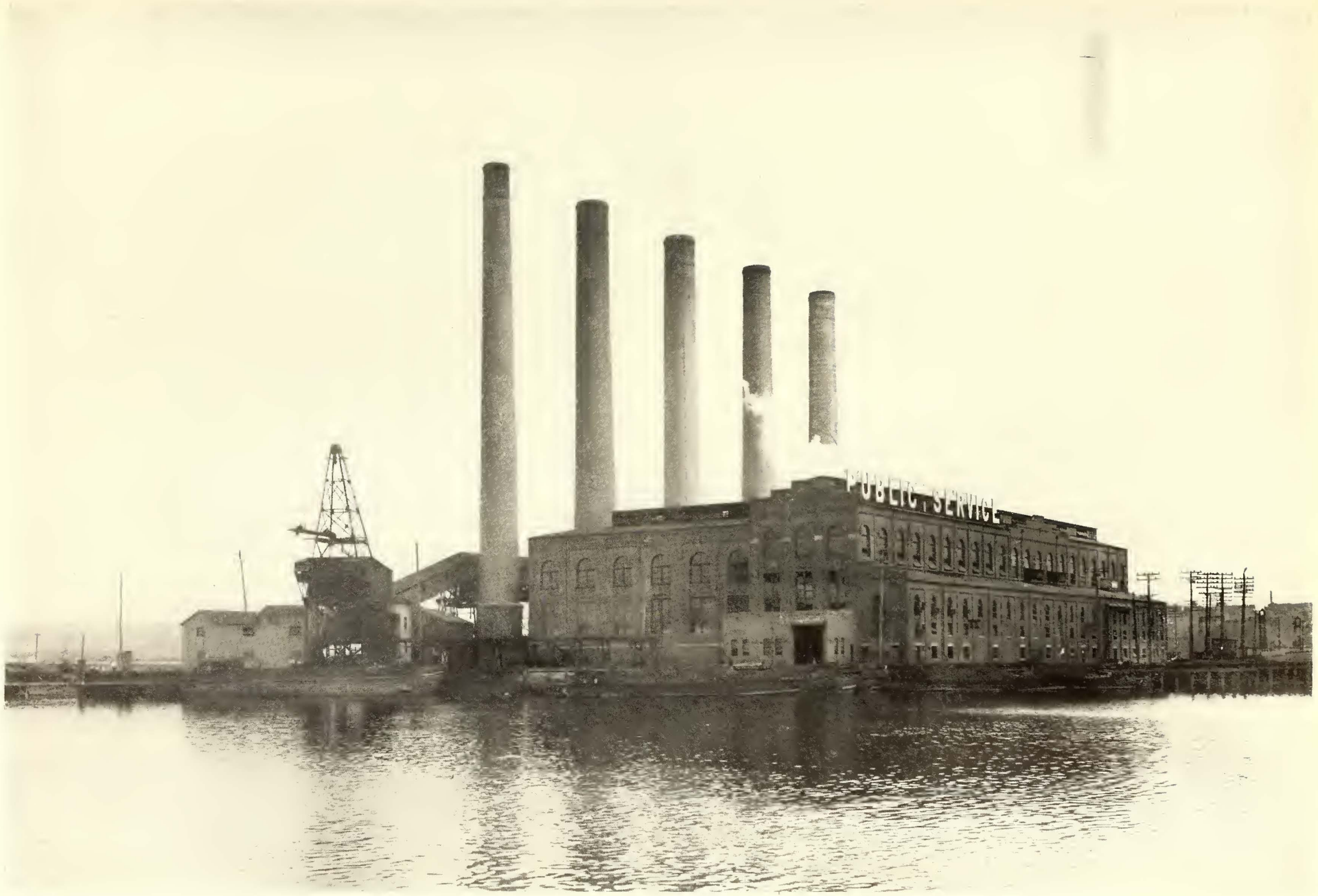
NORTHERN DIVISION POWER STATIONS

The power stations supplying the Northern division are located at Marion, Newark, Secaucus, Fourteenth Street (Hoboken), Paterson and Edgewater. The Secaucus and Edgewater stations generate current for railway operation only, but the other four stations have a combined railway and lighting load. Alternating current at 25 cycles for distribution to the railway substations is generated at the Marion, Newark,



Electric Ry. Journal

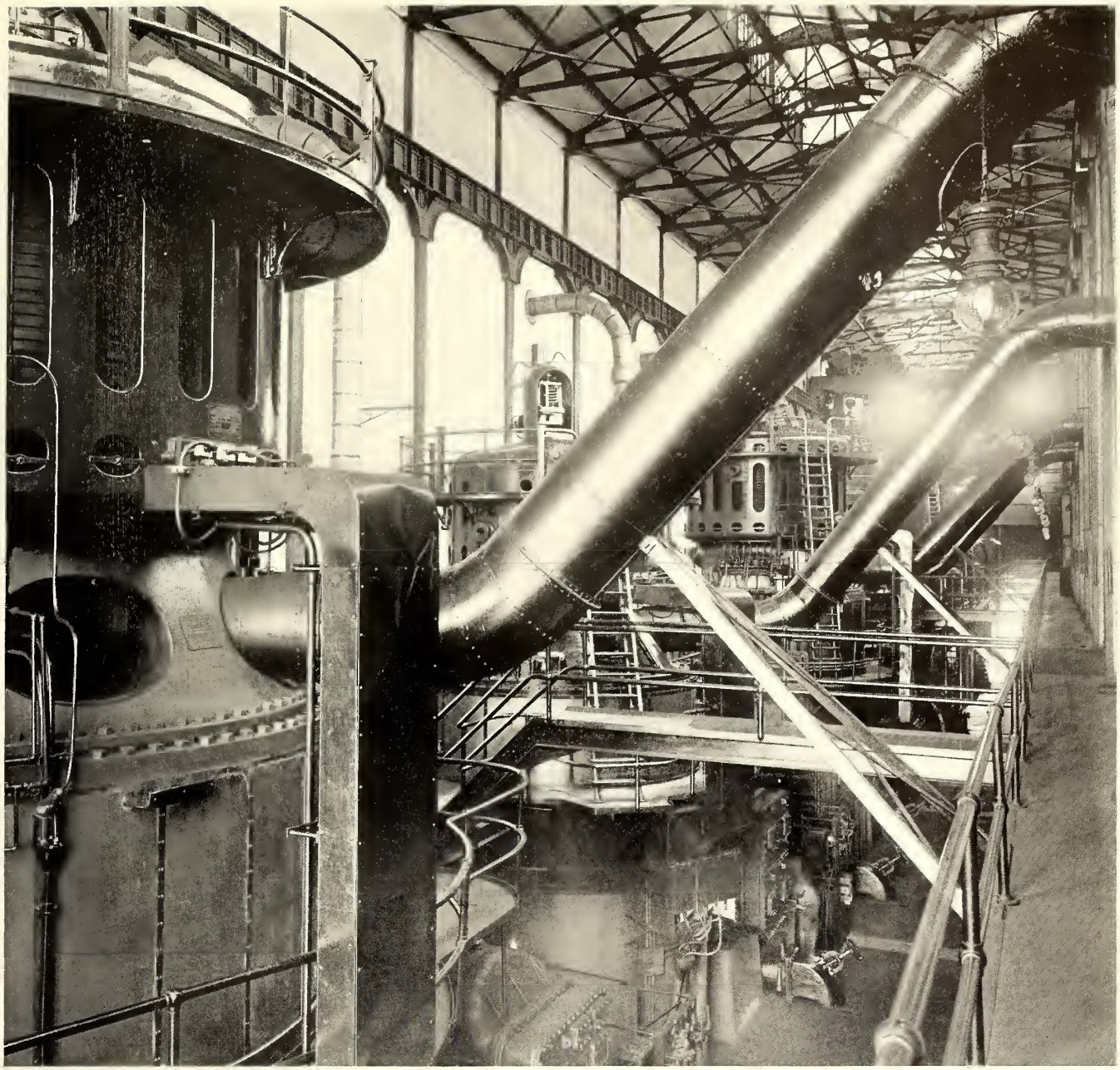
Power Generation—Map of Northern and Central Division Transmission Lines



View of Marion Power Station from West Bank of Hackensack River

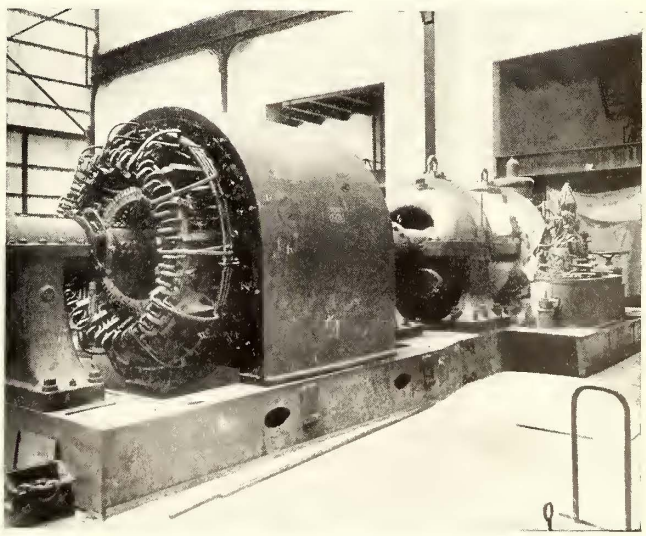
Plate XXV

Coal-Handling Machinery at Marion Power Station



Turbine Room in Marion Power Station

Hackensack River Cable House of Meadows Transmission Line



5000-kw Turbo-Generator Unit in Perth Amboy Power Station

Coal Conveyor Trestle at Perth Amboy Power Station

Exterior of Perth Amboy Power Station

Crossing of Meadows Transmission Line Over Pennsylvania Railroad Electric Division

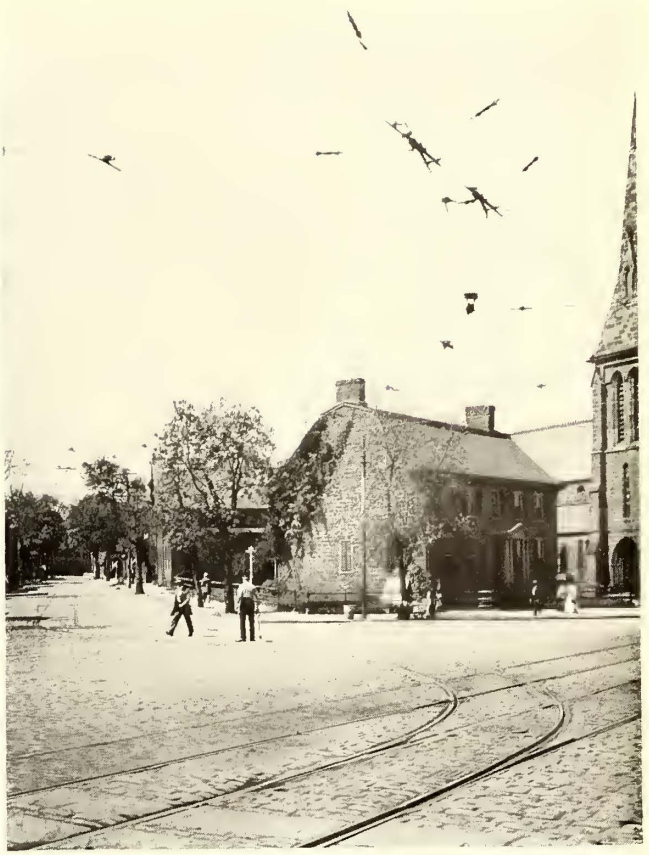
Crossing of Meadows Transmission Line Over Delaware, Lackawanna & Western Railroad

Plate XXX

Exterior of Substation at Washington Avenue, Newark

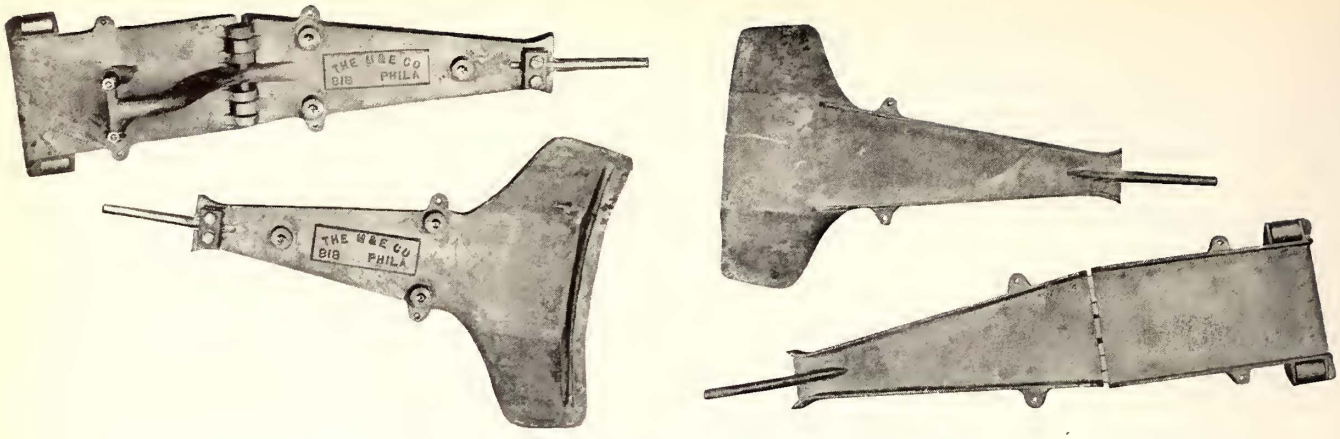
Interior of Substation at Washington Avenue, Newark

Overhead Construction with Numbered Switches in Front of West Hoboken Carhouse

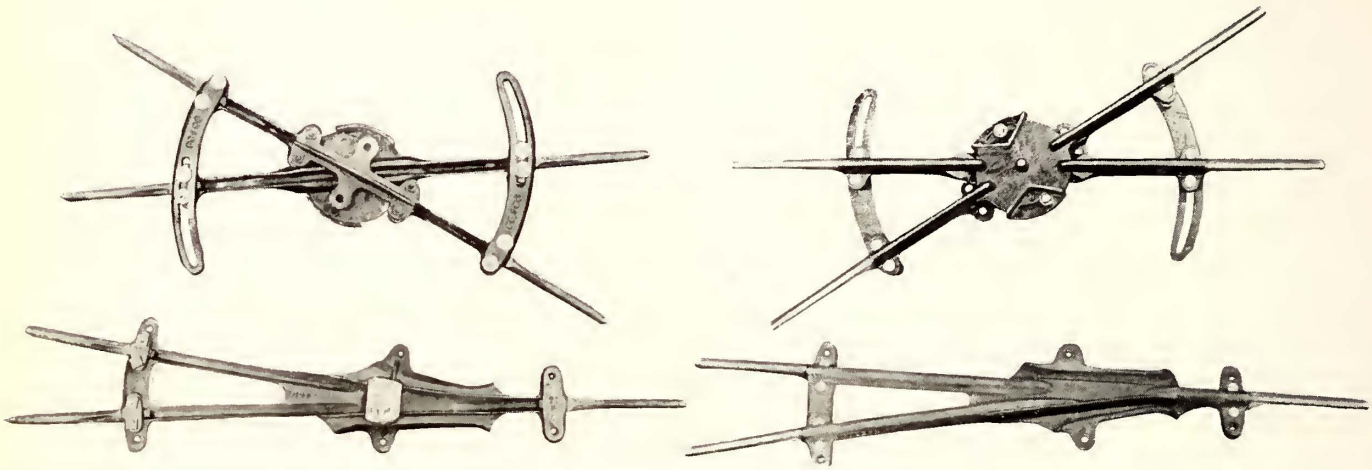


Overhead Switch Layout on Broad Street, Newark, to Accommodate Different Car Pole Locations

Fixed-Angle Overhead Construction in Place at Fourth Street, Union Hill, at the End of a Span-Construction, Right-of-Way Line



Top and Bottom Views of the Hinged Overhead Contact Pans Which Are Installed at Drawbridges



Top and Bottom Views of the Adjustable Crossing with Bridging Piece to Prevent the Trolley Wheel from Entering the Angle

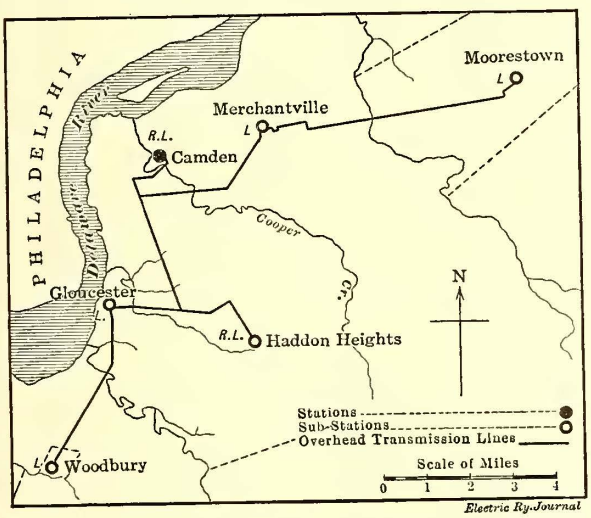
Two Adjustable Crossings in Place on Market Street, Newark

Trolley Troughs Under Low Railroad Bridge, Broad Street, Elizabeth

Secaucus and Edgewater stations. Direct current at 500 volts is generated at the Newark station, Fourteenth Street (Hoboken) station and at Paterson. The Marion station, which is the largest generating plant of the entire system, has a capacity of 23,000 kw at 25 cycles for railway purposes and 26,000 kw at 60 cycles for lighting and power, making a total capacity for this station of 49,000 kw. An additional 9,000-kw, 25-cycle generator will be added within a year. The Newark station, which consists of two separate plants operated as a single station, contains a total of 14,800 kw of direct-current and 25-cycle alternating current generators. The 60-cycle light and power equipment of this station has a total capacity of 9450 kw. The Paterson station contains 2800 kw of direct-current generators for railway purposes and 7800 kw of light and power a.c. generators. The Secaucus station has a total generating capacity of 3550 kw, all of which is used for railway operation.

MARION POWER STATION

The Marion power station, which is the largest generating plant operated by the Public Service Electric Company, is located on the east bank of the Hackensack River west of Jersey City. It was built in



Power Generation—Map of Southern Division Transmission Lines

1905 and has been enlarged from time to time until it now contains 26,000 kw of 60-cycle Curtis turbo-generators and 23,000 kw of 25-cycle generators of the same type. A cross-section of this station is shown in the engraving on page 592. The turbine room is 43 ft. 5 in. wide and 60 ft. 6 in. high from floor to bottom of roof trusses. The boiler room is 109 ft. wide and contains forty water-tube boilers arranged in banks of five boilers each on opposite sides of the four firing aisles. The boiler room is divided by brick partition walls into four separate sections and the ten boilers in each of the last three sections built are connected to brick stacks 14 ft. in diameter inside and 225 ft. high. The boilers in the first section are connected to two brick stacks, one of which is 9 ft. in diameter and 225 ft. high, and the other 14 ft. in diameter and 225 ft. high. Reinforced concrete coal-storage bins are built above the boilers under the roof and discharge the coal through spouts to the hoppers of the stokers.

Coal is delivered on barges to the dock on the Hackensack River. It is unloaded by clamshell buckets operated from a hoisting tower which deliver it to a belt conveyor running parallel to the boiler house on the north side. The conveyor delivers to cross conveyors running into the boiler house over each storage bin. For storing an emergency supply of coal during the season of closed navigation a large open space on the north side of the building is used. This storage yard is spanned by a traveling gantry crane carrying a clamshell bucket. The coal is picked up from the stock pile by this bucket and dumped into a hopper on one end of the crane. From here it is elevated by a bucket conveyor and dropped on the distributing belt conveyor running parallel to the building.

NORTHERN DIVISION SUBSTATIONS

There are nineteen outlying substations on the Northern division, in addition to which substation apparatus is placed in five of the six power stations. Fourteen of the outlying stations contain rotary converters for the railway distribution system and 600-volt railway converters are also installed at the Newark, Secaucus, Fourteenth Street (Hoboken) and Edgewater power stations. The following is a list of the railway substations and the total capacity of rotary converters installed in each: Washington Avenue, Newark, 2000 kw; Irvington Avenue, Newark, 2500 kw; Central Avenue, Newark, 3000 kw; Montclair, 1500 kw; Orange, 1000 kw; Morgan Street, Jersey City, 2000; Garfield Avenue, Jersey City, 4500 kw; Bayonne, 1500 kw; Palisade Avenue, Jersey City, 3000 kw; Seventh Street, West New York, 3500 kw; Rutherford, 300 kw; Arcola, 600 kw; Passaic, 2300 kw. The substation equipment in the power stations includes the following: Newark, 7000 kw, including a 3000-kw frequency changer which may be used for either 25-cycle or 60-cycle supply; Secaucus, 600 kw; Fourteenth Street, Hoboken, 3000 kw; Edgewater, 850 kw. All of the railway substations, with the exception of those at Central Avenue, Newark, and Arcola, also contain lighting equipment of varying capacities. The total capacity of the generating equipment of the Northern division is 48,750 kw for railways and 46,260 kw for lighting and power. The total capacity of the railway substation equipment on the Northern division, including that in power stations, is 39,510 kw.

TRANSMISSION LINES

The transmission system of the Northern division has two centers, one at Newark and one at the Marion power station west of Jersey City. As will be seen from the map on page 590, the transmission

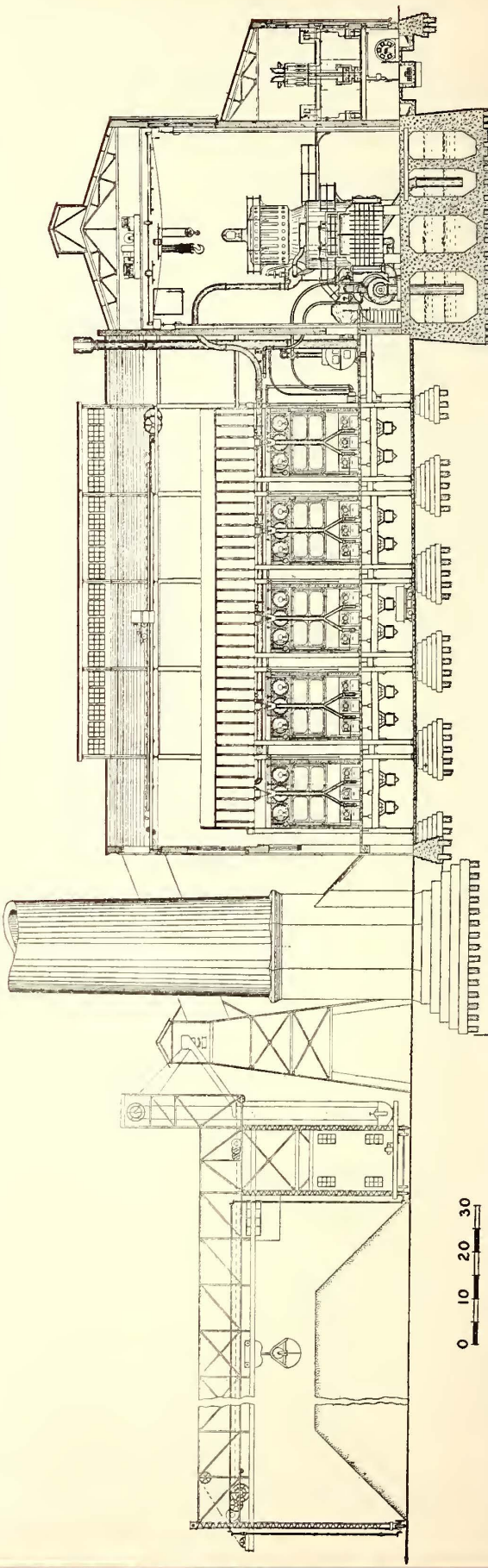
lines from the Marion station form a large loop connecting the substations at Palisade Avenue, Seventh Street, Hudson River, Englewood, Hackensack, Ridgewood, Passaic and Rutherford. They also tie together the Fourteenth Street generating and substation and the Paterson and Secaucus power stations. The Bayonne, Garfield Avenue and Morgan Street substations in Jersey City are also fed by underground transmission lines connecting with the Marion station. The Marion and Newark stations are tied together by two separate transmission lines, one of which crosses the Hackensack meadows along the Turnpike, and the other entering Newark by way of the Plank Road. The 25-cycle generators at Edgewater are tied in to Marion station by a 25-cycle transmission line from Seventh Street substation which follows the 60-cycle line to Hudson River substation. From the latter substation the line runs to Edgewater without entering the Hudson River substation and is connected to the station busbars.

The transmission line connecting the Marion power station with Newark and paralleling the line consists of fourteen No. 00 copper wires carried on two cross-arms supported by a double line of poles. The illustrations on plate XXIX show the crossings of this transmission line over the Delaware, Lackawanna & Western Railroad and over the electrified New York extension of the Pennsylvania Railroad. At the latter crossing the line is carried by two latticed steel poles and no protecting cradle is used. This transmission line terminates on the west bank of the Hackensack River in a cable house, from which it is carried under the river to the Marion power station by submarine cables.

CENTRAL DIVISION POWER STATIONS

The power stations of the Central division are all of comparatively small size. They are located at Elizabeth, Cranford, Metuchen, Perth Amboy and Milltown. The Elizabeth station contains 1275 kw of railway generating apparatus and 800 kw of light and power generating apparatus. The Cranford station contains 3150 kw of railway units and 2850 kw of lighting units. The equipment of the Metuchen station contains 1500 kw of railway machines and 1500 kw of lighting machines. The Perth Amboy station, which is new, contains at the present time two 5000-kw turbo-generators, either of which may be used for the railway load or for the lighting load. The Milltown station contains 1200 kw of railway generating equipment. The stations at Elizabeth and Milltown will be shut down within a few years and the new station at Perth Amboy will become the main station for this territory.

The Perth Amboy station is located on the Raritan River at tidewater and is close to the coal shipping docks of the Pennsylvania, Lehigh Valley and Philadelphia & Reading Railroads, so that a continuous and cheap supply of condensing water and fuel is available. The station is a brick and steel frame building 112 ft. deep and 181 ft. wide. It will



Power Generation—Cross-Section Through Marion Power Station

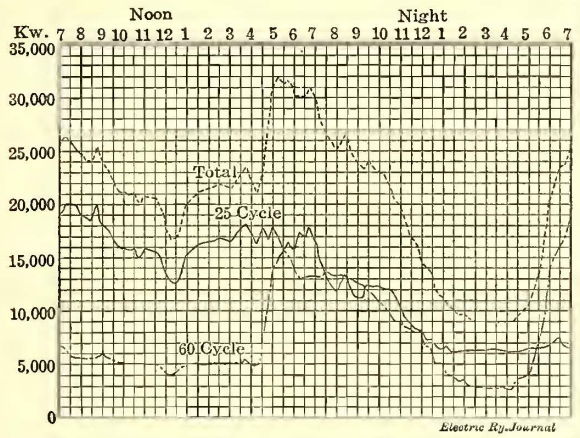
contain three 5000-kw Westinghouse horizontal turbo-generators and when entirely completed will contain five such units. Property is available for doubling this capacity in the future. Coal is delivered in barges and is unloaded with clam-shell buckets operated from a hoisting tower on the end of the dock which extends out 300 ft. into the river. An inclined steel trestle supports the belt conveyor which runs from the hoisting tower into the monitor over the boiler room, where it discharges into the storage bins above the boilers. Views of the Perth Amboy station are shown on plates XXVII and XXVIII.

CENTRAL DIVISION SUBSTATIONS

Only two of the outlying substations on the central division contain railway units. The Lincoln station contains a 400-kw rotary converter and the New Brunswick station contains a 300-kw rotary converter. With the exception of the Cranford station, however, all of the generating stations in this division contain some substation equipment. Elizabeth has 800 kw; Plainfield, 900 kw; Metuchen, 300 kw; Perth Amboy, 1100 kw, and Milltown, 250 kw. All of the generating stations and substations on the Central division, with the exception of Milltown, are tied together by transmission lines, as shown on the map, in such a way that the failure of any one transmission line would not affect the continuous operation of any of the stations.

SOUTHERN DIVISION

The Southern division has only one power station in which current for railway operation is generated. This is located at Camden and contains 4400 kw of railway generators and 3000 kw of light and power generators. The railway load in Camden is carried chiefly by 500-volt direct-current engine generators in the Camden station, but two 500-kw, 60-cycle,

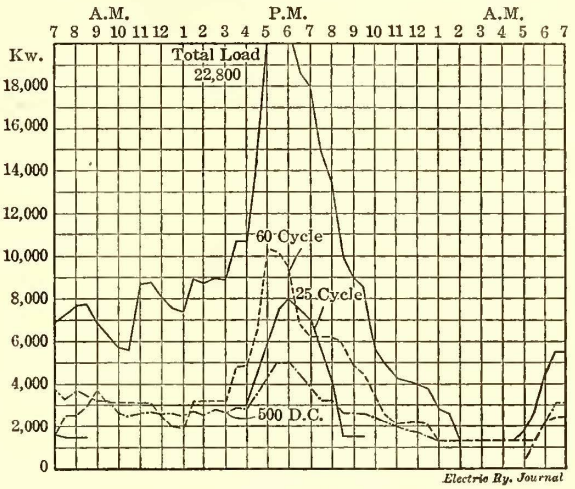


Power Generation—Maximum Load Diagram of Marion Station

11,000-volt rotary converters are also installed in the station to supply the railway lines. Only one substation in the Southern division contains railway-converting apparatus. This is located at Haddon Heights, where two 500-kw, 60-cycle rotaries are fed from a transmission line carrying current at 11,000 volts. As the traffic in the Camden territory grows other substations will be built in the suburbs.

LOAD CONDITIONS

During the year 1910 the total output of the generating stations of the Public Service Electric Company was 288,740,147 kw-hours, of which the rail-



Power Generation—Maximum Load Diagram of Newark Station

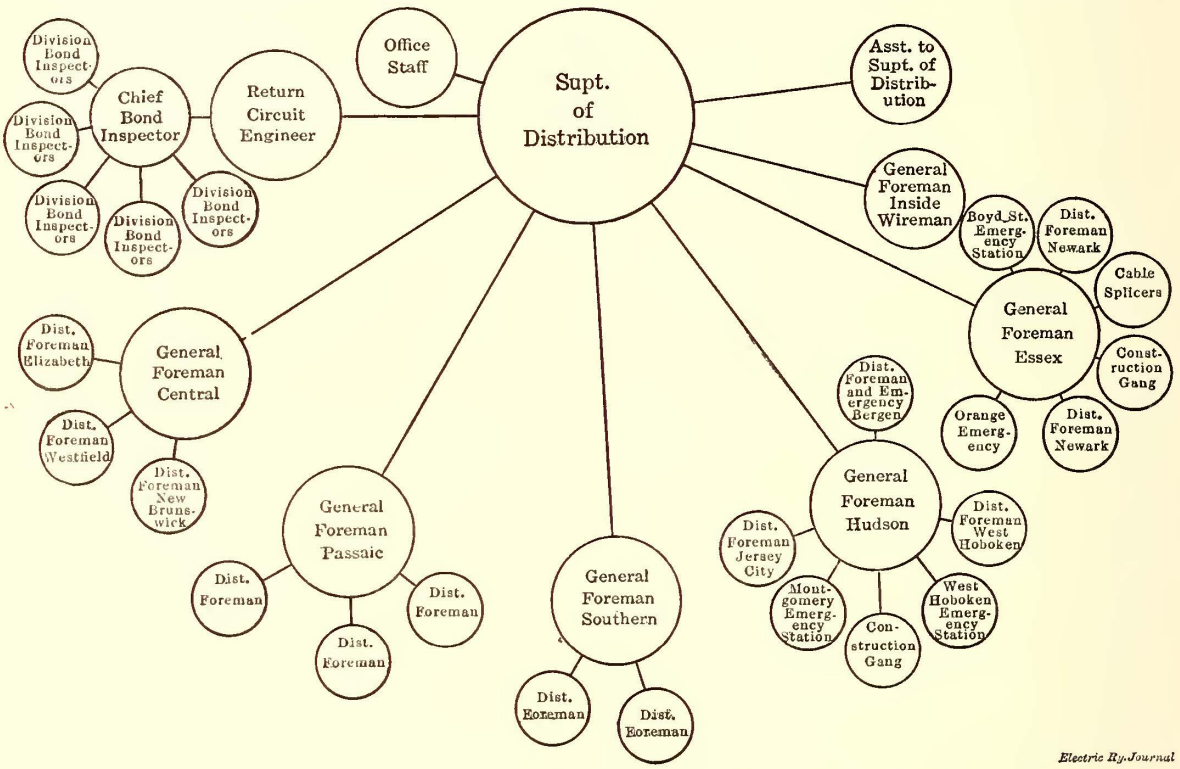
way company used 150,108,893 kw-hours and the remainder, or 138,631,254 kw-hours, was used for lighting and power supply. The maximum total loads occur during December and typical maximum load curves of the Marion, Newark and Camden stations are reproduced. The evening peaks between 5 and 7 o'clock are much larger than the morning peak, due to the combination of railway and lighting loads, which reach their maximum values at about the same time. Notwithstanding these peak-load conditions the Marion station had a load factor of 66.29 on the maximum day last year.

LOAD DISPATCHING

All of the alternating-current generating stations on the Northern division are operated in multiple so that the load can be thrown from one to another as may be desired. The system of station dispatching is under the direct charge of a chief operator at the Marion station, who is assisted by three load dispatchers, one of whom is on duty on each eight-hour shift. These dispatchers give all orders to stations for starting up and shutting down generators and throwing feeders in and out at the various substations and between the generating stations. This method of tying together the power stations by transmission lines and operating them all from a central point makes it possible to lay out a program in advance for running each of the stations so as to give the best load-factor possible and the lowest average total cost of current at the busbar. The program is changed occasionally as conditions change to keep down the total cost to a minimum. Some very interesting results reducing the operating costs of the generating stations are being obtained by this method of operating.

OVERHEAD CONSTRUCTION

THE distribution or line department has charge of all low-tension direct-current distribution, including lighting, railway and industrial motor circuits. It also has charge of all bonding and return circuits, telephone and block signals. As shown in the accompanying organization diagram, the chief of this department has the title of superintendent of distribution. Among the subordinate officers who report directly to him are the general foremen of the five operating divisions as named in the article on the way department. Each general foreman has charge of the construction and maintenance of the low-tension direct-current distribution lines in his district, and he is also jointly responsible with the return-circuit engineer for the maintenance of return circuits. divisions have certain special facilities, as indicated. Thus, the Essex division has a construction gang, cable splicers and two emergency stations. The Hudson division has a construction gang and three emergency stations, whereas the Central, Passaic and Southern divisions have only regular maintenance gangs. These differences in organization are due to the fact that the dense traffic conditions on the Essex and Hudson divisions require greater specialization. The average maintenance gang on all divisions consists either of a district foreman, lineman, helper and driver, or of a foreman, two linemen and driver. The feeder and pole-construction gang on the Essex division varies from ten to fifty men, according to the amount of work in hand. Construction work on the Southern, Central



Overhead Construction—Organization Diagram of the Distribution or Line Department

The general foreman of inside wiring takes care of lighting and motor circuits in the company's buildings. The return-circuit engineer is directly responsible for the construction and maintenance of all bonding and other return-circuit work as hereinafter described. The total number of men employed under the several heads shown in the diagram varies from 100 in winter to 150 in summer. The headquarters of the department are in two rooms on the third floor of the Public Service Building.

DIVISION ORGANIZATION

The organization diagram shows that the district foremen subject to each general foreman vary in number on the different divisions, and also that some and Passaic divisions is handled by the maintenance gangs, except where the job is large enough to justify the employment of a temporary gang. The cable splicers employed by the general foreman of the Essex division usually consist merely of one cable man and helper. It is the duty of these men to keep all cables in good condition, to see that manholes are clean, to determine all faults in cables and to submit monthly reports on tests of cable sheaths with relation to stray currents. These reports give the voltage of cable to track and to ground. These men are generally employed in Newark, but they are subject to call on other parts of the system. Large cable installations are made by the cable manufacturers, but smaller jobs are handled by the railway company's construction

gangs. Conduit lines are built by the construction department of the Public Service Electric Company.

EMERGENCY SERVICE

As previously observed, emergency gangs are employed on the Essex and Hudson divisions. There are two to four men in a gang. The company gives these men free lodging at the emergency station and pays for their laundry service. The men are subject to call at any hour of the day, but they receive one day off with pay every seventh day. On the other divisions two men in each gang take turns in staying at headquarters during the night to take care of any calls. These stations are provided with bedding for the use of those who are willing to stay there all night; otherwise, the men are summoned by telephones established in their homes by the company. The demands on their time for emergency service, however, are very rare, as the traffic conditions are not severe on the divisions named.

The department is supplied with Trenton tower wagons, wrecking wagons, feeder wagons and trolley wagons and hose-jumper wagons, all of which are drawn by horses. There has just been received, also, for use in Newark, an electric emergency wagon from the Electric Vehicle Company, Long Island City, N. Y. The cars and wagons used on outlying divisions have telephone equipments.

The great area served by this company and the variety of operating conditions have made it impracticable to establish a central bureau at which the work of maintenance and emergency gangs may be assigned. Instead each general foreman has a blackboard in his office on which his district foremen report the equipment they are using at a given place. As soon as the work at a certain spot is done the foreman telephones his next location to the office. It is customary also for emergency crews who are out on the line to telephone to their home office upon completion of a given job, so that they may be assigned to other work. This eliminates the loss of time which would ensue if they returned to the office without telephoning for instructions. The emergency crew reports the work done on a form of the type reproduced on this page. This mentions the place where the trouble occurred, the time of the call, the time of arrival, the time the line was cleared and the cause of the trouble. These reports are compared with the detention reports up to midnight of the preceding day, as furnished by the transportation department through the night telephone operator, and also with the daily report of interruptions in power circuits, as prepared by the power department. Consequently, interruptions to traffic are reported from three independent sources, so that the general manager and other executives can see whether defects are being promptly corrected by the responsible department.

It should be noted in this connection that every division of the transportation department is provided with a wrecking car. This outfit is used by the transportation department for handling car and track blockades.

Public Service Railway Company.

Overhead Department—Trouble Reports.

........................N. J., ... 191....

Place..

Trouble..

....

Time of Call................M. *Time of Break*................M.

Time of Repairs................M. *Cars Delayed*................

Reported by................ *Lineman*................

Place..

Trouble..

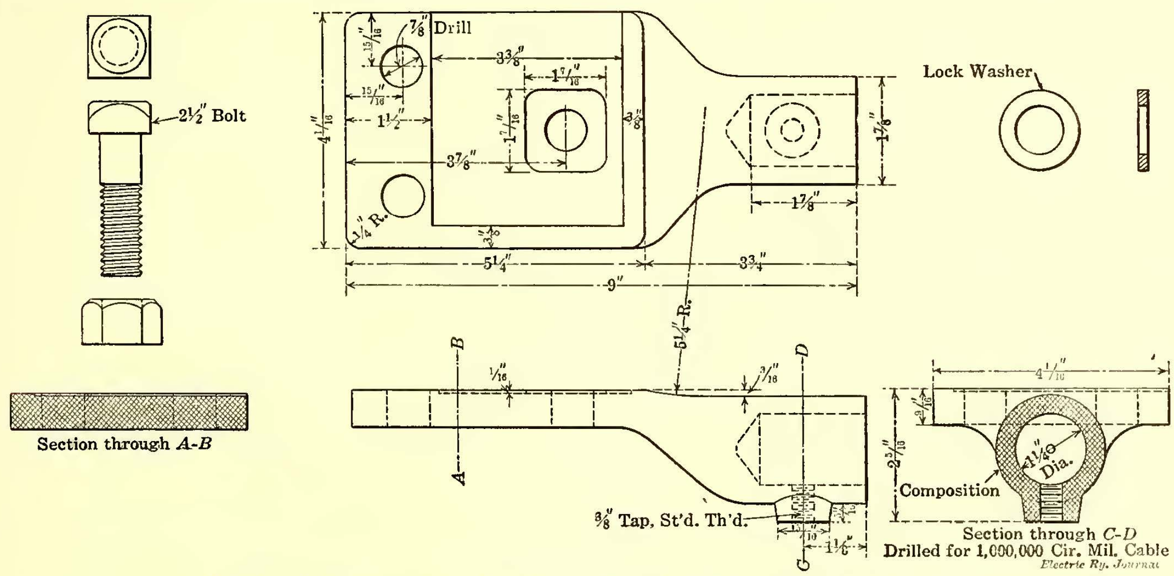
....

Time of Call................M. *Time of Break*................M.

Time of Repairs................M. *Cars Delayed*................

Reported by................ *Lineman*................

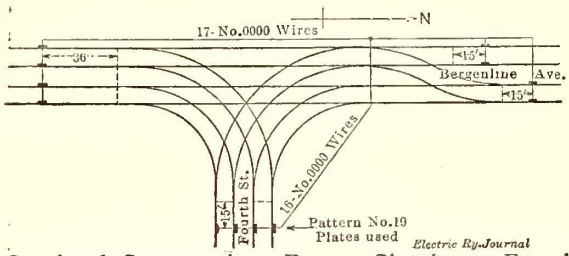
Overhead Construction—Part of Line Crew's Daily Report



Overhead Construction—Details of Terminal Plate for Negative Circuits

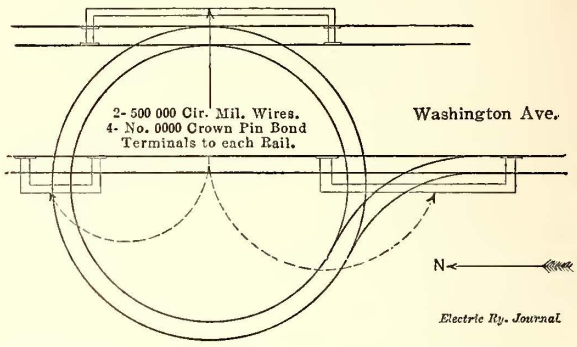
DUTIES OF THE RETURN-CIRCUIT ENGINEER

The return-circuit engineer has charge of all return circuits from the rail to the power house, such as bonds, negative return wires and supplementary wires around special work. He is assisted by the chief bond inspector and by division bond inspectors. The return circuit engineer makes surveys at least once a year of every part of the system to



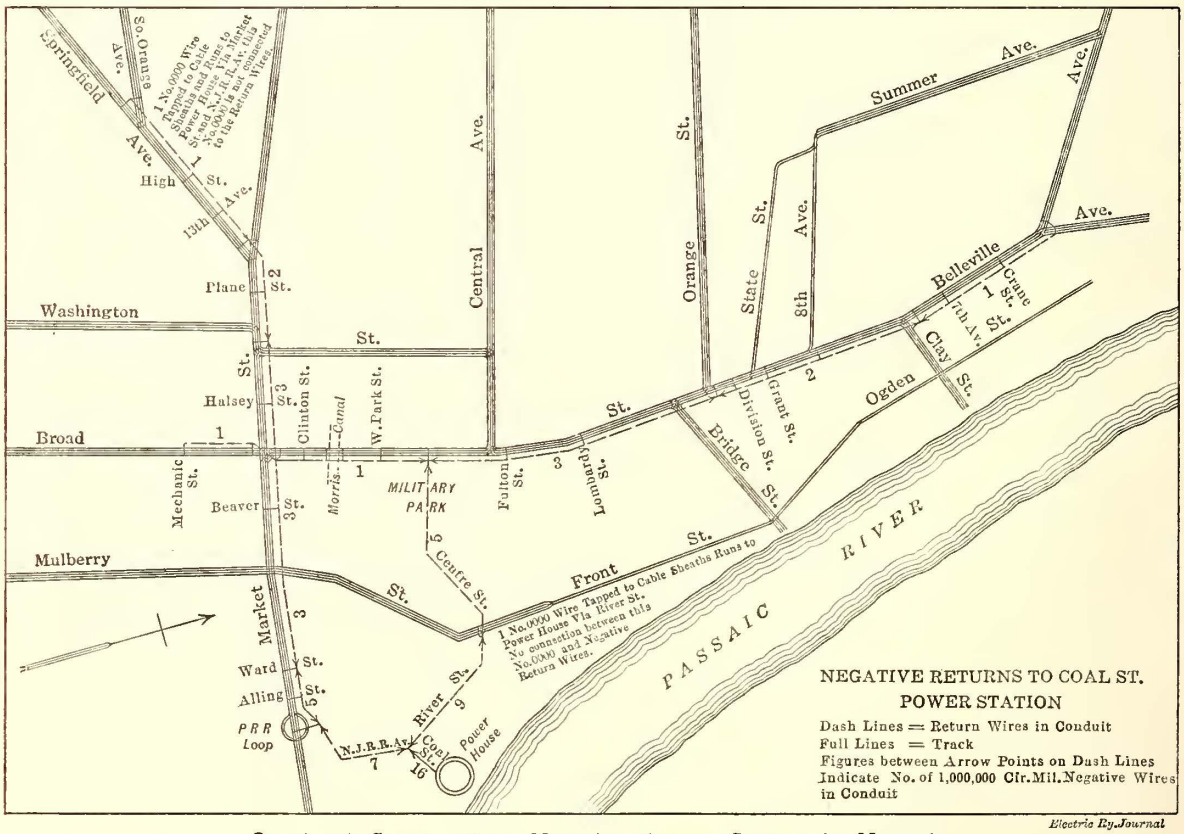
Overhead Construction—Return Circuits at Fourth Street and Bergenline Avenue, Union Hill

study the effect of stray currents. For this work he is provided with a Herrick car, which is used for bond testing and for determining transmission-line losses, with portable bond testers for individual cases, electrical measuring instruments, etc. The chief bond inspector uses the Herrick car for locating defective bonds. The memoranda of these locations are turned over to the proper division bond inspectors. Defective bonds are repaired directly by the distribution department with the brazed-bond system of the Electric Railway Improvement Company, three of whose bonding cars are now in service. Construction and extensive rehabilitation of bonding are done by the way department under the supervision of the distribution department. Crown-pin bonds are standard for new work and reconstruction. The Lorain electric-welded joint has been adopted for city track work.



Overhead Construction—Return Circuits at Big Tree Loop, Washington Avenue, Belleville

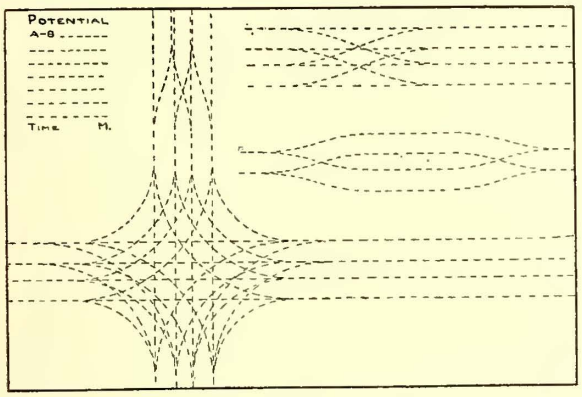
One of the most interesting features of the return-circuit construction is the method of wiring around all special work, no dependence being placed upon the bonding. For this purpose the company uses soldered terminal plates, which are applied and installed as explained in the drawing on page 595 and in the following description: Before applying the terminal plate for negative or supplementary wires the rail is ground off by means of an electrically driven grinder and tinned. Then the plate is tinned and bolted up with three 2½-in x ⅞-in. bolts, which have lock washers on either side. Upon this the rail is heated with a



Overhead Construction—Negative Return System in Newark

gasoline torch and solder is poured into its 1/16-in. recess. The wire or cable is attached by means of a set screw and is also soldered into the terminal. The supplementary wires are placed along the ends of the ties at about 6 ft. from the rail joints to avoid interference by track-repair gangs. This method has been found to give the highest mechanical and electrical efficiency for return-circuit work.

The return-circuit wiring of all special work is kept in an indexed file of individual drawings 8 in. x 13 in. in size. Examples of such arrangements are the drawings on page 596 of Big Tree Loop on Washington Avenue, Belleville, and Fourth Street and Bergenline Avenue, Union Hill, which show respectively the application of crown-pin bond terminals and of terminal plates. Terminal plates, however, are standard. A drawing on page 596 shows the system of parallel negative return wires which has been installed in Newark to tap return current from underground-cable sheaths. These wires are run in conduit from various points to the Coal Street power station, as indicated on the diagram.



Overhead Construction—Front of Bonding Inspector's Report Used for Special Work

Bonding reports on special work are made by the division bond inspectors on forms of the type shown on this page, on which every possible combination of special track work is indicated by dotted lines. The bond inspectors are instructed to fill in solidly the exact layout which they have bonded or tested. If a test is made, letters are used to indicate the points of contact and the results are tabulated in the upper left-hand corner of the report. If a continuous wire has been installed, the inspector indicates its position and locates the point of attachment as being so many feet from the switch point. He notes also the number and style of the terminals and the size of wire. These reports are used to make the finished indexed drawings of the class previously referred to and shown on page 596.

REPORTS, JOB ORDERS AND REQUISITIONS

The state of every job for which the distribution department is responsible is detailed on a monthly report for the general manager. The general style of this report is similar to that described in the article on the way department, and so requires no reproduction. The table opposite is an abstract of a form made at

PART OF SCHEDULE FOR AUTHORIZATIONS—DISTRIBUTION DEPARTMENT May 20, 1911

Auth. No.	Division.	Description.	Date Started.	Date Will Start.	Per Cent Completed. April.	May.	June.	July.	August.	September.	October.	November.	December.	1912 January.	Total.	Will Complete.	Completed.	Remarks.
292	Essex	Automatic signals—Mt. Prospect Avenue, Newark	.....	May 22	..	100	..	..	..	..	..	..	..	..	..	June 1	.....	.....
472	Essex	Return circuit	.....	.....	..	..	..	..	..	..	..	..	..	..	..	.....	.....	Pending advice from the legal department.
473	Central	Trolley guards	.....	July 24	..	..	..	25	75	..	..	..	..	..	..	Sept. 1	.....	.....
494	Passaic	Negative to Paterson Station	.....	June 1	..	..	100	..	..	..	..	..	..	..	..	June 15	.....	.....
505	Southern	Telephone system—Blackwood Line	.....	July 1	..	..	..	100	..	..	..	..	..	..	..	Aug. 1	.....	.....
506	Southern	Negative—River Road and State Street to Federal Street	.....	.....	..	..	..	..	..	..	..	..	..	..	..	.....	Apr. 30	.....

the beginning of the year to follow the progress of authorized jobs. This schedule gives the authorization number, the division, character and locality of the work, when it was begun or when it will be begun, the percentage completed from month to month, the estimated date of completion and the actual date of completion. A final column, headed "Remarks," is reserved for notes regarding responsibility for delays, etc.

The main storeroom of the distribution department is at Plank Road and Passaic Wharf, Newark, and is a part of the supply center in charge of the general storekeeper. Each division has a substoreroom, supplies for which are secured through a stores order which is sent by the general division foreman to the storekeeper, via the superintendent of distribution, by whom it must be approved before it can be filled.

FEEDER-DISTRIBUTION SYSTEM

The feeder system of the Public Service Railway is divided into sections, some of which are fed jointly; that is, in parallel, by certain stations. This method of connection has the same advantage as a tie-wire system for taking care of overloading and otherwise for equalizing the loads in a large territory. A typical example of this feeder equalization is presented in the sketch on this page, which shows an installation at Miller Street and Frelinghuysen Avenue, Newark, where three automatic circuit breakers have been installed to equalize sections Nos. 25, 52, 44 and 22. It should be added here that the section insulators are usually installed at cross-overs, wyes, loops and turning points generally for the convenience of the transportation department, so that cars may be turned at the nearest point in case of trouble.

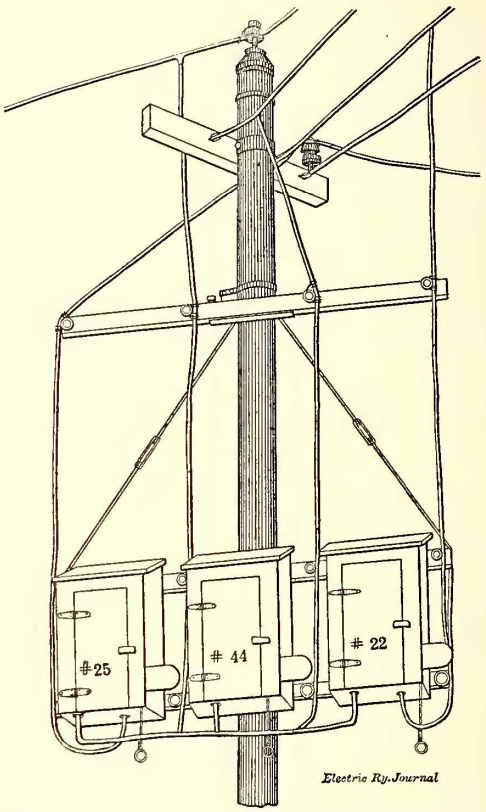
In the illustration of the Miller Street pole, sections Nos. 25, 44 and 22 are indicated on separate equalizer boxes. Section No. 52 is equalized through the other three sections. The breakers are closed, except in case of trouble. These breakers are in circuit with four telltale wires which are connected to a four-point switch and a lamp circuit in the station master's office at the Miller Street carhouse. Each telltale is marked and connected to a corresponding section. When one of the automatic circuit breakers is open and before it is closed there is placed on the proper telltale wire that switch in the station master's office which corresponds to the open breaker. The lighting of the lamps will indicate that the section is O. K., so that the circuit breaker should be closed. If the lamps do not light it is an indication that there is a ground on the line, so that the circuit breaker should not be closed. In this event the emergency crew must be notified at once to find the trouble on the given section.

When the circuit breaker is open a red semaphore shows alongside the box. When the circuit breaker is closed this semaphore is concealed behind the shields of the box. A piece of rope about 18 in. long with a ring at the lower end extends from the bottom of each box. The circuit breaker can be closed by pulling down this rope with a hooked pole which is kept in the station master's office.

ANALYSIS OF POWER REQUIREMENTS

An important feature in connection with the power-distribution system is the annual study made by the superintendent of distribution of the energy requirements of each feeder section in relation to changes in power and substation equipment, feeder arrangement, bonding betterments, etc. This study includes an analysis of the changes in power and substation apparatus suggested by the chief engineer of the Public Service Electric Company, which supplies the energy requirements of the Public Service Railway Company.

The recommendations of the superintendent of distribution are based on the proposed maximum service schedules over the specified section, as worked out



Overhead Construction—Feeder Equalizer Boxes

by the transportation department for the ensuing years, and upon the known average requirements of cars operated in the territories under consideration. As shown on the next page, the transportation department lists the approximate car requirements according to the number of the sections or circuits.

All calculated loads are based on records which were procured during the heaviest traffic months of the current year. The second table on the next page is a typical example of the relation between the electrical and transportation conditions in a given territory.

In the foregoing instance 30-kw substation capacity was allowed per car, which gave a station rating of 2160 kw, or an overload demand of 160 kw. As a rule, the substation machinery allowance per car in these estimates varies from 30 kw to 40 kw, according to the average weight and type of the equipment used on given sections.

Table XII.—Estimated Service on Passaic Division for the Year 1910.

Number of Circuit.	Route.	Number of Cars.	Number of Circuit.	Route.	Number of Cars
1	City Hall Loop	22	14	Main St., Michigan	12
4	Haledon	2	17	Main St., Passaic	10
5	Totowa	2	18	Singac River Road	4
6	Governor	3	19	Singac	3
7	Broadway	11	20	Grand Street	3
8	Cedar Lawn	8	21	Clay Street	4
9	North Main Street	4	36	Berry's Creek	2
10	Riverside	7	37	Rutherford	5
11	Lakeview, Clifton	4		Lodi	3
13	White Line, Passaic	6		Total cars	115

Table XIII.—Load on Stations in Hudson Division.

Palisades or West New York Substation, Capacity 2000 kw feeds.

	Section.	Jointly with Station.	Number of Cars in 1910.
1	Ft. Lee	....	7
2	Bergen Line	....	10
4	Summit Avenue	R	6
5	Union Line	R	9
7	Boulevard	R	4
8	Hudson Heights	....	10
9	Forty-second Street Ferry	R	10
10	West Hoboken	R	2
12	Shop	R	5
13	New Durham	....	2
14	Fairview	....	4
34	Homestead	R	3
	Total		72

Note:—R means that the section is jointly fed with Hoboken.

FEATURES OF LINE CONSTRUCTION

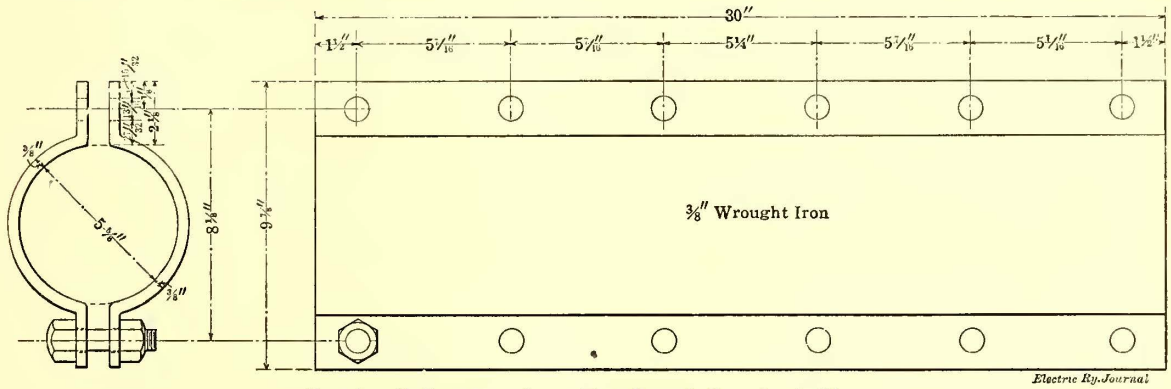
The consolidation late in 1903 of the properties now constituting the Public Service Railway brought under one management an almost infinite variety of overhead work, much of which was in urgent need of improvement. Since this time over 80 per cent of the trolley wire has been replaced, No. 00 wire being usually substituted for No. 0, and 500,000 lb. to 750,000 lb. of copper have been added to the distribution system every year in feeders, cables, etc. Advantage was taken of this reconstruction to standardize the pole and line material so far as practicable. The standard poles are 30-ft. chestnut or tubular steel, with a rake of about 8 in., and set 6 ft. in the ground in a 6-in. concrete shell. The pole spacing for both double and single-tangent track is 110 ft. The steel poles are 5-6-7-in. sections, with a 30-in. space at the ground line. The span wires are 5/16-in. double-galvanized steel and are hung with a minimum sag of 12 in., to insure flexibility. The spans are fitted with porcelain interlocking insulators, while caps and cones are used for primary insulation. The trolley wire is No. 00, suspended by means of 14-in. clinch ears at a height of 18 ft. 6 in. above the top of the rails. The trolley wire is hung with a 3-in. sag in 110 ft., to give a tight wire.

Corroded steel poles are usually renewed by the application of a 30-in. split clamp, which is made of ⅜-in. wrought iron and bent to shape in the company's shops. Details of this clamp are shown in a drawing on this page. The pole and clamp are given a heavy coat of graphite paint. In some cases the space between the clamp jaws is filled with cement. All steel poles now bought are reinforced at the butt with a 30-in. tubular sleeve, swedged near the ground line, as indicated on page 600. In the downtown section of Newark several hundred steel poles have been rehabilitated by the use of the Gherky sleeve.

An instruction print with table of radii is furnished to every foreman to insure uniform placing of wire on curves. This print, which is reproduced on page 600, shows the distance off center of the wire on all common radii of curves, and states that 4 in. offset must be added for each inch of elevation of the outer rail. The overhead switches are located entirely by the track frog, the position of which is determined by the radius of the curve. This reduces the location of the trolley frog to one standard distance in all cases. Only one degree of frog is used for all curves. The linemen are instructed simply to place the switch so many feet back from the track frog along the tangent.

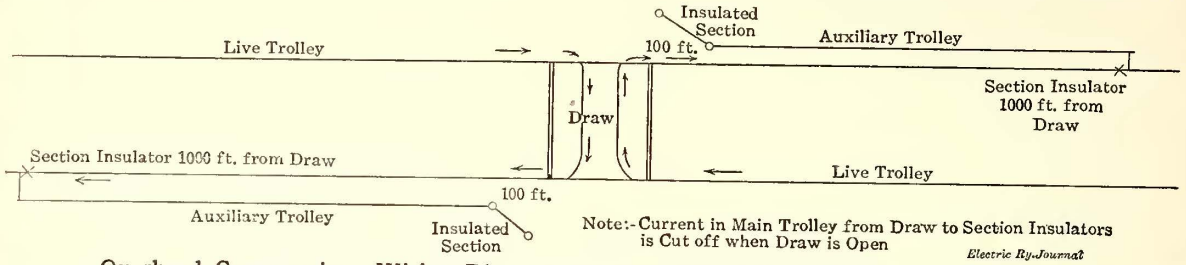
SPECIAL INSTALLATIONS

A view on plate XXXI shows the overhead frog construction applied on a curve near the Lackawanna Railroad station, where it was necessary to take care of variations due to the different location of trolley bases on single-end and double-end cars. One frog is installed in the ordinary position, but the second frog is placed on the straight wire about 6 ft. in front of the other. This extra frog is connected by another wire to a third frog placed on the curve wire at the point of tangency.



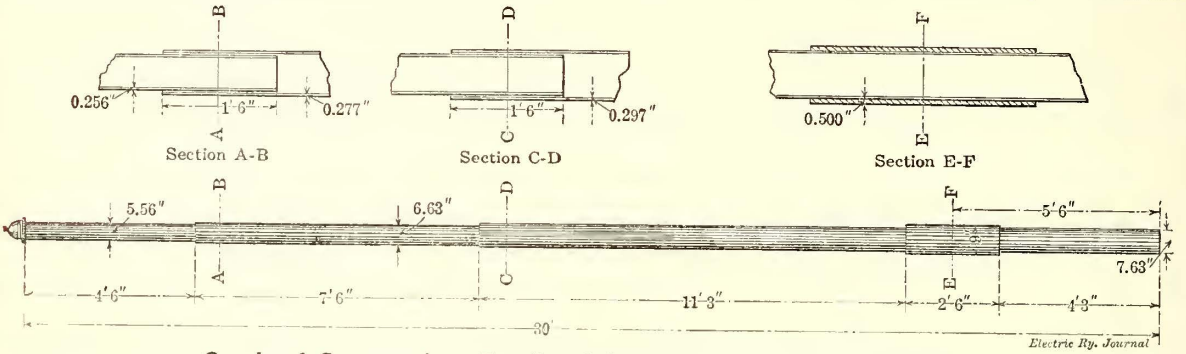
Overhead Construction—Details of Standard Clamp

Owing to the fact that the greater part of the Public Service system is arranged for single-end operation, it was found impracticable to back cars safely into a wye without turning the trolley pole. To meet this difficulty the standard trolley switch or frog was equipped with a flat bronze spring, as shown in plate XXXII. This gives it the action of a spring track switch. The conductor has no trouble now, as he is required merely to see that the trolley rope is free when the pole reaches the frog.



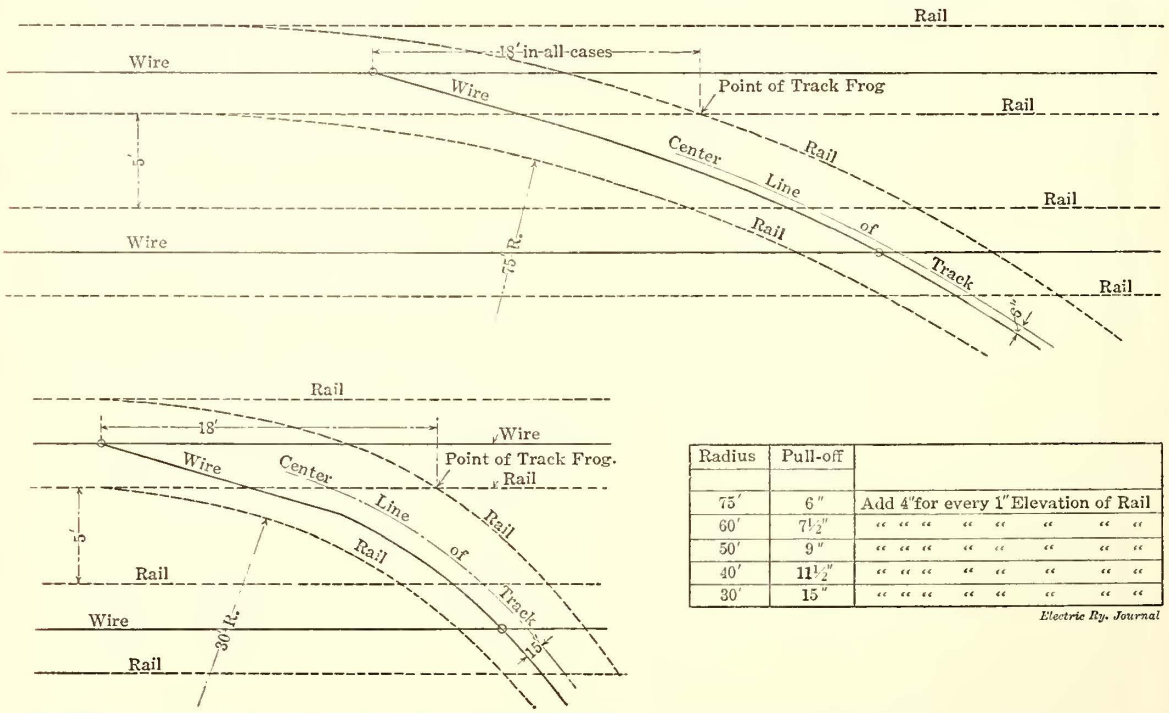
Overhead Construction—Wiring Diagram Showing Power Cut-Off Scheme at Drawbridge

All trolley frogs and fixed angle crossings are made with a bootjack or bridging piece to prevent the trolley from catching in the V of the frog and tearing down the line. This construction is shown in plate XXXII for individual switches. A similar installation on Market Street, Newark, in front of the Pennsylvania Railroad Station is also shown in plate XXXII.



Overhead Construction—Details of Standard Steel Pole and Sleeve

All frogs, crossings, section insulators, etc., have flexible approach ears to prevent the crystallization of the trolley wire at the end of the ear and to obviate the necessity of preventer ears. Plate XXXIII shows an example of this construction.



Radius	Pull-off	
75'	6"	Add 4" for every 1" Elevation of Rail
60'	7½"	" " " " " " " "
50'	9"	" " " " " " " "
40'	11½"	" " " " " " " "
30'	15"	" " " " " " " "

Electric Ry. Journal

Overhead Construction—Standard Instruction Pr int for Erecting Overhead Work at Branch-Offs

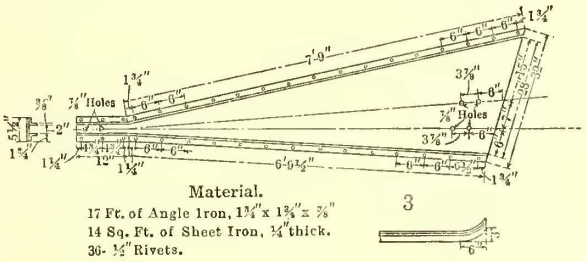
Two drawings on page 602 show the special cast-steel chairs which support wooden cross-arms on iron

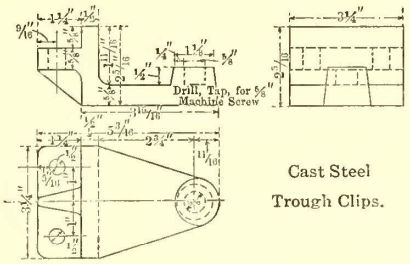
poles without using cross-arm braces. Each chair is made of two halves bolted around the pole. Two supporting members are used for double-arm chairs and one supporting member and a strap for single-arm chairs. The bolts which fasten the cross-arms to the chair are independent of those that fasten the chair to the pole. Separate sets of bolts were found necessary to prevent the slipping of the chair under heavy loads. Both chairs have a supporting surface of 2⅜ in. x 15⅝ in.

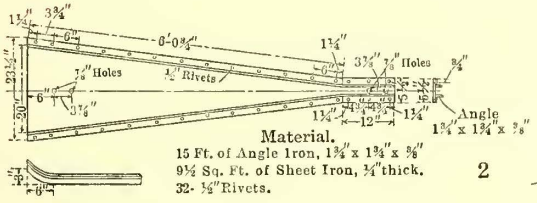
The feeder pole at Front and Ogden Streets, Newark, which has been fitted with these chairs, is also interesting in another way, inasmuch as it has to carry very heavy loads, the weight of which must be distributed over a limited area. The pole consists of three extra heavy tubes of 10 in., 9 in. and 8 in. diameter respectively. It is stiffened inside by a steel rail which extends into the lower part of the top section. The interior of the pole is grouted. A channel beam 10 ft. long is placed at right angles to the pole just below the ground along the curb line, and a second 10-ft. channel is placed at right angles to the pole on the opposite side, 8 ft. below the ground line. The second channel serves as a deadman for the anchor rods which are attached to a pole band installed just below the ground line.

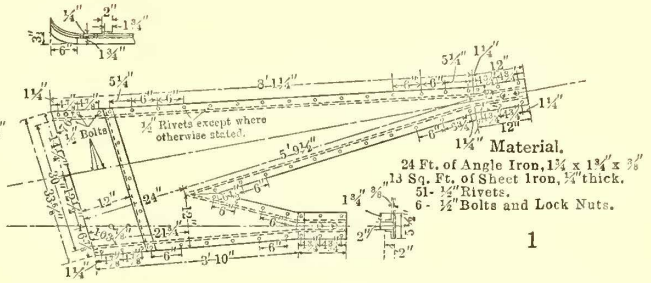
An example of the overhead construction adopted for locations with very restricted clearance is presented by a half-tone on plate XXXII and by the drawing on this page, which shows the overhead trough and pan construction under the Jersey Central Railroad in Elizabeth. At this place the trolley wheel would not stay on the wire because of a 5 per cent grade on the approaches. The pans are insulated from the metal structure of the railroad approach by 2 in. of wood and mine hangers, each with a 1-in. petticoat. The insulation required exceptional care to avoid interference with the signal circuits of the steam railroad.

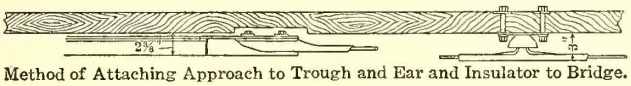
A wiring diagram on page 600 shows the overhead construction used on the approaches to drawbridges. At a point 1000 ft. from the draw a section insulator is installed in the regular trolley wire to deprive the car of current when the draw is open. A parallel wire is provided, however, for lighting the car and for moving it cautiously to within a shorter distance from the draw. The auxiliary trolley is dead-ended at a point 100 ft. from the draw. The overhead line connections between the roadway and the draw consist of pans, either of the automatic drawbridge type of the Electric Service Supplies Company or of home-made construction. Top and bottom views of the former pans are shown in plate XXXII. Both the overlapping and underrunning parts are made of cast bronze. The underrunning half is attached to



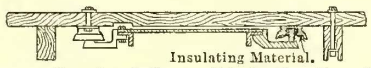




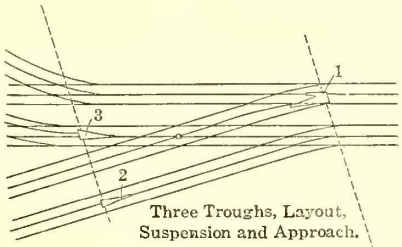




Method of Attaching Approach to Trough and Ear and Insulator to Bridge.



Method of Suspending, Insulating and Protecting Troughs to Bridge.



Material.

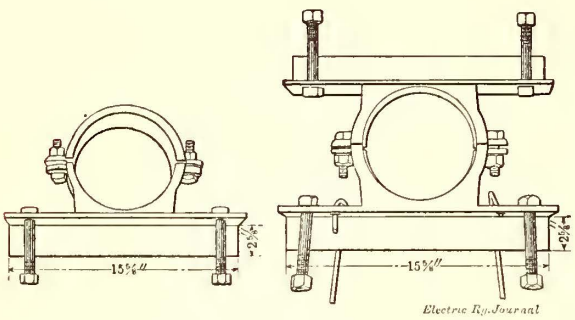
3 Troughs.	1 Adjustable Crossing.
70-80 Mine Hangers and Bolts.	280 Ft. of 2-0 Phono-Electric Wire.
20 Trough Clips.	2 Switches.
50-60 Ears.	500 Ft. of 2"x 4" Timber.

Electric Ry. Journal

Overhead Construction—Details of Pan Work Under Railroad Bridge at Broad Street, Elizabeth

the draw and the overlapping half to the end of the structure. The underrunning half has a hinged outer portion, which passes under the other pan and makes positive contact by means of springs. The wings of the solid half are inclined to provide for variations in the height of the pans, due to oscillations of the draw for the expansion and contraction of the bridge structure. The outer ends of the hinged portion have rollers to minimize friction.

Plate XXXIII shows some two-way and three-way overhead crossings without the flexible approaches; a



Overhead Construction—Cast-Steel Chairs for Supporting Wooden Cross-Arms on Iron Poles

standard section breaker; overhead construction at Fourth Street, and private right-of-way, Union Hill, showing four pull-off wires attached to a fixed angle or crossing; line construction in front of the West New York carhouse, showing some catenary suspension; line construction at Plank Road storage carhouse, and overhead switches in front of the West Hoboken carhouse, numbered to correspond to the numbers of the carhouse tracks.

MANUFACTURE OF OVERHEAD EQUIPMENT

The company is now manufacturing circuit breakers, switches, adjustable crossings and other line material at the Plank Road car maintenance shops. Until very recently frogs and crossings were made of a bronze composition containing eighty-seven parts of copper, six parts of tin and seven parts of zinc. This is being superseded by malleable iron, which is more flexible and cheaper, even when due allowance is made for the scrap value of the old composition. Ears and approaches, however, will continue to be made of another bronze composition consisting of 90 per cent copper, seven parts zinc and three parts tin. Phono-electric wire is installed in the downtown sections of Newark and Jersey City. This wire gives about two-thirds more wear than the ordinary hand-drawn copper.

SIGNAL SYSTEM

The line department is installing United States non-recording signals on 166 miles of single-track sections, comprising practically all single-track mileage. According to the plans of the company all of the single-track routes will be equipped with this system. The apparatus is of the manufacturer's standard type, except that a different contact switch is used wherever cars are turned to the right. The advantages of this switch, a view of which is shown in plate XXXIII, are that there are no complicated parts to maintain and that the wheel can travel on its groove all the way without interruption in a horizontal plane. This switch is being patented by the superintendent of distribution.

ROLLING STOCK

THE car equipment of the Public Service Railway comprises 1381 double-truck closed cars, 177 single-truck closed cars, 276 double-truck open cars, 254 single-truck open cars, 96 plows and sweepers, 62 sprinklers and sand cars, and 134 work, line and miscellaneous service cars, a total of 2380 cars of all kinds. When the Public Service Corporation was organized in 1903 a varied assortment of rolling stock equipment was acquired with the street railway properties which were taken over. Many of these cars were replaced at once by more modern equipment, but those which were in good condition were retained in service. During the last eight years the company has purchased or built in its own shops 811 large double-truck closed cars and 137 double-truck open cars to replace old cars withdrawn from service and to provide for increased traffic.

The older cars built prior to 1903 have series numbers beginning with 1 and continuing up to 1300. The 12-bench, double-end open cars built in 1904 have serial numbers beginning with 1400. Closed cars with serial numbers from 1522 up to 2319 have all been built since 1904. The cars used on the Southern Division in Camden have serial numbers beginning with 2900, 3000 and 3100, while service cars of all divisions are numbered beginning with 5000.

The following is a brief description of the principal types of closed cars purchased since 1904:

1500 class: Double-end; 30-ft. 8-in. bodies; longitudinal seats; seating capacity 33; converted to pay-as-you-enter type at Plank Road shop in 1908.

1600 class: Single-end; 30-ft. 8-in. bodies; cross seats; seating capacity 40; converted to pay-as-you-enter type at works of John Stephenson Company, 1908.

1700 class: Part single-end and part double-end; 28-ft. 8-in. bodies; longitudinal seats; seating capacity, double-end cars 31, single-end cars 33; converted to pay-as-you-enter type at the Plank Road shop and at the works of John Stephenson Company in 1908.

1800 class: (Nos. from 1800 to 1846) Single-end; 30-ft. 8-in. bodies; cross-seats; seating capacity 40; converted to pay-as-you-enter type at works of John Stephenson Company in 1908.

1900 class: (Nos. from 1900 to 1949) Part single-end and part double-end; 30-ft. 8-in. bodies; cross seats; seating capacity 42.

1900 class: (Nos. from 1950 to 1981) Single-end; 28-ft. 8-in. bodies; longitudinal seats; seating capacity 33; converted to pay-as-you-enter type in 1908 at works of John Stephenson Company.

2000 class: (Nos. from 2000 to 2049) Single-end; 30-ft. 8-in. bodies; cross seats; seating capacity 39. Built in 1907.

2000 class: (Nos. 2050 to 2099) Single-end; pay-as-you-enter; 30-ft. 8-in. bodies; cross seats; seating capacity 39. Built in 1908.

2100 class: Same as Nos. 2050 to 2099. Built in 1908.

2200 class: Single-end; pay-on-platform type; 32-ft. bodies; longitudinal seats; seating capacity 41. Built in 1910.

2300 class: Double-end; pay-on-platform type; 32-ft. bodies; longitudinal seats; seating capacity 41. Built at Plank Road shop, 1911.

Exterior views of these later types of cars as converted are shown on plates XXXV to XXXVII.

The newer cars used on the Southern Division are of the following types:

3100 class: (Nos. from 3154 to 3186) Double-end, 33-ft. 4-in. bodies; cross seats; seating capacity 46. Built in 1906.

1800 class: (Nos. from 1857 to 1876) Double-end; 29-ft. 4-in. and 32-ft. bodies; cross seats; seating capacity 40 to 44. Built in 1904 and 1906.

1900 class: (Nos. 1991 to 1999) Same as 2200 class. Built in 1910.

The following table summarizes the lengths of the closed cars operated by the Public Service Railway:

Car bodies over 33 ft.	54
Car bodies from 30 ft. to 32 ft.	867
Car bodies from 28 ft. to 30 ft.	162
Car bodies from 22 ft. to 28 ft.	334
Car bodies under 22 ft.	141
Total	1558

TYPES OF PREPAYMENT CARS

In 1907 the Public Service Railway ordered 150 prepayment cars built under license from the Pay-As-You-Enter Car Company. These cars, which are numbered from 2050 to 2199, were the first prepayment type cars put in operation on this road. The results of operation of these cars were so successful that 733 of the old style double-truck cars have since been converted to the prepayment type. The prepayment feature has been adopted as standard for all new cars. The only exceptions are for cars operated on some of the long lines where fare zones are established and the conductor is required to pass through the car to collect second fares.

Three types of prepayment platforms have been used on the new and rebuilt cars. These are distinguished as "pay-as-you-enter," "pay-within" and "pay-on-platform." The "pay-as-you-enter" type has separate exit and entrance door openings in the rear-end bulkhead. The "pay-within" type has the bulkhead entirely removed and the conductor stands within the car facing to the rear. The "pay-on-platform" type has a double sliding end-bulkhead door without a central doorpost to divide the opening into entrance and exit, but has the usual curved platform railing inside of which the conductor stands. The "pay-on-platform" arrangement has been adopted for all future construction of new cars and the "pay-within" arrangement is being used in rebuilding some

of the old cars which have short platforms. The following table summarizes the prepayment cars operated by the company:

	Single-End	Double-End	Total
Pay-as-you-enter	334	132	466
Pay-on-platform	212	246	458
Pay-within	81	22	103
Total prepayment	627	400	1027
Old style	89	442	531

The platforms of all prepayment type cars are inclosed with folding gates or doors mechanically operated by the conductors and motormen. Doors are used on both platforms of all double-end prepayment cars and on the front platforms of single-end cars. Wire mesh gates are used on the rear platforms of single-end cars. On the first cars which were converted the gates over both the entrance and exit steps on the rear platform were dropped down to the step tread outside of the platform sills and were arranged to open outwardly. All of the entrance gates are now being set up on the platform and arranged to swing inward.

SINGLE-END AND DOUBLE-END CARS

Most of the lines operated by the Public Service Railway have wye or loop terminals for turning single-end cars and a majority of the cars purchased during the last five years have been of the single-end type. The company now has 716 single-end closed cars and 842 double-end closed cars. The increased seating capacity and lower weight of a single-end car as compared with a double-end car of the same type is shown by the 1700 class cars of this company. Of the 100 cars of this type forty-six are single-end and fifty-four are double-end. All have longitudinal seats and 28-ft. 8-in. bodies. The double-end cars seat thirty-one passengers and weigh 44,000 lb., while the single-end cars seat thirty-three passengers and weigh only 41,500 lb.

SEATING ARRANGEMENT

Longitudinal seats are favored by the management for cars operated on all but the longest lines. The 2200 and 2300 class cars built during 1910 and 1911 have longitudinal seats. Nearly all of the cars on the Southern Division are used on long runs into suburban territory and such cars are equipped with cross seats. Combination seating has been placed in some of the original narrow longitudinal seat cars where the latter are being used for suburban work.

WHEELS

The standard wheels of the Public Service Railway are chilled cast iron of the reinforced spoke pattern. They are 33 in. in diameter, with 2½ in. treads and 11/16 in. flanges. Several thousand solid steel wheels have been purchased and put in service on interurban and viaduct lines, but at present prices of iron and steel wheels, cast-iron wheels are considered more economical for city service. A trial lot of 100 light-weight, one-wear steel wheels have recently been put in service to determine their life and cost per 1000 car miles as compared with cast-iron wheels. The practice of grinding cast-iron wheels to remove flat spots is described in the chapter on maintenance of car equipment.

MOTORS

Of the 1381 double-truck closed cars 1186 have four-motor equipments. The two-motor equipments under double-truck cars are confined to the old light cars. A few two-motor equipments with a total capacity of 120 hp are being tried under large cars as an experiment, but the grades and the rail conditions on many of the streets are so bad at times that it is difficult to obtain sufficient adhesion on two pairs of driving wheels to accelerate the large cars at the rate required to attain the present schedule speeds.

Table XIV shows in detail the types of motors used on closed, open and service cars. The Westinghouse No. 307 and General Electric No. 216 motors are

TABLE XIV.—TYPES OF MOTORS USED BY THE PUBLIC SERVICE RAILWAY.

	Closed Cars.		Open Cars.		Service Cars.		
	Two-Motor	Four-Motor	Two-Motor	Four-Motor	Two-Motor	Four-Motor	Total
West. 307	...	8	...	...	...	...	8
West. 101	32	468	...	...	4	5	509
West. 68	29	288	...	...	...	6	323
West. 93-A	...	33	...	...	...	...	33
West. 92-A	...	28	...	...	...	...	28
G. E. 216	...	10	...	...	...	...	10
G. E. 80-C	55	175	...	...	...	7	237
G. E. 67	25	110	...	17	...	4	156
G. E. 57	112	19	41	...	86	11	269
G. E. 90-A	...	8	...	...	...	...	8
Older types	111	39	128	3	109	11	401
	364	1186	169	20	199	44	1982

of the interpole type, which has been adopted as standard for all new motor equipments.

TRUCKS

Short-wheel-base trucks with outside-hung motors were for a long time the standard equipment for closed double-truck cars, but recently the company has adopted as standard the M. C. B. equalized type, with 6-ft. wheel base and inside-hung motors. Nearly all of the cars now operated on the longer routes where high speed is attained have been equipped with trucks of this type, and the short-wheel-base trucks are being used under cars operated at slow speed.

AIR BRAKES

All of the large double-truck cars are equipped with air brakes in addition to hand brakes. In 1904 the storage air-brake system was adopted for the cars running on the principal lines and compressor stations were installed at the important carhouses. During the past two years, however, independent compressors on the cars have been applied in large numbers. Out of a total of 1303 air-brake cars, 681 have storage tank equipment and 622 have independent compressors. The storage air-brake cars have two storage tanks 18 in. x 78 in. with a combined capacity of 439 cu. ft. of free air at 300 lb. pressure. They discharge through a reducing valve set at 50 lb. into a service reservoir 12 in. x 42 in., from which the air is admitted through the brake valve to the brake cylinder. An average of 1.2 cu. ft. of free air is required for each full application of the brakes so

that the storage capacity on the car is sufficient for at least 300 brake applications.

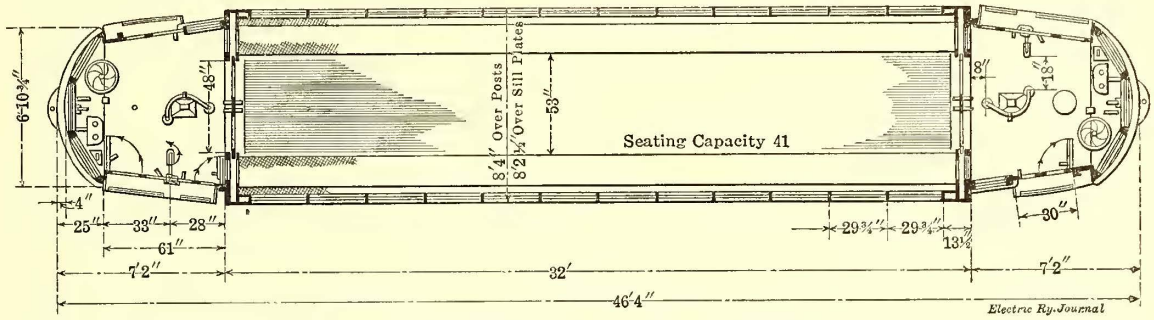
CAR HEATING

Closed cars are heated by coal stoves set in the center of the car on one side or by hot-air coal heaters mounted on the front platform and discharging through a register in the forward bulkhead. Hot-water heaters burning coke are used on the Southern division cars.

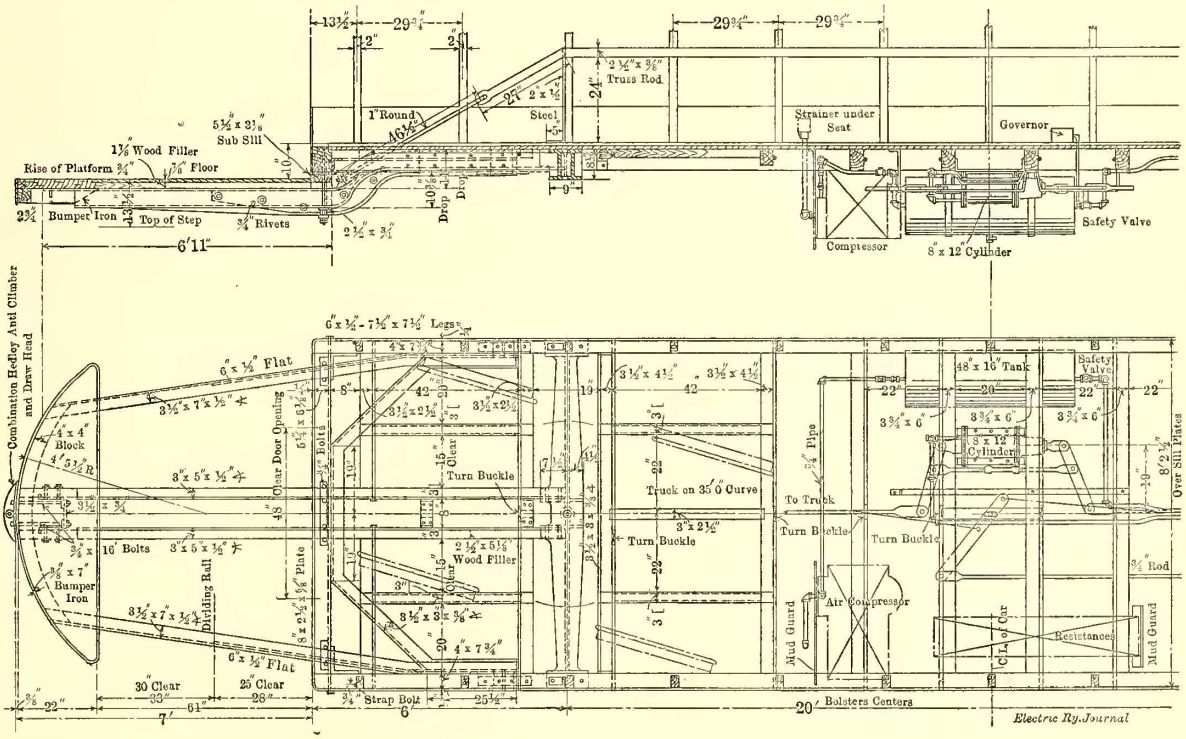
LATEST TYPE OF CAR

The latest type of car of the Public Service Railway is designated as the 2300 class. Twenty cars of this type have been built this year at the Plank Road shop. These cars are designed for double-end prepayment operation and have 32-ft. bodies. The platforms at each end are 7 ft. 2 in. long and are completely inclosed with folding doors above the steps. The seating capacity is 42 passengers, and the total weight with equipment is 45,600 lb.

No center sills are used in the underframing. The side sills consist of 7¾-in. x 4-in. yellow-pine timbers, reinforced with a ¼-in. x 18-in. sill plate, which forms the bottom side panel and is continued around the ends of the car body to the bulkhead-door posts. The bolsters are of cast steel with shouldered ends, on which the side sills rest. In the center of the underframing are four cross timbers 3¾ in. x 6 in., which support the air-brake apparatus and the resistance grids hung under the car. Along the face of each cross timber is a ¾-in. sill tie rod, which has riveted ends countersunk in the sill plates and a turnbuckle inserted in the center to draw it up tight. The end sills are 5¼-in. x 6⅞-in. white-oak timbers, mortised into the side sills and stiffened with ½-in. x 6-in. knee plates. Each end of the underframing is further reinforced by a continuous steel angle 3 in. x 3½ in. x ⅜ in., which is bolted to the side sills just outside the bolster for a distance of 25½ in., and is then bent inward at an angle of 45 deg. to the inside face of the end sill, against which it has a bearing of 38 in. No other diagonal bracing is used.

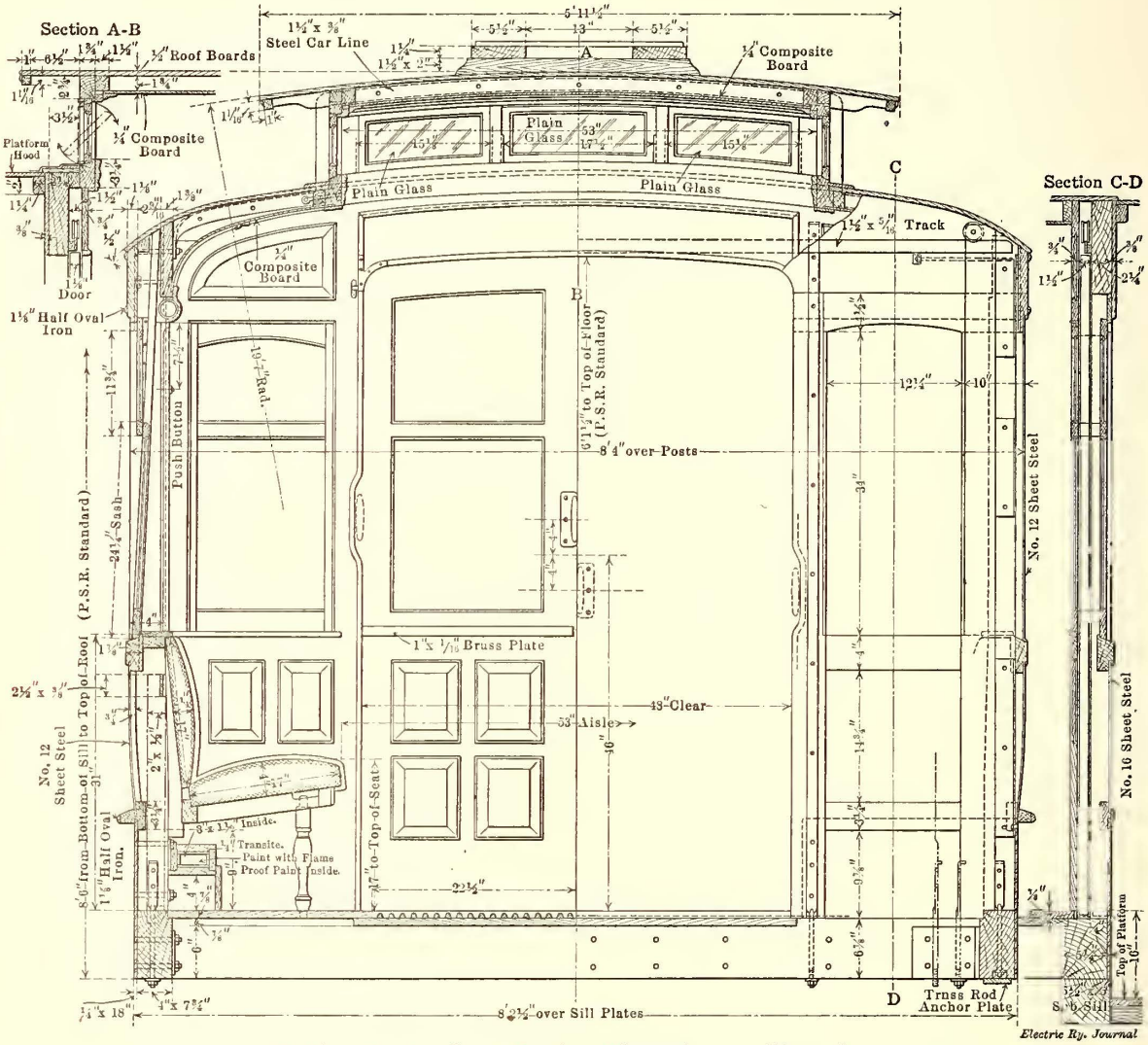


Rolling Stock—Floor Plan of 2300 Class Car



Rolling Stock—Part Plan and Elevation of Framing of 2300 Class Car

The platform framing consists of two 3-in x 5-in. x ½-in. angle center sills and two 3½-in. x 7-in. x ½-in. angle side sills. The center platform sills are carried back to the bolster, to which they are bolted. They are reinforced with 2½-in x 5⅛-in. oak fillers, which extend out under the crown piece and back up the anti-climber drawhead casting. The bumper beam is 4 in. x 4 in., cut on a radius of 4 ft. 5½ in. and sheathed with a ⅜-in. x 7-in. face plate. The platform side sills are bolted inside of the body side sills and are reinforced at the bend under the end sill with



Rolling Stock—Cross-Section Through 2300 Class Car

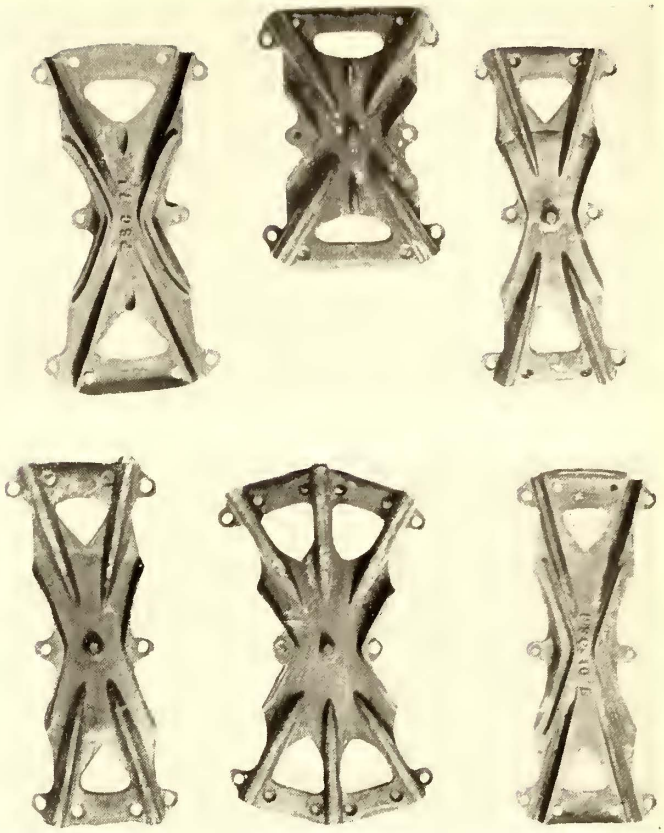
6-in. x ½-in flat plates riveted to the vertical webs of the angles. A 5½-in. x 3⅛-in. subsill is attached under the body end sill, and the platform sills are clamped up against this subsill with ¾-in. stirrup clamps.

The body posts are ash, 2 in. x 3½ in. They are mortised into the top of the side sills and bolted to the ¼-in. sill plates. A steel plate 2 in. x ½ in. is attached on the side of each of the posts over the bolsters to take the downward thrust of the overhang truss rod. This truss rod is 2½-in. x ⅜-in. section, and is gained into the posts just below the windows. It terminates at each end in an eye, into which is inserted a 1-in. round hook bolt which passes down through the side sill to the truss-rod anchorage. The top side panels under the windows are formed of No. 12-gage sheet steel, which is screwed to the blocking back of the fender rail and is notched into the window rail. The panels are slightly convex and are supported on the inside by ¾-in. ash ribs.

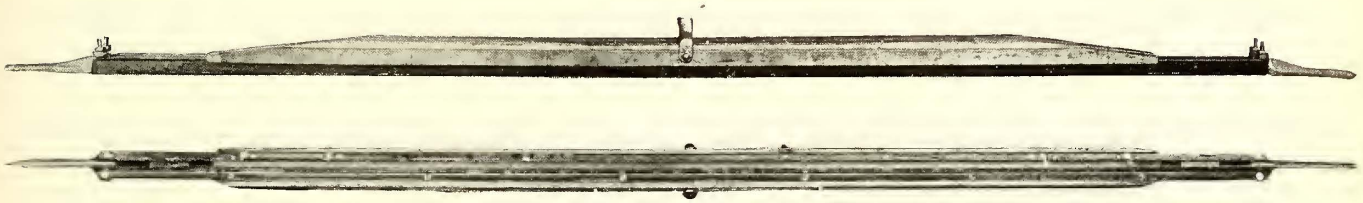
The roof is of the monitor-deck pattern with compound carlines over each post. The roof boards are ½ in. thick, covered with canvas. Agasote is used for the headlining of both the upper and lower deck.

The end bulkhead doors slide back into pockets in the bulkhead and have a clear opening of 48 in., which is divided into entrance and exit passageways by the platform railing which partially surrounds the fare box. This railing terminates 8 in. away from the step into the car and is bent around slightly more than 90 deg., to come in line with the post on which the door-operating handles are mounted. The opening over the right-hand step is 61 in. wide, and is divided by a pipe railing into an entrance 32 in. wide

Equalizing Feeder Boxes, Miller Street and Frelinghuysen Avenue, Newark



Two-Way and Three-Way Fixed Angles—Flexible Approaches Not Shown



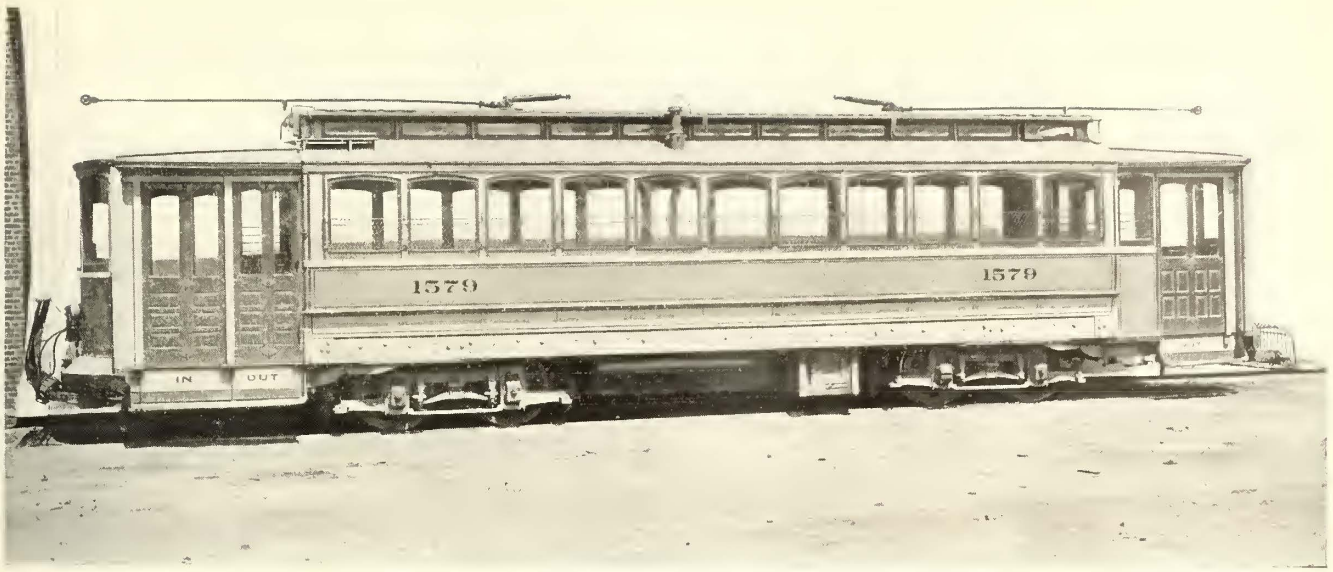
Overhead Switch for Signal System

Standard Form of Section Insulator

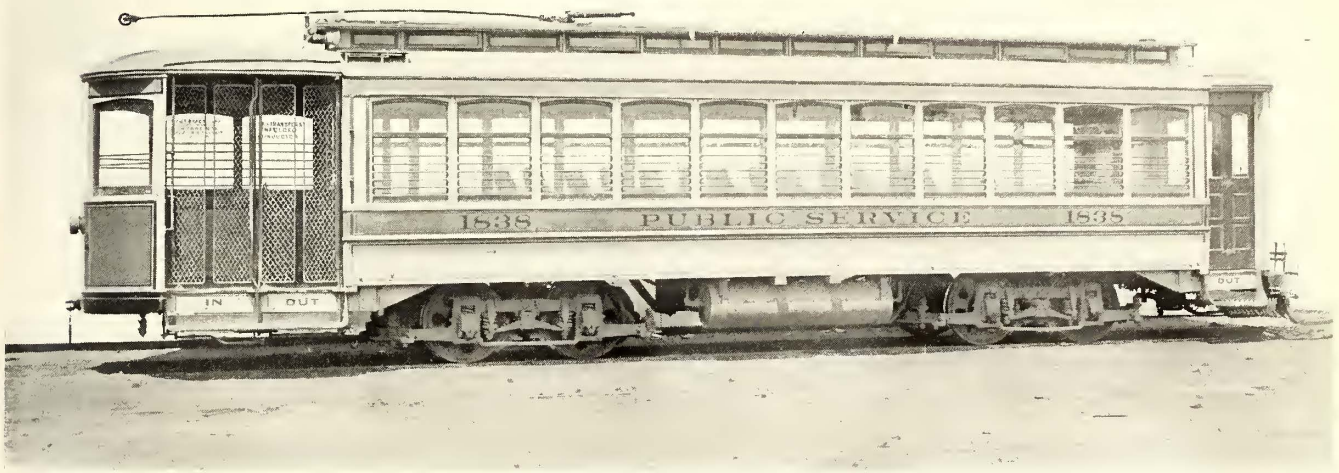
Standard Overhead Line Hanger with Flexible Approaches

Example of Overhead Construction, Including a Few Catenary Hangers (Shown at the Right), in Front of the West New York Carhouse

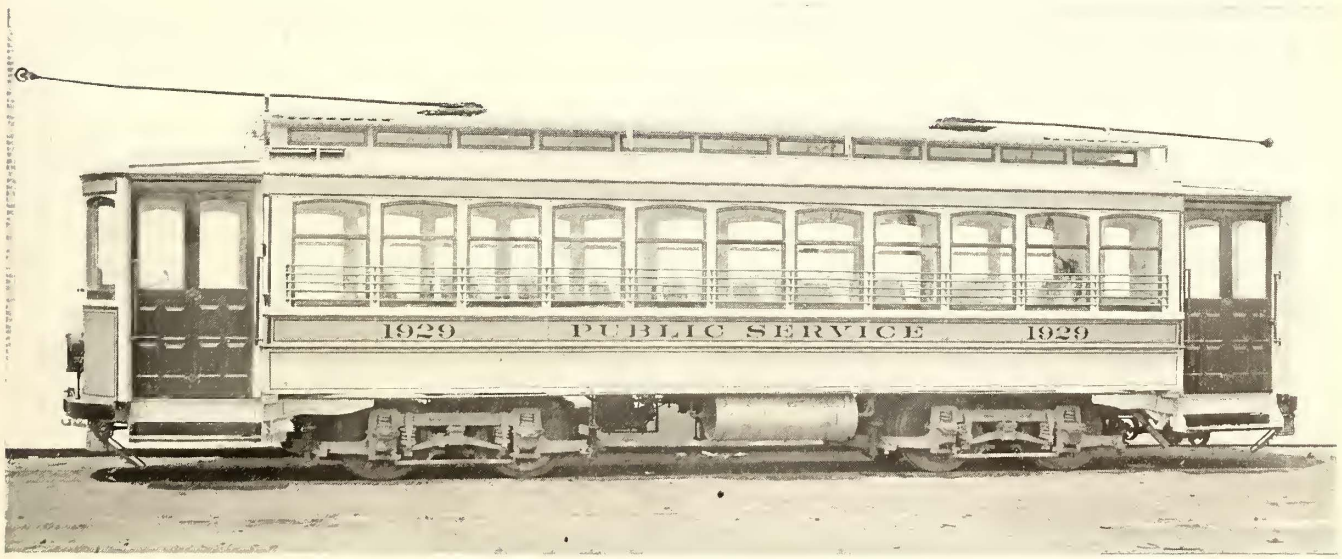
Another Example of Well-Aligned Overhead Construction as Installed in Front of the Plank Road Storage Carhouse, Newark



Exterior View of 1500 Class Double-End Closed Car

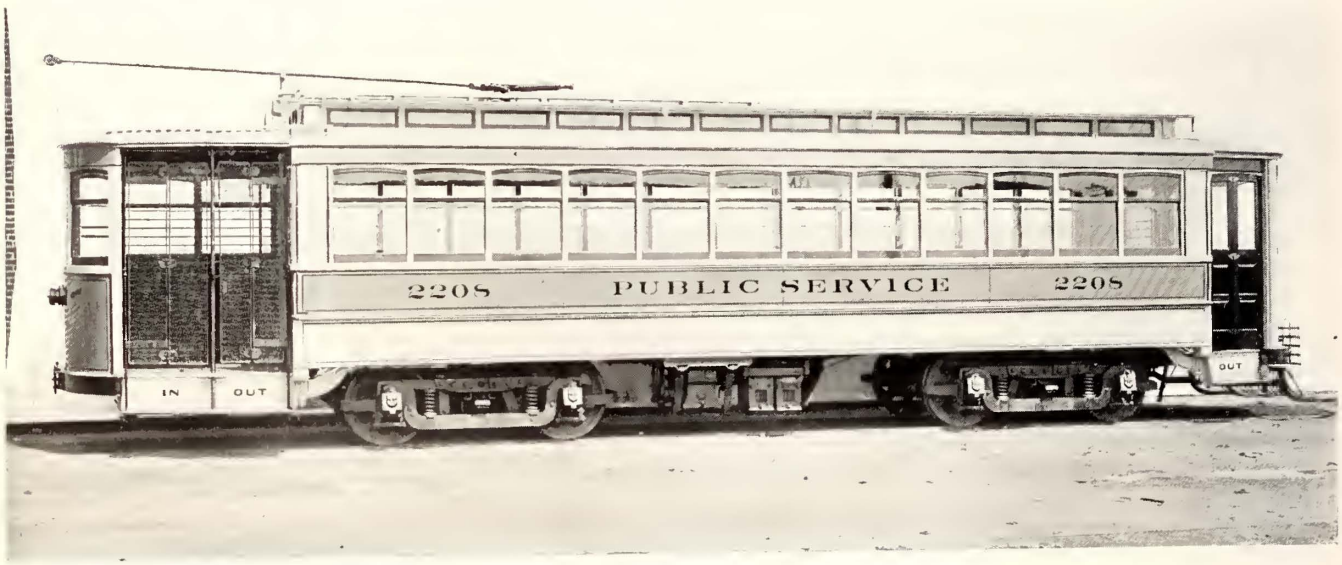


Exterior View of 1800 Class Single-End Closed Car



Exterior View of 1900 Class Double-End Closed Car

Exterior View of 2100 Class Single-End Closed Car

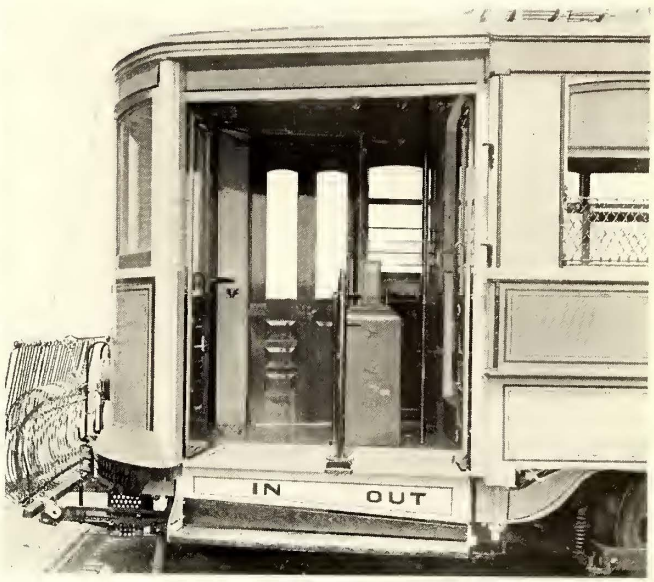


Exterior View of 2200 Class Single-End Closed Car

Exterior View of 3100 Class Car Used on Southern Division

Exterior View of 2300 Class Double-End Closed Car

Interior View of 2300 Class Car



Rear Platform of 2300 Class Car

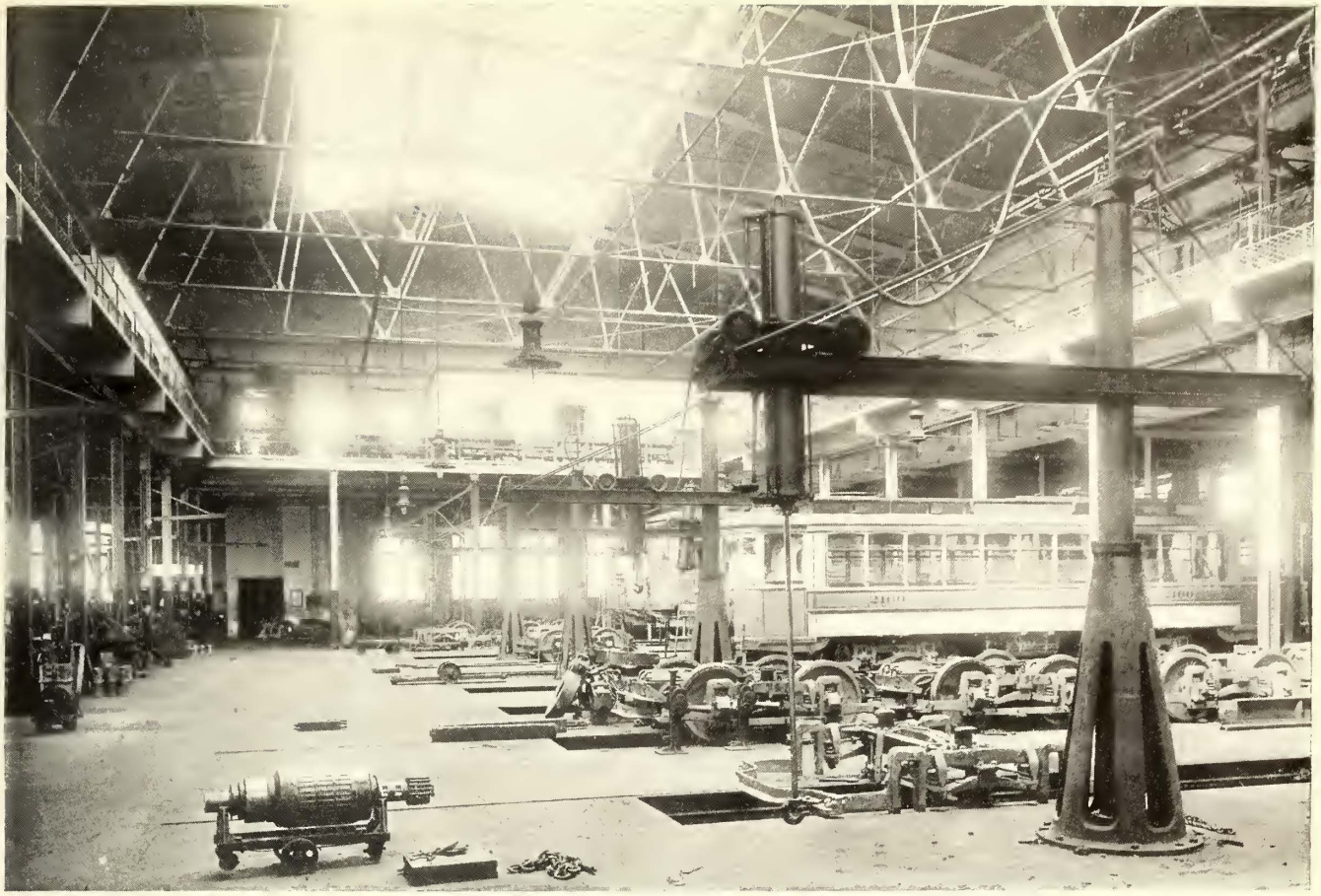
Side View of 1400 Class Double-End, 12-Bench Open Car

Plate XXXVIII

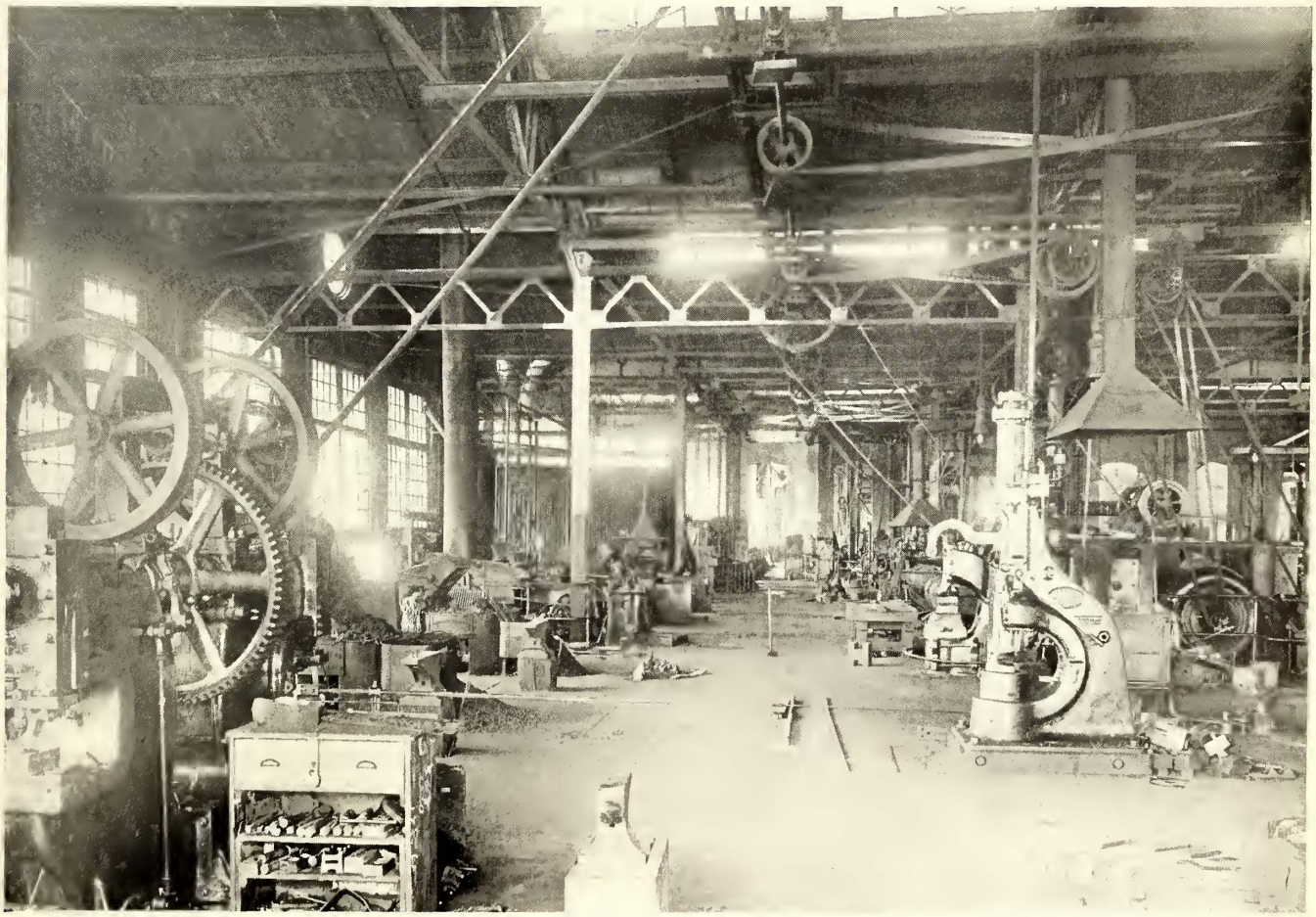
Two-Car, Multiple-Unit Train

Exterior View of General Manager's Office Car

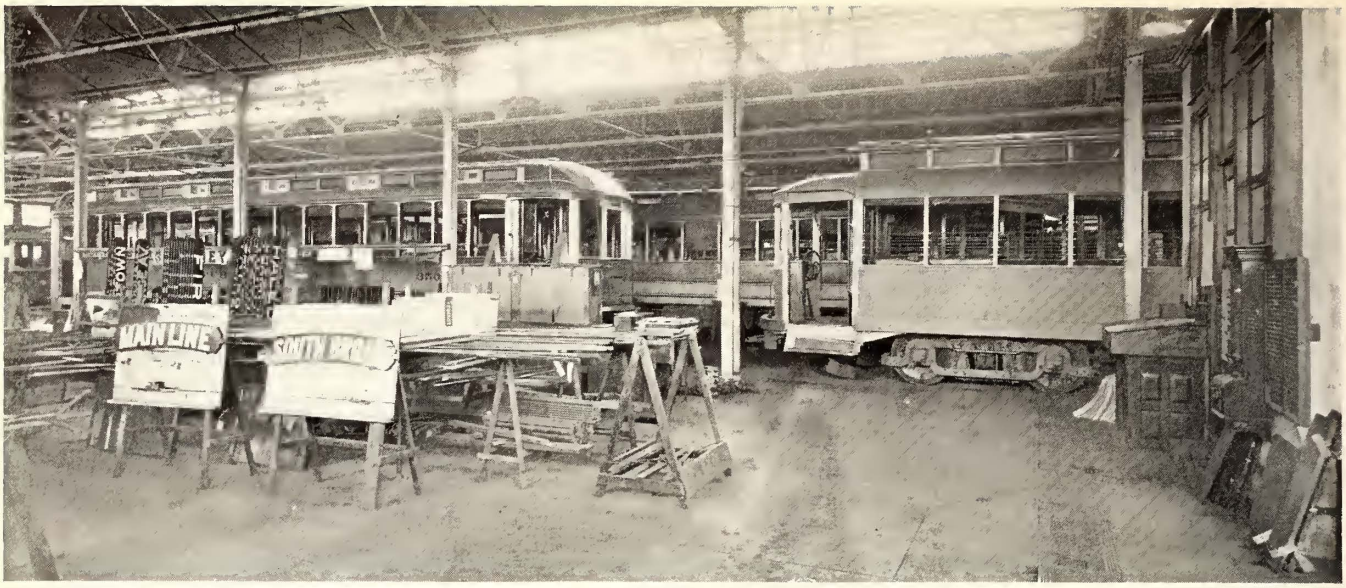
Interior View of General Manager's Office Car



Truck Overhauling Department, Plank Road Repair Shop

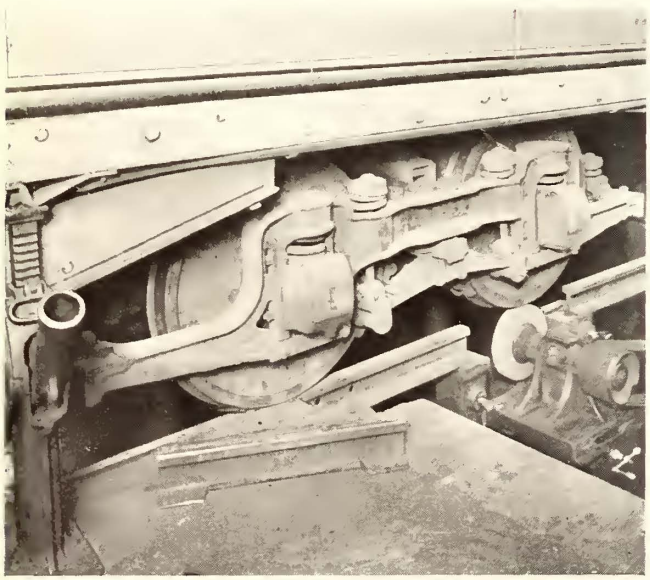


Blacksmith Department, Plank Road Repair Shop

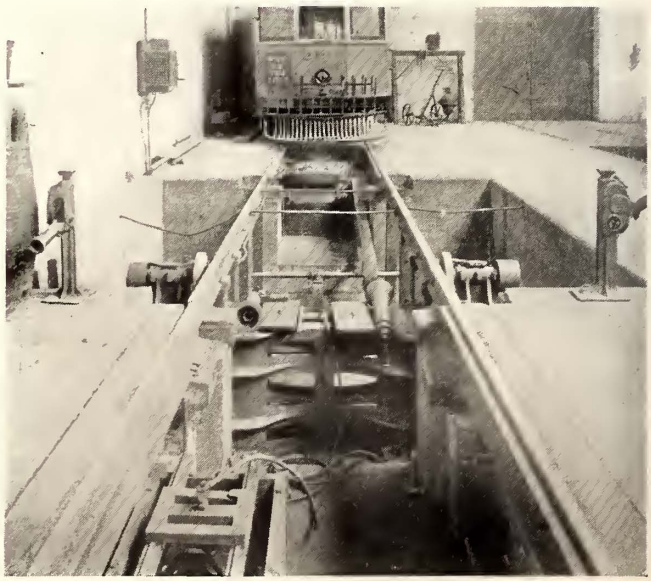


Paint Shop, Plank Road Repair Shop

Woodworking Mill, Plank Road Repair Shop



Wheel Grinder at West Hoboken Carhouse



Wheel Grinder at West Hoboken Carhouse

in the clear and an exit 25 in. wide in the clear. The double folding door which closes the entrance folds back and in against the controller, while the exit door folds in against the bulkhead. A grab handle is attached on the inside of each door, so that when the doors are open the handles are in a convenient position to be grasped by persons ascending or descending the step. No grab handles are attached outside of the doors. The exit door on the opposite side of the platform has a clear opening of 27 in. It folds back against the hand-brake wheel, and, like the doors on the right-hand side, has a grab handle attached to it.

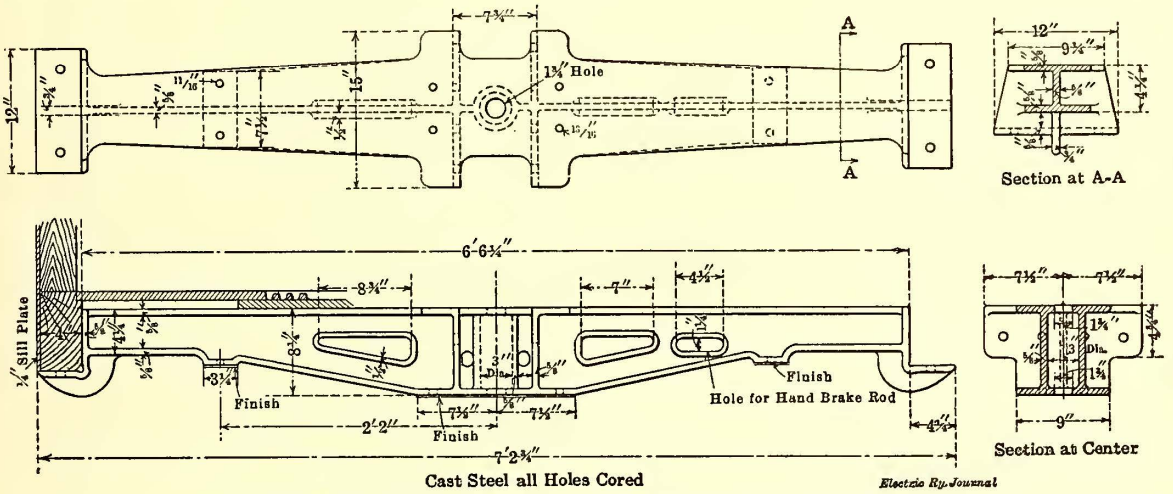
The door-operating mechanism is very simple. Each door consists of two halves hinged together. One half is mounted on a vertical rod extending down through the platform floor, and the other has attached to it at the top a roller which runs in a slotted guide above the door opening. The vertical hinge rod carries a bell crank, which is attached to the bottom of the operating-handle shaft. The operating handles are mounted on top of the post which forms a partition between the entrance and exit passageways. By revolving these handles 90 deg. either door can be opened or closed independently of the other. The exit door on the left-hand side of the platform is operated by a handle mounted above the brake wheel. The steps below all doors are stationary and are not protected by covers.

The cars are painted the standard color of the Public Service Railway. The top panel and vestibule ends are painted a chrome yellow; the bottom panel and the side posts are painted cream color; wide striping and trimming is Tuscan red, and fine striping and lettering is black.

The special equipment of these cars includes the following : Earl trolley catchers; Dayton Manufacturing Company's incandescent dash headlights; Hedley cast pattern anti-climbers; Providence fenders; Consolidated Car Heating Company's buzzer system; Agasote headlighting; Sterling-Meaker "Little Giant" hand brakes and fare registers; National Lock Washer Company's curtain fixtures; General Electric CP-27 compressors and straight-air brakes: Sherwin-Williams paint; Murphy varnish; Brill trucks.

MULTIPLE-UNIT TRAIN

During the past summer an experimental two-car multiple-unit train has been operated on some of the lines running into the Exchange Place terminal in Jersey City. The train consists of two double-truck closed single-end cars, with 25-ft. bodies and prepayment platforms. On each truck is mounted one GE-57 motor of 50 hp. The leading car is equipped with a K-35 controller, through which all four motors are operated, while the trailer car is fitted with a K-11 controller on the front platform, through which the two motors under the trailers may be operated when the trailer is detached and run as an individual unit. An illustration of this train is shown on plate XXXVIII. The company is now equipping a number of its smaller double-truck cars for multiple-unit operation.



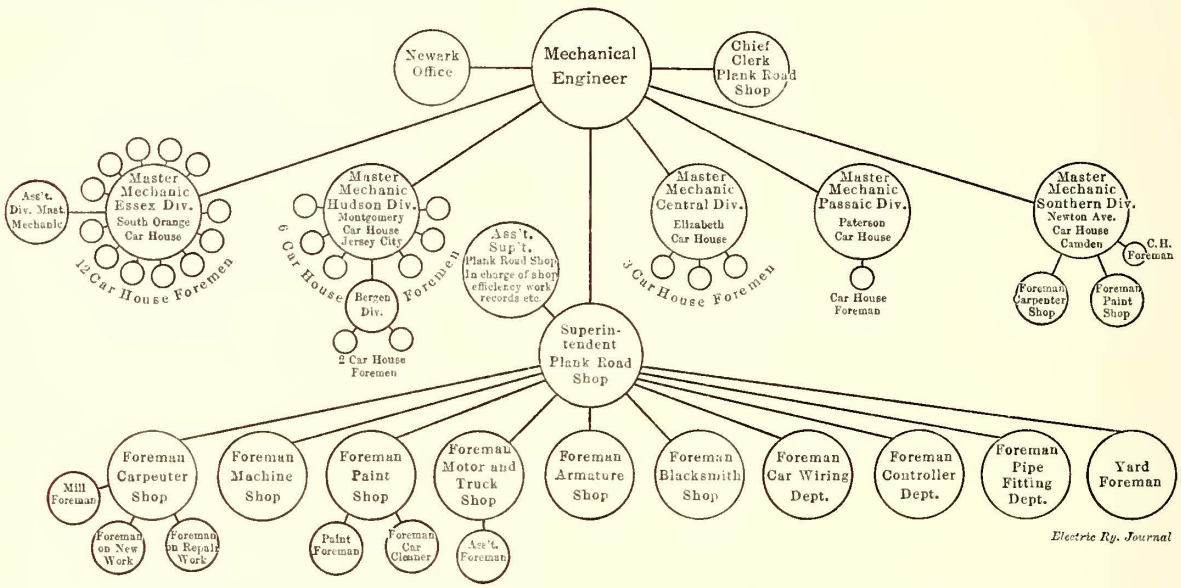
Rolling Stock—Cast-Steel Body Bolster for 2300 Class Car

MANAGER'S OFFICE CAR

Among the special cars owned by the company is an office car for the use of the general manager. Views of this car are shown on plate XXXVIII. It is 43 ft. 8 in. long over bumpers, 29 ft. long over corner posts, and 7 ft. 8 in. wide over the sides. The interior is divided into an observation and office compartment 18 ft. long and a buffet and toilet compartment 9 ft. long. The observation and office compartment has four windows 46 in. wide in each side, and the bulkhead doors are almost entirely of glass, so that a good view of the track ahead and on each side can be obtained. This compartment is furnished with comfortable wicker chairs and folding tables, which can be used for office work or for serving meals. A large scale map of New Jersey, on which are shown all of the company's lines, is mounted on a spring roller attached to the upper-deck sill. The kitchen facilities include a buffet range, denatured alcohol stove, sink, water tank, dish and linen lockers and a complete equipment of dishes, silver and linen.

MAINTENANCE OF CAR EQUIPMENT

THE 2380 cars of the Public Service Railway are cared for at twenty-four carhouses and depots scattered over the northern and central part of the State and one carhouse on the Southern division in Camden. On account of the long distances from many of these carhouses to the main repair shop of the company, which is located in the southeastern part of Newark, shop facilities are provided at eleven of the twenty-four operating depots on the Northern and Central divisions, and cars are sent to the main repair shop only for painting and heavy body repairs. Regular overhauling of the trucks and motors is done at the carhouses. The Southern division, which includes all the lines centering in Camden, has a well-equipped repair shop at the carhouse, where all light and heavy repairs to cars, including painting, are made.



Car Maintenance—Diagram of Organization of Mechanical Department

ORGANIZATION OF THE MECHANICAL DEPARTMENT

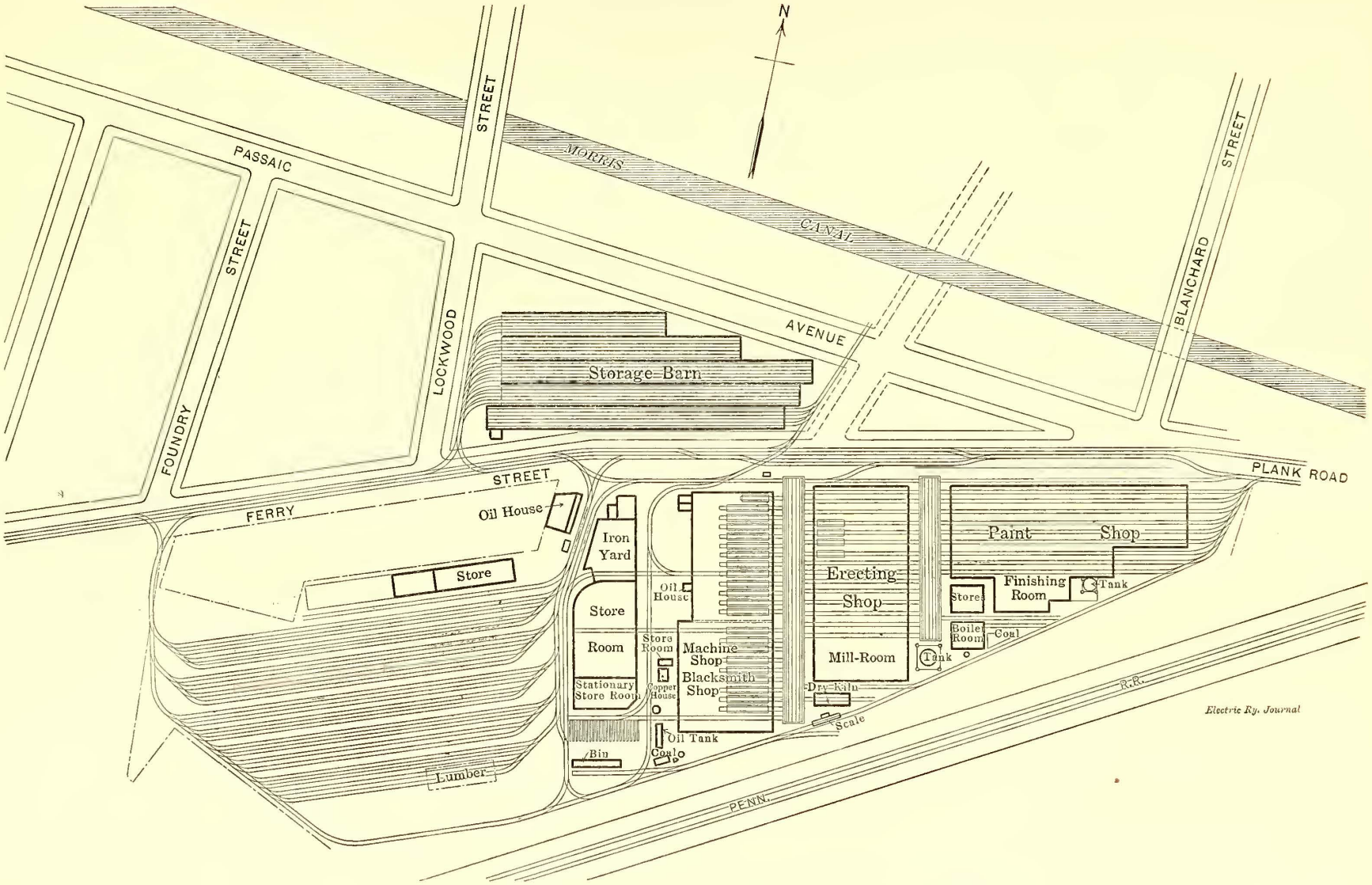
The organization of the mechanical department is very similar to that of the mechanical department of a large steam railroad system. At the head of the department is the mechanical engineer, who reports to the general manager. The inspection and maintenance of the cars assigned to each of the six operating divisions of the railway company are in charge of a division master mechanic, who reports to the mechanical engineer. These division master mechanics have supervision over the carhouse foremen at each of the twenty-five operating depots. The master mechanic of the Essex division, which includes Newark and the Oranges, has twelve carhouses under his supervision, and he has an assistant who relieves him of part of his work. The master mechanic of the Hudson division also superintends the work of the two carhouse foremen on the Bergen division, which includes the recently acquired lines of the New Jersey & Hudson River Railway & Ferry Company. The master mechanic of the Southern division, in addition to his duties in connection with the routine maintenance and inspection of cars, is in charge of the Camden repair shop. He has a foreman carpenter and a foreman painter as assistants in the shop. Each master mechanic has an office at one of the carhouses on his division and has a clerk, who attends to the necessary reports and car-maintenance records for the division.

The Plank Road repair shop has an organization which is independent of the divisional maintenance forces. The shop superintendent reports directly to the mechanical engineer. Each of the ten shop departments has a foreman, who reports to the shop superintendent, and there is also an assistant shop superintendent, who has charge of all shop records and reports, makes special investigations of shop methods and in other ways assists the shop superintendent in an executive capacity. Three of the shop foremen have subforemen under them in charge of special branches of the work.

The mechanical engineer has an office and drafting room at the Plank Road shop, with a chief clerk and a force of clerks to handle the department correspondence records and reports. He also has an office in the company's main office building in Newark, and he divides his time between these two offices and the outside carhouses.

SHOP FACILITIES

The Plank Road shop, which is the main repair shop of the company, is among the largest electric railway repair shops in the United States. The nucleus of the present group of buildings was an old power station, which was later remodeled into a two-story truck shop, mill and machine shop. In 1905 the old



Car Maintenance—Plan of Plank Road Shops and Car Storage Yards

shop was completely remodeled and greatly enlarged at a cost of nearly $500,000. The main shop building was converted into a truck and machine shop on the ground floor, and the second floor was cut out in the center to form a gallery 32 ft. wide around all four sides. On this gallery are located the armature and controller repair departments. A one-story addition 153 ft. x 140 ft. was built on the south end for the blacksmith and wheel departments, so that the main building is now 348 ft. long and contains twenty-three pit tracks leading from a transfer table pit which separates the carpenter shop on the east.

The carpenter and erecting shop and woodworking mill are in one building, 286 ft. x 140 ft. The erecting shop contains fourteen tracks on 10-ft. centers and

PUBLIC SERVICE RAILWAY CO.

ORDER FOR PIECE WORK
PLANK ROAD SHOPS

Car No._____ Job No._____

Date_____191__

WORKMAN'S NAME	CHECK No.

Better-ment	Piece	DESCRIPTION OF WORK	AMOUNT
		GRAND TOTAL	

_____Foreman

_____Supt. Shops

_____P. W. Inspector

NOTE—Any work performed not authorized by this order will not be paid for.

Car Maintenance—Piecework Order Card

has a total capacity of 42 cars. The building is of brick with steel roof trusses and saw-tooth roof. The woodworking mill is in the south end of this building. East of the carpenter shop and separated from it by another transfer table pit is the paint shop, 354 ft. x 135 ft. It contains nine tracks spaced on 14-ft. centers and will hold seventy cars. It is of the same type of construction as the carpenter shop. The other principal buildings on the shop site are a boiler house, paint storeroom, oil house and general storehouse. On the north side of Ferry Street, opposite the shop buildings, is a storage carhouse with a capacity of 150 cars. A complete description of the Plank Road shop as rebuilt in 1905 appeared in the STREET RAILWAY JOURNAL of July 22 and Sept. 2, 1905.

All painting, heavy body repairs, wheel work, armature and field winding for the Northern and Central divisions are done at the Plank Road shop. In addition the shop manufactures and re-works a large amount of repair material and supplies, which is distributed to the carhouses for use as required. When the shop is not crowded with work cars frequently are drawn from the operating depots for overhauling. The Plank Road shop employs on an average 425 men in all departments.

PIECEWORK IN SHOPS

The piecework system has been introduced in a number of departments in the Plank Road shop. Armature repairs, controller repairs, carpenter work on new cars and in remodeling old cars and all paint shop operations are paid for on a piecework basis. The details of the system as applied in the paint shop are typical of all departments.

After a period of more than four months' careful observation the foreman of the paint shop made up a schedule of piecework prices for more than 600 painting operations as applied to car bodies of different types and sizes. This schedule was made up as a book of tables in blueprint form. Each operation is described briefly, is given a number and is followed with prices for doing the work on each of four general types of cars. At the beginning of each day each employee in the paint shop receives a piecework order card, on which are entered the car number, the shop job number, the date, workman's name, schedule number, quantity and description of each operation to be done and the amount to be paid for the work. These cards are made out by the foreman's clerk from an assignment sheet drawn up by the foreman every night, on which he lists the cars to be worked on the next day, the character of the work to be done on each and the men assigned to do it. The amount of work entered on one of these cards may be sufficient to keep the man to whom it is given busy for only part of the day or for several days. The cards are turned in at the end of every day and given out again the next morning until the work assigned has been completed and inspected and passed by the foreman, who signs the card. On the back of the card are ruled spaces, in which each man who does any part of the work called for on the face of the card enters his name, the date of doing the work, the number of hours spent and the amount earned at the piecework rate. In addition to filling out the time and piecework price on these cards, each workman turns in at night a time slip showing the numbers of the jobs on which he has worked that day, the time spent on each and the amount earned at piecework rates. These tickets are sent to the auditor's office for making up the pay roll and distributing the charges to the proper job numbers, but they are first checked against the piecework order cards in the foreman's office.

The piecework order cards are filed by car numbers and when a car has been completed the entries on all of the cards relating to that car are transferred to a repair record card which is filed for perma-

nent record. This card when filled out shows in detail all work done on the car and the cost.

The men in the paint shop work in gangs of from two to four men and each gang pools its earnings. Thus the varnishers work in gangs of four, two men being engaged on the outside of a car at the same time that the other two men are working on the inside of the car. Any work which is not satisfactory to the inspector must be made right at the expense of the man responsible for the defective work, but no charge is made against the man for extra material required to make the work right. With this system of piecework orders checked against time slips it is not possible for a man to be paid twice for the same job or to be paid for work which he did not perform.

CARHOUSE REPAIR FACILITIES

The repair shop facilities provided at the carhouses vary in the details of the tool equipment and amount of space occupied. At some of the larger depots they include machine tools, wood-working machinery and blacksmiths' forges, in addition to a complete equipment of jacks, armature buggies, taps, dies and other small tools. On the Hudson division the West Hoboken and Montgomery Street carhouses have equipment of this kind and the following carhouses on other divisions have similar equipment: Essex division, Miller Street, South Orange Avenue and Montclair; Central division, Elizabeth, Dunellen and Milltown; Passaic division, Paterson; Bergen division, Edgewater. The following list of the principal tools at the West Hoboken carhouse is typical of the equipment of other carhouses:

1 Niles lathe	1 Armature bander
1 McCabe lathe	1 Wheel grinder
1 Shaper	1 Band saw
1 Snyder drill press	1 Circular saw
1 McCabe drill press	2 Buffalo forges
1 Bolt cutter	1 Babbitting forge

1 Emery wheel.

DEPOT INSPECTION AND MAINTENANCE

All carhouse inspection and maintenance work is done during the daylight hours. Oiling, however, is done at night. The inspection crews consist of two men. One man works in the pit and inspects the trucks, wheels, journals, foundation brake gear and all other apparatus hung under the car. The other man examines the motor commutators, gages the armature clearance, inspects the gear lubrication and motor bearings and goes over the entire car body including the trolley base and pole. One controller repairman is assigned to each depot and he inspects the controllers and electrical apparatus other than the motors on all cars inspected. At the small depots the foreman attends to this work.

All cars are inspected once a week and in addition the brakes on hand brake cars are inspected every three days, the brake inspections being made between the general inspections. A general inspection requires about one hour, and at a carhouse from which ninety cars are operated two inspection crews can handle the work with some time to spare. The number of inspection crews is determined by the size of the depot. Sufficient men are assigned to do the routine inspection work and to carry on continuously some overhauling work. An effort is made to have these men overhaul in their spare time every car assigned to a depot at least once each year. This overhauling consists of removing the trucks, dismantling the brake rigging, cleaning and repairing the motors, resistances, controllers and other electrical apparatus, rebabbitting bearings and thoroughly cleaning and inspecting the car from top to bottom. The brake rigging, which is removed, is sent to the blacksmith shop to have the worn holes plugged and redrilled, and it is replaced by a repaired set of rods and levers taken from stock. Defective or charred field coils are removed from the motors and replaced by coils in good condition and the armature commutators are turned and slotted if worn.

REPAIR RECORD CARD No.____

Style of Car____ Date In____ 191____

Repairs Made At Plank Road Shop Date Finished____ 191____

Car Number____ Job Number____ Length____

Schedule	PIECE	DESCRIPTION	HOURS	PRICE	AMOUNT	Schedule	PIECE	DESCRIPTION	HOURS	PRICE	AMOUNT
								Total Piece Work			
								Total Day Work			
								GRAND TOTAL			

Checked by____

Foreman Approved____ Supt. Shop

Car Maintenance—Piecework Record Card

Wheels are changed if necessary. Any machine or blacksmith repairs which cannot be made at the smaller depots are sent to one of the large depots on the division, where the worn or broken part is replaced by a repaired part taken from stock. Defective armatures and field coils are sent to the Plank Road shop for repairs. Each depot carries a stock of one or more armatures, sets of field coils and wheels and axles for each of the types of equipment operated from that depot. As this stock is drawn upon it is replenished by the return from the Plank Road shop of repaired parts or by new equipment. Supply cars make regular trips at frequent intervals between the general storehouse at the Plank Road shop and all of the carhouses to deliver material and pick up parts sent in for exchange.

MAINTENANCE AND INSPECTION RECORDS

Each inspection crew is furnished with a cloth-bound blank book of convenient size to fit into a pocket, and in this book is entered a record of the numbers of each car inspected, all defects found and all parts renewed or repaired. At the end of the day the entries on these books are transferred to the daily report sheet of the carhouse foreman to the division master mechanic. These report sheets are made up in book form with duplicate leaves which remain in the book. One of them is reproduced. As will be seen, the daily report is a complete log of the day's work at the carhouse. At the top are spaces in which are entered the number of cars on hand and the number of those disabled. Below are spaces for the report of those cars sent to the Plank Road or division

PUBLIC SERVICE RAILWAY COMPANY

.....Division.....19

DAILY REPORT OF CARHOUSE FOREMAN TO DIVISION MASTER MECHANIC

Weather..... .....Foreman

CARS ASSIGNED	NO. CARS REQUIRED FOR SCHEDULE	EXTRA CARS AVAILABLE	NO. CARS DISABLED	CAUSE OF DISABLEMENT						CARS SENT TO PLANK RD SHOP	CARS REC'D FROM P. R. SHOP	CRIPPLES TURNED IN	CRIPPLES FOUND O. K.
				COLLISIONS	CONTROL TROUBLE	FLAT WHEELS	MOTOR TROUBLE	OTHER TROUBLE	CARS NOW AT P. R. SHOP				

NO. OF REPAIR MEN ON DAY DUTY ON NIGHT DUTY

CARS SENT TO REPAIR SHOP		CARS RECEIVED FROM REPAIR SHOP	
CAR NO.	CAUSE	CAR NO.	REMARKS

CARS PULLED IN

CAR NO	TIME	LINE	MOTORMAN	BADGE NO	CAUSE

FIELDS AND ARMATURES CHANGED

	TYPES OF MOTORS																		TOTAL
	49	52	56	57	58	57	68	80	92	93	101	800	1000						
ARMATURES																			
FIELDS																			

CAR NO.	CARS INSPECTED AND REPAIRS MADE ON SAME

NOTE—CARE SHOULD BE TAKEN TO THOROUGHLY INSPECT CARS IMMEDIATELY AFTER ACCIDENTS AND A COMPLETE REPORT (SIGNED) COVERING CONDITION OF SAME MADE ON REVERSE SIDE OF THIS SHEET

Car Maintenance—Daily Report of Carhouse Foreman

shops and of those cars returned. Following this is a space for a report of cars pulled in, and then follows a statement of armatures and fields changed. At the bottom of the card is a space for a report of the day's inspections and the work done on cars. When a car is turned in after an accident of any kind the carhouse foreman writes a full report of the accident and the condition of the car on the back of the sheet.

These report sheets are sent to the office of the division master mechanic, where they are filed by carhouses. The division master mechanic keeps a book record of every car assigned to his division. Every item on each report sheet is copied into this book

MOTOR AND TRUCK WORK REPORT

Car House ____ Date ____ Car No. ____

WORK DONE

	Motors Overhauled (Type ____)		
	Trucks Overhauled (Type ____)		
	Brake Rigging Overhauled		

MATERIAL RENEWED

No.		No.		No.	
	Journal Brasses		Brake Shoe Heads		
	Check Plates		Controller (End No. ____)		
	Brake Shoes		Circuit Breaker (End No. ____)		

MOTOR	No. 1	No. 2	No. 3	No. 4
No. Sets Axle Bearings				
No. Sets Armature Bearings				
No. Gear Cases				
No. Field Coils Replaced				
Pinions Replaced				
Armatures Replaced				

CAR WHEELS

REMOVED — Kind ____ Diam. ____

Motor No.	MAKE	WHEEL Nos.	CAUSE	AXLE Nos.
1				
2				
3				
4				

INSTALLED — Kind ____ Diam. ____

Motor No.	MAKE	WHEEL Nos.	REMARKS	AXLE Nos.
1				
2				
3				
4				

Work done by ____

(USE OTHER SIDE FOR ADDITIONAL INFORMATION)

Car Maintenance—Overhauling Record Card

under the car number to which the item relates. When a car is overhauled the carhouse foreman makes out in triplicate a motor and truck work report, which shows in detail the work done and the material used for replacement.

WHEEL MAINTENANCE

Appliances for changing wheels and axles are provided at all carhouses and a stock of wheels mounted on axles, with the proper sizes of gears for the different types of motor equipment, is carried at each house. All wheel boring and pressing on and off are done at the Plank Road shop. Cast-iron, spoke-pattern wheels are used under most of the cars and the maintenance of these wheels in good running condition is a large problem on account of the widely scattered locations of the carhouses. Several years ago Charles Remelius, who was then superintendent of rolling stock of the Public Service Railway, designed a machine for grinding flat spots out of the treads of cast-iron wheels without requiring the removal of the wheels from under the cars. One of these machines was built by the Q M S Company, Plainfield, N. J., and installed at the Plank Road shop. Six other machines subsequently were built and installed in the following carhouses: West Hoboken, Montgomery Street, South Orange Avenue, Central Avenue, Paterson and Camden. Six more machines have recently been ordered from the Q M S Company to be installed at the Greenville, Montclair, Miller Street and Elizabeth carhouses and at the Big Tree and Springfield carhouses now under construction.

The wheel grinder is mounted in a pit and consists of two 14-in. x 2-in. grinding wheels mounted on separately driven arbors. The wheels have vertical and lateral movement on slides carried in a heavy cast-iron frame. A short piece of the rail over each wheel is removable. The grinding wheels are driven at 5000 r.p.m. by a 15-hp motor mounted on the pit floor and belted to a jack shaft.

To grind a pair of wheels the car is run over the pit and the axle of the wheels to be ground is raised by two screw jacks bearing on the motor axle bearings. A motor rheostat is inserted in the car motor circuit and the wheels are revolved at a speed of about 75 r.p.m. in a direction opposite to that of the grinding wheels. One man is required to manipulate each of the grinding wheels.

The first cost of the machines installed is about $900 and the average cost of operation is about 30 cents per wheel, which includes interest, labor and cost of supplies. The time required to grind a pair of wheels depends, of course, on the depth of the flat spots and the hardness of the metal, but in a day of ten hours one machine will grind from twenty-four to thirty-two pairs of wheels. In one month last year the two machines on the Essex division ground more than 2400 wheels working day and night shifts. Wheels can be ground from three to five times before the chill is worn through.

CAR CLEANING

The mechanical department has recently been made responsible for the cleaning of cars, which was formerly done under the supervision of the transportation department. The interiors of the cars are swept out and dusted every night, and the exterior is washed and windows cleaned once a week or more often if necessary in bad weather.

TRANSPORTATION DEPARTMENT

THE scope of the transportation department will be understood by reference to the accompanying organization chart. The ranking officer is the superintendent of transportation. He has an assistant superintendent of transportation, six division superintendents, superintendent of employment, superintendent of schedules, superintendent of ferries and a supervisor of inspection. The operators of toll roads and wagon lifts report directly to the superintendent of transportation. The subordinate officers of the division superintendents are called supervisors. The depot or station masters, inspectors, starters and carhouse clerks report to the supervisors.

APPLICATIONS FOR EMPLOYMENT

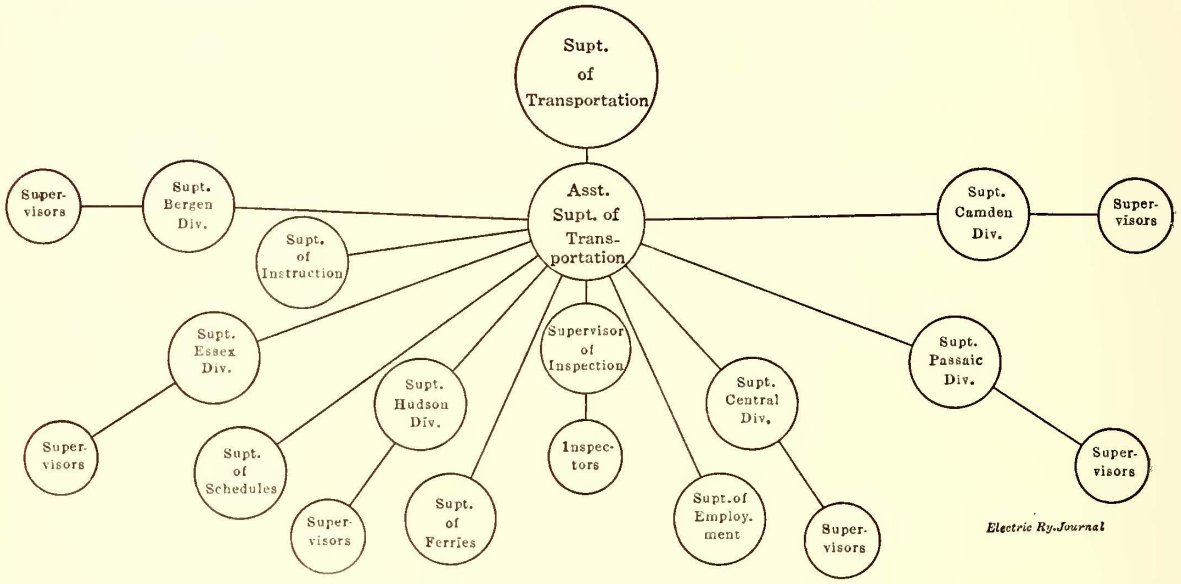
The employment bureau is under the supervision of the superintendent of employment. Notices for men wanted for platform work are posted permanently at the carhouses, shops, on newspaper bulletin boards and at other places where men go to seek news regarding employment. The notices are prepared as a schedule which states the hours and places at which applications will be received.

The first step is the filling out of the application blank by the prospective motorman or conductor. The questions to be answered are presented in the form on the next page.

Applicant must also give for references the names, addresses and occupations of four persons who have known him for at least two years. When these references are in the metropolitan district they are investigated personally. Otherwise it is the custom to send the inquiries by mail, inclosing a stamped return envelope. A form is used for recording the results of the investigations which are made personally.

It is customary for investigators not only to look up all the names that are given but to visit tradesmen, barbers and others in the vicinity who are likely to know something of the applicant's personal habits. When an inquiry is mailed to a railway, the company sends out a form which differs from that sent to other references and includes a request for a physical description of the person whose name is mentioned.

One question on the application blank asks applicants whether they are willing to accept certain provisions of the New Jersey Employers' Liability Act relating to compensation for injuries. This act, to which references were made in the ELECTRIC RAILWAY JOURNAL of April 29, page 763, and June 24, page 1129, offers to an injured employee the choice of accepting certain sums or specified percentages of his wages in case of accident, or of bringing action for recovery in the usual way.



Transportation Department—Organization Diagram

There is no difference in the wording of the application blanks used for prospective conductors and motormen, but those who wish to become conductors must fill out a bond for $150; consequently, applications for this position are looked up by the bonding company as well as by the railway. The form used by the bonding company contains space for four references and an extract from the Penal Code stating that it is a crime to obtain employment by false documents or false statements.

After the application has been approved, the applicant is given a "call-in" slip by the superintendent of employment. This orders him to report at the headquarters of the employment bureau with $2 if he is to be a motorman or $3 if he is to be a conductor. These deposits are made to cover badges, caps, etc., and in the case of the conductor the bonding fee of $1.50. A special receipt is given by the bonding company in acknowledgment of this fee.

The new men are referred to a single store for their first cap so that they will be sure to get the best, but thereafter the caps may be purchased at other stores in accordance with the specifications mentioned elsewhere in this article. The order for a cap is made out on a special blank, which has a return coupon. This coupon is sent to the supervisor who is to employ the new man.

PHYSICIAN'S EXAMINATION

The first step taken by the holder of a "call-in" slip is to appear before the physician for examination.

File No.....

Public Service Railway Company.

MOTORMAN OR CONDUCTOR.

DO NOT FILL THIS OUT

AGE.....
HEIGHT.....
WEIGHT.....
COLOR EYES.....
COLOR HAIR.....
MUSTACHE.....
BEARD.....
COMPLEXION.....
CHARACTERISTIC MARKS:
.....
.....

I hereby make application for a position as ..... in the service of the Public Service Railway Company with the full understanding that in the event of my securing employment, I am to abide by such rules and regulations governing the employees as the management may from time to time establish.

If employed, I promise to loyally and faithfully serve the Company, and to do all in my power to further its interests, to conduct myself honestly, soberly and with proper obedience and respect to its officials, and courtesy to passengers and the public.

1. Name in full (no initials).....
2. Present Address.....St.....City or Town, Length of Res.....
3. Previous Address.....St.....City or Town, Length of Res.....
4. Birthplace.....5. Married or Single.....
6. Period of Residence in New Jersey.....7. Housekeeping or Boarding.....
8. With whom are you Boarding?.....9. Are you a Citizen?.....
10. State what family you have, or what persons, if any, are dependent on you for support and where they live.....
11. Give name and address of nearest Relative.....
12. Are you subject to any sickness or infirmity?..... 13. Are you in any way crippled or deformed?.....
14. Are you color blind or near-sighted?..... 15. Have you any serious defect whatever in sight, hearing or speech?..... 16. Have you ever been injured? If so, when, where, how and effect of injury.....
17. Do you belong to any Labor organization? If so, give name.....
18. Have you ever been accused or convicted of any crime or misdemeanor?.....
19. Do you use intoxicating liquors?..... 20. How long have you been out of employment?
21. Have you ever been discharged or suspended from any position? If so, state particulars when and where and for what reason.....
22. Have you any relations in the employ of the Public Service Railway Company? If so, give their names and positions.....
23. Have you ever been employed by this Company, or any railroad controlled by it, or any other railroad? If so, state when, by what road and what capacity, on what division, and cause for leaving.....
24. Have you ever filed an application for a position with this or any other railroad company?.....
25. Give dates of your employment during the past five years, also the names of your employers, and their addresses during that time:
26. Are you willing to accept the provisions of Section II, and that part of Section III which relates thereto, of the New Jersey Law commonly known as the "Employers' Liability Act," relating to compensation for injuries, same being Chapter 95 of New Jersey Laws of 1911?.....
27.

State of New Jersey, } ss.
County of }

.....of full age, being duly sworn according to law, on his oath saith that he is the person named in and who signed the foregoing application; that the name signed thereto is his true name; that he has read the foregoing application and understands the purport thereof; and that the answers to all questions in said application are true; and that he makes the answers above for the purpose of procuring employment from.....

Sworn and subscribed before
me this.....day of
.....191 .....
Signature

Transportation Department—Application for Employment Complete Except for Question Relative to References

The age limit of applicants for platform work is twenty-one years to forty years, and the minimum height 5 ft. 6 in. The pay-as-you-enter cars have made it practicable to accept shorter men for conductors than formerly because the register and bell cords are not so hard to reach as on open cars. The thorough nature of the examination will be apparent from the data sheet. The questions on this sheet follow:

EMPLOYMENT BUREAU.
PHYSICIAN'S EXAMINATION FOR EMPLOYEES.

Date.....
Name.....Position applied for.....
Age ..... Residence.....
(Street) (City)

(Applicant must answer the following questions):
Have you ever been rejected by any life insurance company or beneficial association, or had a policy modified in any manner?
.....
Have you ever had: (a) Consumption.....
or lived with consumptive.....
(b) Prolonged coughs.....(c) Asthma.....
(d) Delirium tremens.....(e) Chronic diarrhoea.....
(f) Piles.....(g) Difficulty in urinating.....
(h) Epileptic or other fits.....(i) Rheumatism.....
Fistula.....Gall stones.....(j) Syphilis.....
(k) Spitting of blood.....(l) Enlarged veins.....
(m) Dizziness or vertigo.....Are you ruptured.....
If so do you agree to wear a proper fitting truss while in the employ of the above-named companies?.....
Do you use alcoholic beverages?.....State kind used.....
Quantity daily.....If a total abstainer, how long so?.....
Are you vaccinated?.....
When were you vaccinated last?.....
Was it successful?.....If not, do you agree to waive all claims if you die of either smallpox or varioloid unless hereafter successfully vaccinated?.....
Have you ever been an inmate of a hospital, sanatorium or institution? If so give duration and cause.....
.....
Have you now any disease, injury or disorder?.....
Have you ever been away because of impaired health?.....
Have you ever had any personal injury or accident?.....
Have you ever had any serious illness or undergone any surgical operation? .....
.....
Do you believe in the employment of a physician in case of sickness? .....

Family history:
Married or unmarried.....
If married (a) Name of wife.....
(b) Name of children.....
If unmarried, give name and address of living parents.....
.....

I declare these answers to be true, and I agree that any misstatements shall render any and all obligations of the above companies null and void to me and any heirs or assigns.

Signed.....
Name of Applicant.

Witness.....

PHYSICAL EXAMINATION.

Vision: Right eye.....Left eye.....
Color: Right eye.....Left eye.....
Heart ..... Hearing.....
Lungs.....Enlarged veins.....
Does applicant wear glasses?.....Were glasses ordered?.....
Deformities .....
Marks of identification.....
Was applicant held over? If so, give reason.....
.....
Remarks: .....
.....
.....

I have examined the above-named person and recommend that his application be ..... accepted.

Signed.....
Examining Surgeon Employment Bureau.

Skeins of colored wool are used for tests of color blindness, but instead of merely matching colors the men must be able to name them properly. It has been found that men who matched two shades perfectly could not distinguish red and pink. Applicants are also required to read three test cards with both the right and left eye. The lettering varies considerably from the standard cards sold by opticians to prevent the cards from being memorized in advance. Motormen applicants must possess perfect vision, but the doctor often recommends conductor applicants to get glasses and return for re-examination. Tests are also made for hearing. The examination includes exercises of several kinds to show physical condition. Men who have any serious diseases, such as hernia, ruptures, etc., are not accepted. About 20 per cent of the applicants whose references are good are rejected on account of physical disability.

In the course of the examination note is made of identification marks, such as scars, moles and minor mutilations. It may be of interest to add that when a platform employee who has been concerned in an accident asserts that he did not see or hear matters which he should have done, he is sent to the physician for an examination. This policy has been found to promote good discipline.

REPORTING TO CARHOUSE

The badge given by the chief clerk of the employment bureau to the applicant who has passed his physical examination is numbered according to the division to which he is assigned. The chief clerk is guided in making these assignments by the trainmen's record, shown on this page. This form gives the number of conductors and motormen at each car depot, under the following classifications: Regular, extra, under instructions, required and appointed.

The cardboard form which is sent to the local supervisor for every student assigned contains a summary of the information which the superintendent of employment has secured through the several sources described. This includes the physical description and characteristic marks of the applicant. The supervisor must notify the superintendent of employment at once if he finds the description of the man with the badge number mentioned on the assignment form does not tally with his appearance. The bottom of this form contains an acknowledgment stub which must be signed by the supervisor and returned to the superintendent of employment for record. A filing abstract is exposed on the back of this form after it has been folded. This form makes a cover in which are placed all duplicates of discipline forms and future papers pertaining to the employee named.

Instruction of the student begins from the moment that he reports to the local supervisor. The instruction methods are described elsewhere in this article. Card records are kept of all platform employees, white cards for conductors and pink for motormen. These cards give for each man his date of appointment, his successive assignments, and the date of his resignation, discharge or transfer. One file number is used for the same man no matter how often he enters and leaves the service. The cards are filed alphabetically, according to the name of the person. They are also grouped according to months. A second series of cards is used, filed according to the badge number. This card gives the date on which the badge was issued, the name of the holder, his file number and the date at which he left the service. The practice of filing according to badge numbers is a necessity because many inquiries afford no other clew.

Notices of appointments and resignations are sent to the general auditor by the superintendent of employment, in accordance with notifications which the latter receives from the different supervisors. These notices give the name, occupation, badge number, file number and carhouse of the individual concerned. Special forms are provided for the supervisors to record the return of badges, punches, rule books, change carriers and buttons. One form goes to the superintendent of employment, one to the auditor and one remains in the carhouse. Requisitions on the superintendent of employment for supplies of this character are also made out in triplicate. One is retained in the files of the superintendent of employment. The second is sent by him to the general auditor indorsed with the statement that he has forwarded the desired material. The third copy stays with the supervisor who made the original requisition.

EMPLOYMENT BUREAU

Record of Trainmen for Week Ending 191

DIVISIONS	DEPOTS	CONDUCTORS					MOTORMEN				
		REGULAR	EXTRA	UNDER Instructions	REQUIRED	APPOINTED	REGULAR	EXTRA	UNDER Instructions	REQUIRED	APPOINTED
HUDSON	Greenville										
	Montgomery										
	Hoboken										
	Pavonia										
	West Hoboken										
	West New York										
	TOTAL										
	Broad										
	Montclair										

Transportation Department—Part of Record for Showing Employment Conditions at Every Carhouse

INSTRUCTION ON CARS AND IN SCHOOLROOM

When a student is sent to report at a given carhouse he delivers to the supervisor a card containing the data reproduced on the following page.

This card has a number of lines on which the successive platform instructors sign their names during the ten to fourteen-day period that a man receives platform instruction. When the chief instructor is satisfied that sufficient platform teaching has been given, he signs the card for return to the superintendent of employment. The stub attached to this card is retained for record at the carhouse.

After having been broken in on the cars, the new

man is sent to one of the three instruction rooms in Camden, Hoboken or Newark. Upon completion of the school course he is taken in hand by a representative of the claim department for instruction in accident prevention, preparation of accident reports, etc. These schools are also used to discipline motormen and conductors who have shown negligence in their work.

The following description of the school in the Miller Street carhouse, Newark, will give a good idea of the equipment and methods which are in use to perfect the education of the new men after they have had some platform experience.

An important feature of the schoolroom is the demonstration board to show what happens in a K-10 two-motor and a K-6 four-motor circuit. Lamps are used to represent the fields and resistance and fans are employed to show the action of the armatures. A front view of this board is shown on page 618. Two

PUBLIC SERVICE RAILWAY CO.

NEWARK....., 191

Mr. .....Supervisor.
Place bearer..... Badge No.....
at .....Carhouse to learn the duties of
.....
.....
Supt. of Employment.

Instructed by—
..... Instructor No.....
..... Instructor No.....
..... Instructor No.....

This is to certify that I have received the necessary instructions and thoroughly understand the duties of the position of ....., as required by the rules of the Company, and have also received the following supplies, all of which I agree to return to an authorized officer of this Company or forfeit amount shown opposite each article.

Change Carrier.....	valued at		$1.00
Punch	"	"	2.25
Rule Book, No.....	"	"	.50
Buttons, Small.....	"	"	.30
Buttons, Large.....	"	"	.50
Badge No.....	"	"	3.00

Name .....
Date.....
Examined and found familiar with Instructions and Book of Rules.
By.....
Chief Instructor.
Date.....191
By.....
Supervisor.
Date.....191

TO BE RETURNED PROMPTLY TO OFFICE OF SUPT. OF EMPLOYMENT.

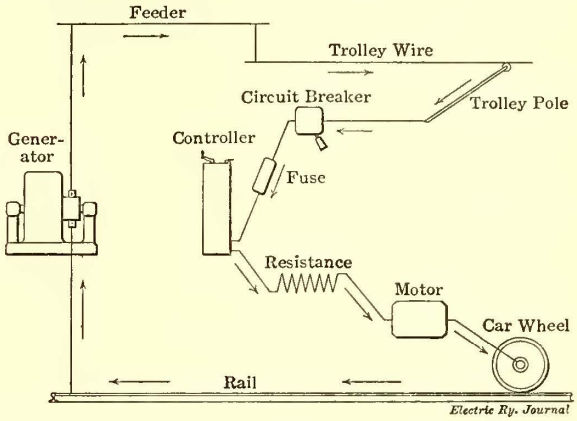
.....
Date.....191
Name .....Badge.....
Carhouse .....
Reported at Carhouse for instructions.....191
Reported for duty and card returned.....191
Failed to report in specified time, Outfit returned to Employment Department.....191

Transportation Department — Student Platform Man's Card of Introduction to Supervisor and Car Instructors' Certificate

diagrams on this page are reproductions of two very simple blueprints, one of which shows the complete course of the current from the generator through the low-tension distributing system, the car apparatus and the rail return to the power station. The other blueprint shows in outline the series and parallel positions of a four-motor equipment. Both prints are 35 in. x 26 in. in size so that they can be read easily by the entire class.

A complete four-motor car equipment with air brakes is placed on the floor of the instruction room. The motors are dummies but have lamp circuits to show when the current is in the fields and armatures. Above this equipment there is mounted a complete trolley stand and pole with trolley wires, span wires, ears and frogs. The room also contains a controller stand with complete equipment of gages, fuses, compressor switch and circuit breaker. There is also a dummy platform with two controllers, a hand brake, spindle, headlight and fender. Several motor parts are provided so that the instructor can indicate the parts more readily and explain their use.

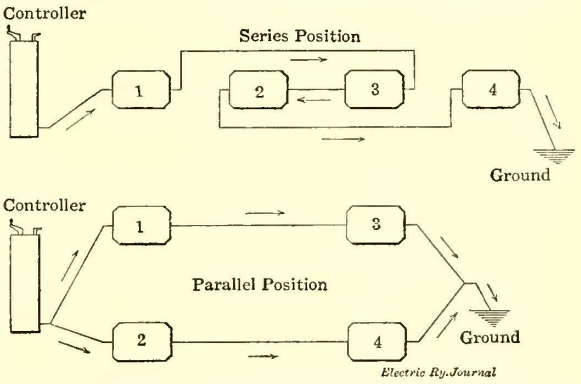
The instructor usually begins his lecture to a class



Transportation Department—Simplified Current Diagram of Railway Circuit

with the simplest possible explanations of electrical action and follows with a series of demonstrations on what should be done in case of emergencies such as open resistances, grounded wires, crippled motors, etc. Instruction in the operation of block signals has been added recently. A primer on the handling of car equipment has been prepared for the convenience of motormen students.

Motormen who are assigned for service on prepayment cars must pass a special written examination



Transportation Department—Simplified Current Diagram of Four-Motor Equipment

on subjects which relate especially to the door operation, bell signals and emergency conditions.

BOOKLET OF SUGGESTIONS TO MOTORMEN

It has also been found advisable to prepare a booklet of suggestions for motormen instructors in order to attain greater conformity in platform teaching and to insure the better handling of equipment. These instructions follow:

A FEW SUGGESTIONS FOR MOTORMEN INSTRUCTORS.

Take more interest in the student, showing and telling him all you know about a car; remember he is watching every move you make and is going to operate a car as he sees you do. If you take chances he will do the same and his judgment of distance may not be as good perhaps as yours and may get him into trouble, but encourage him if he lacks confidence.

1. Show him where all switches and fuses are located.
2. Tell him proper names of the equipment of a car, so he can report intelligently the condition of a car.
3. Show him the necessity of notching a controller, notch for notch, giving time on first and second positions, so as not to throw any passengers. A car which is started smoothly makes the best time.
4. Show him how to take off controller cover, and throw back deflector. Warn him against trying to adjust fingers.
5. Show him how to knock off overhead switch or circuit breaker and to reset same.
6. Show him how to drop and reset fender.
7. Show him how to adjust arc headlight.
8. Tell him of the necessity for making a thorough examination of his car before leaving carhouse, trying brakes and controller.

(*a*) In following a wagon going in same direction as car on or near the track if you remain at least twenty (20) feet behind wagon he will do the same.

(*b*) If you throw off your power for street intersections anticipating a wagon coming out across the street, he will do the same.

(*c*) If you have car under control passing standing car, *being able to stop in two feet*, he will do the same.

(*d*) If you remain three hundred (300) feet behind your leader when running faster than series point speed, he will do the same.

(*e*) The neat and tidy condition of the instructing motorman, also keeping car in clean condition, is very essential as an example for the new man.

9. Show him the necessity of recognizing every point on controller at all times, even after shutting off for section insulator or circuit breaker.
10. Show him the necessity of allowing his car to coast or drift at all times whenever possible, saving machines and power, and danger to motors if power is used when going down hill.
11. Show him points on lines where rail is bad and crosswalks are not to be blocked by car.
12. Tell him why he must cut out motors the minute any defect shows.
13. Tell him the necessity for reporting any defect on the car so the cars may be kept in good condition.
14. Have him properly instructed in making out accident reports, and in rendering every assistance possible in securing witnesses to all accidents.

INSTRUCT HIM, ABOVE ALL, TO TAKE THE SAFE SIDE AT ALL TIMES.

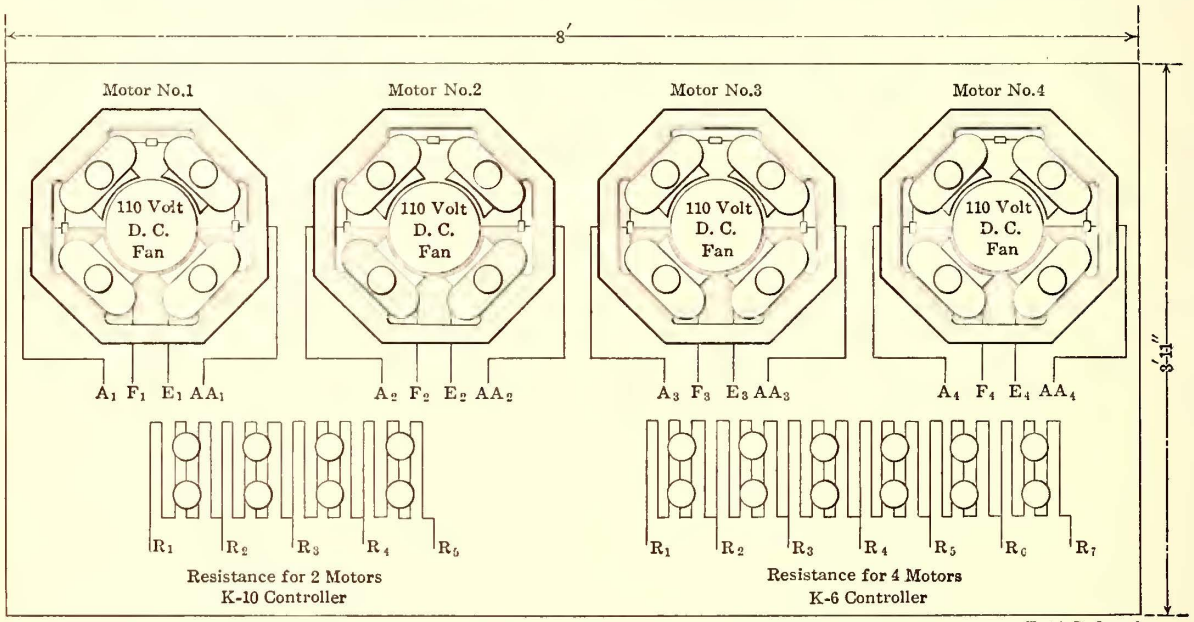
CONDUCTORS' INSTRUCTION ROOM

The conductors' section of the schoolroom contains a large blackboard on which are drawn specimens of the day cards as employed on both prepayment and ordinary cars. The board is also used for showing sample transfers, various forms of employees' tickets, transportation badges, etc. The teacher shows the men how to make out the different forms, punch transfers and perform other conductor's duties. The men are then required to pass a written examination.

The instruction room at Hoboken, which is the latest equipped by the company, is somewhat more elaborate than the Miller Street installation, especially in having a set of dummy controllers and brake stands where the men are trained to handle the spindles in synchronism with the movements of the teacher.

RULE BOOK

All platform employees are provided with a cloth-bound rule book, relating to their personal conduct, operating rules, safety of passengers, accidents, ejectments, carhouse rules and special rules for the operation of prepayment cars. This book is based on the standard code adopted in 1909 at the Denver meeting of the American Electric Railway Association and accepted as the standard of the Street Railway Association of the State of New York.



Transportation Department—Front of Demonstration Board in Miller Street Schoolroom

UNIFORMS, WAGES AND PROMOTIONS

The suits, overcoats, ulsters and caps of uniformed transportation employees are made according to standard specifications. There are four authorized firms where employees may purchase clothing or caps. The specifications do not cover buttons, which are furnished free to new employees. There is no difference in the summer and winter uniforms except in the weight of the cloth. On very hot days the men are permitted to wear black alpaca coats.

When new men are placed on the extra list they receive a minimum wage of $10.50 per week if they answer all roll calls for duty. At the end of the first year's service they are given a bonus of $10, which helps to cover their living expenses during the instruction period.

The present wages of conductors or motormen

are 22, 23, 24 and 24½ cents an hour, according to the number of years in service. Beginning on Jan. 1, 1912, these wages will be increased as follows: First year, 23 cents; second year, 24 cents; third year and thereafter, 25 cents.

Men who are selected to run the service cars are paid 25 cents an hour flat. While no extra payment is given to the crews who handle chartered cars, the men are pleased to be picked for this service because these cars are operated with long lay-overs.

The platform instructors are paid 25 cents extra for every day that they serve as teachers of student motormen or conductors.

The most reliable men are selected for the snow service. The motormen receive 30 cents an hour and the conductors 28 cents an hour for actual platform time in snow removal. Regular seniority rates are paid for waiting time. A double shift is reserved for every plow or sweeper, as every crew works a maximum of twelve hours. Each crew is assigned to a certain section of the line and to a certain sweeper or plow. The men report of their own accord upon the first signs of a snowstorm. However, it is sometimes necessary to send for them, particularly when snow begins to fall during the night. For this reason the names and addresses of the snow crews are posted in the carhouse.

Conductors and motormen receive one blue service stripe for each of the first four years. One gold stripe is substituted for five blue stripes at the end of the first five years and another gold stripe added for every additional five years. The inspectors and starters wear similar service stripes on their sleeves. Their rank is indicatd by a yellow stripe around each arm and two yellow stripes around the cap.

Inspectors and starters receive $2.65 a day for the first year, and $2.75 a day thereafter. These men also receive one week's vacation with pay. Platform men who desire to become inspectors or starters must make written application to the division superintendent, who considers their records, length of service and ability to handle men. For inspectors the company prefers active and agreeable looking men because they must board a great many cars during the day and also come into frequent contact with the patrons when they pass through the car to make register and passenger counts.

BENEFITS AND PENSIONS

A feature of the employment system of the Public Service Railway is the insurance sick benefit and pension fund which was established Jan. 1, 1911, and is conducted without cost to the employees. By this system $300 is payable at death to the beneficiaries of all employees who were with the company on Jan. 1, 1911, whose compensation at the time of death had not exceeded $1,800 annually, and who remained in the service continuously from Jan. 1, 1911, to the time of death. Employees who have entered the service since Jan. 1, 1911, do not acquire insurance rights until they have worked for one year. Thereafter the insurance rights are retained only by continuous service.

Upon the death of any employee entitled to insurance, the division superintendent where the deceased was employed reports the death to the chairman of the welfare committee and sends him the necessary records. The claim is certified for payment when the rightful beneficiaries are ascertained.

Sick benefits are paid to all employees whose period of service exceeds thirty days, whose wages do not exceed $1,800 a year, and whose compensation does not continue during absence from duty. The sick benefit is $1 for each day's disablement following the first week's absence from duty, when caused by illness or injuries. The sick benefit payable in any one year to any employee is limited to $90. These payments are practically the same as those made by a number of voluntary associations on other street railways where the cost of operation requires the collection of 50 cents to $1 per month in dues. Furthermore, the death payment in such organizations is often not more than $150, or one-half of the amount which is granted by the Public Service Railway without any assessments whatsoever.

The sick and death benefit payments as stated apply only to those employees whose wages do not exceed $1,800 a year. The pension system, however, applies to all employees who have reached the age of sixty-five and have completed twenty-five years of continuous service. Any employee who has reached the age of seventy years, after completing at least twenty years of continuous service, is arbitrarily retired on a pension. The amount of the annual pension is calculated as follows: For each year's service, 1 per cent of the average wage or salary for the ten years preceding the retirement, provided, however, that no pensions shall be less than $240 a year.

The application for voluntary retirement on pension must be verified by the immediate superior of the applicant and approved by the general manager and the president or one of the vice-presidents.

Failure to make application for retirement on pension at the time of reaching the age of sixty-five years and completing twenty-five years of continuous service does not deprive any employee of the right to make such claim at any later date during his continuous service. Retirement on pension does not deprive the employee of the benefits of death insurance, but employees retired on pensions are not entitled to sick benefits.

All of the rules mentioned in the foregoing paragraphs have been very liberally construed in practice. For instance, leave of absence on account of illness, for other urgent reasons, or even for suspension which is followed by reinstatement within three months, is not considered a break in the continuity of service. In other instances death benefits and pensions have been granted where the good record of the employee has justified some relaxation of the rules.

The inauguration of this welfare system has had

an excellent effect on reducing the number of floating employees. In fact, hundreds of applications for reinstatement have been received since the provisions of the system became generally known.

INSPECTION AND DISCIPLINE

The operating records of motormen and conductors are kept on individual cards 9 in. wide with different headings, as shown on this page. Both records begin with the date on which the man was qualified. The record of a motorman mentions the reasons for his return to the school, such as poor handling of the controller, carelessness in running too fast over the special work, failure to avoid collisions with other vehicles, disregard of the rules against permitting passengers to ride on the front platform, suspensions, times late, etc. The conductor's record shows whether there were differences in the number of passengers compared with the register reading, if he had failed to call out streets, had permitted passengers to smoke on the rear platform, had not held the trolley over special work, had not registered fares, etc.

The information on these records is obtained from uniformed inspectors, non-uniformed checkers and secret service men. The report of the uniformed inspector is very simple as it is intended principally to record the register discrepancies, but under "remarks" the inspector is at liberty to add any information which he thinks would be for the good of the service. The checker's report, as shown on page 622, is somewhat more elaborate, as these inspectors have the opportunity of watching the crew throughout the trip. The duties of the secret service men are the widest of all. They furnish reports on every phase of car operation, particularly the misuse of transfers by passengers, study traffic conditions, hunt for thieves who are robbing the company's properties, etc.

The reports of the uniformed and non-uniformed inspectors are sent to the chief inspector and the superintendent of employment. A copy of the uniformed inspector's report is also sent to the division superintendent for purposes of discipline. The discipline report on which the local supervisor indicates the offenses for which a platform man has been disciplined is reproduced on the next page. This information is placed on the individual records previously mentioned and it is also assembled on a discipline report which shows the total number of offenses of each kind throughout the entire system for the month. This report is made up for the superintendent of transportation and readily indicates to him what troubles are of most frequent occurrence and therefore most in need of correction.

The merit system is not in use on the Public Service Railway. Offenses are punished by re-instruction, warnings, suspensions or discharge as the case may warrant. Suspensions do not affect the run of a man unless he has been late four times during one year. The degree of punishment is recommended by the local supervisor, but the sentence is carried out by the division superintendent. An appeal to the superintendent of transportation is permitted, but as a rule only men who have been discharged bring their cases before him. Among offenses which result in immediate discharge are insubordination, desertion of the car in the street, drinking heavily either on or off duty, rear-end collisions and dishonesty.

One side of the inspector's daily service report on matters of registers gives the headway, the conditions of the rails and overhead line, rule violations, delays, with causes for same, and accidents. The front of this report contains fifteen headings, as follows: Car number, time, run number, crew's appearance, brakes, sand box, switch rod, drawbar, deck signs, dash signs, roller destination signs, fender, flat wheels, remarks and time depot was notified. A "v" in the

Motorman _____ File No. _____ Badge No. _____

Employed _____ Assigned to _____

Discharged _____ Resigned _____ Reappointed _____

DATE		REPORTS

Transportation Department—Headings of Motorman's Report

Conductor _____ File No. _____ Badge No. _____

Employed _____ Assigned to _____

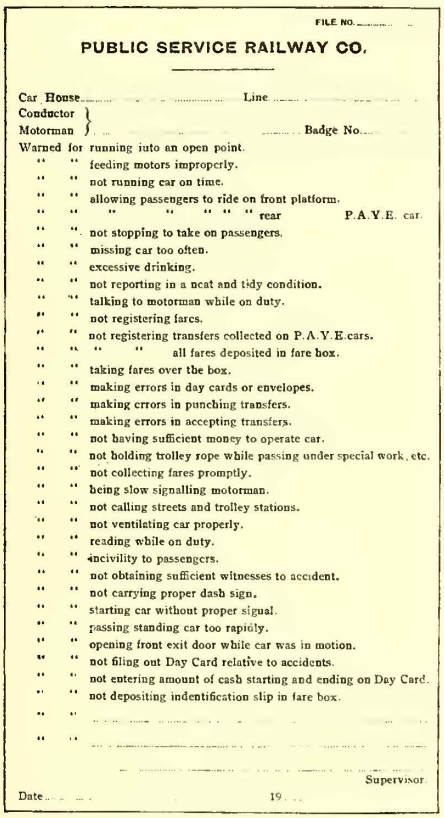
Discharged _____ Resigned _____ Reappointed _____

DATE		Car No.	Time	Rep. by	No. Pass.	No. Reg.	No. Not Dep.	Difference	DATE		REPORTS

Transportation Department—Headings of Conductor's Record

proper column indicates that the items noted were O. K., and an "x" that they were unsatisfactory or defective. A car-timing report is also made out by inspectors to show the number of minutes a car is ahead or behind time.

Records of all discrepancies in register readings for individual conductors are kept on a special form which is signed by the superintendent of employment, the superintendent of transportation and the division superintendent. The main part of the form entitled "Register Records" is sent to the local superintendent, who acknowledges its receipt by forwarding the discipline record previously mentioned. A stub on the top of the register record is retained in the employment bureau as a check against the return of the discipline slip.



FILE NO. .....

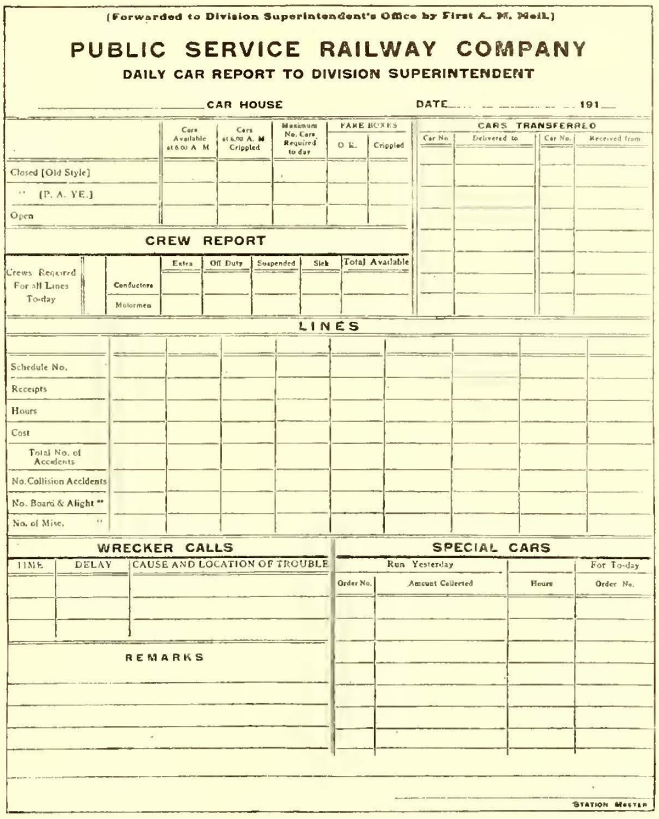
PUBLIC SERVICE RAILWAY CO.

Car House..... Line .....
Conductor }
Motorman } ..... Badge No.....
Warned for running into an open point.
" " feeding motors improperly.
" " not running car on time.
" " allowing passengers to ride on front platform.
" " " " " " " " rear P.A.Y.E. car.
" " not stopping to take on passengers.
" " missing car too often.
" " excessive drinking.
" " not reporting in a neat and tidy condition.
" " talking to motorman while on duty.
" " not registering fares.
" " not registering transfers collected on P.A.Y.E.cars.
" " " " all fares deposited in fare box.
" " taking fares over the box.
" " making errors in day cards or envelopes.
" " making errors in punching transfers.
" " making errors in accepting transfers.
" " not having sufficient money to operate car.
" " not holding trolley rope while passing under special work, etc.
" " not collecting fares promptly.
" " being slow signalling motorman.
" " not calling streets and trolley stations.
" " not ventilating car properly.
" " reading while on duty.
" " incivility to passengers.
" " not obtaining sufficient witnesses to accident.
" " not carrying proper dash sign.
" " starting car without proper signal.
" " passing standing car too rapidly.
" " opening front exit door while car was in motion.
" " not filing out Day Card relative to accidents.
" " not entering amount of cash starting and ending on Day Card.
" " not depositing indentification slip in fare box.
" "
" "

Supervisor.

Date..... 19...

Transportation Department—Discipline Report from Local Supervisor



(Forwarded to Division Superintendent's Office by First A. M. Mail.)

PUBLIC SERVICE RAILWAY COMPANY

DAILY CAR REPORT TO DIVISION SUPERINTENDENT

_____ CAR HOUSE DATE..... 191__

	Cars Available at 6.00 A. M	Cars at 6.00 A. M Crippled	Maximum No. Cars Required to-day	FARE BOXES O. K.	FARE BOXES Crippled	CARS TRANSFERRED Car No.	CARS TRANSFERRED Delivered to	CARS TRANSFERRED Car No.	CARS TRANSFERRED Received from
Closed [Old Style]									
" [P. A. Y. E.]									
Open									

CREW REPORT

		Extra	Off Duty	Suspended	Sick	Total Available
Crews Required For all Lines To-day	Conductors					
	Motormen					

LINES

Schedule No.									
Receipts									
Hours									
Cost									
Total No. of Accidents									
No. Collision Accidents									
No. Board & Alight "									
No. of Misc. "									

WRECKER CALLS

TIME	DELAY	CAUSE AND LOCATION OF TROUBLE

SPECIAL CARS

Run Yesterday Order No.	Amount Collected	Hours	For To-day Order No.

REMARKS

STATION MASTER

Transportation Department—Station Master's Daily Report on Carhouse Business.

CARHOUSE OPERATION

The operation of a carhouse may be best understood by an explanation of the equipment and forms used at a given installation. The following description of the Miller Street carhouse will therefore serve for the rest of the system.

In this carhouse the assembly and locker room contains large bulletin boards on which are posted notices of importance to the men. One blackboard gives the assignment of crews for the different runs, according to seniority. This shows the name of the regular motorman and conductor on each run with the name of the usual substitute alongside of each. An "x" opposite a man's name indicates that he must report to the station master before going on his run. This board also contains the names of the unassigned extra men who report at 5 a. m. and 10 a. m. every day. On the opposite side of this room is a glass case in which bulletin notices are displayed for thirty days. These notices are then pasted into a book kept by the supervisor for the instruction of new men. The wage scale, per hour and per minute, is pasted permanently in this case. It is also the custom for the receiver to display for a week a carbon copy of the daily pay roll sent to the auditor, so that a man can check up his figures and ask for a correction before it is too late. A blackboard alongside the glass case is used for notices of local interest.

The car bulletin board to which motormen refer in the morning is posted outside of the station master's office. This board shows the car numbers, track numbers, run numbers and line.

In the operation of prepayment cars at this carhouse two types of fare boxes are used, the Johnson and the Brill. The former is a coin-counting and registering device in which the money is recorded as soon as it has been deposited. It is then available for change. Conductors who have the Brill box are furnished with $10 in change and are expected to have $5 of their own money because the fares deposited stay in the till until opened in the auditor's office. The till has four compartments, each of which the successive conductors on a car lock in turn by pulling

the side lever over for one notch. As each conductor goes on the car he drops into the box a 2¼x1¼ in. identification card, which gives his run number, box number, line, badge number, date and name. A different color of paper is used for each line. These cards enable the auditor readily to trace the responsibility for discrepancies found in each compartment.

All cars, whether of the regular or prepayment type, are furnished with separate cash and transfer registers. In addition to the regular day card of the conductor there is a supplementary car record which stays with the car. On this the successive conductors write the cash box number, the compartment number and the cash and ticket readings. Great stress is laid upon the importance of a continuous register reading, no matter how many conductors have had the car.

Line _____

Date _____ 19__ Trip _____

Car No. _____ Conductor No. _____

Time on _____ Time off _____

Street on _____

Street off _____

Register on _____ Register off _____

Free _____ Transfers _____

Missed _____ Total Passengers _____

Fares Collected and not Registered _____

PAYE CARS
- Fares not Deposited in Fare Box _____
- Fares Deposited in Fare Box But not Reg'd _____
- Transfers Collected But Not Registered _____

Motorman No. _____

Operative _____ Expense _____

Transportation Department—Checker's Report Form

STATION MASTER REPORTS

The station master sends to the division superintendent the daily car report shown on page 621. This form shows the number of cars in operation on individual lines, wrecker calls and special cars. The heading under "Lines" gives the schedule receipts, car hours, platform cost and the different classes of accidents. Under "Remarks" the station master refers to reasons for extra traffic or to other matters which are not specifically called for in the reports. Reports of cars transferred must be made out every day whether cars are shifted or not. The station master also makes out a report covering the mileage of every non-revenue car. This report must be signed by the crew in charge of such cars.

A separate daily statement is forwarded to the general auditor's office only of the number of cars run, number of trips, car hours, car miles, extra trips and trips lost.

ACCIDENT REPORTS

In addition to the regular accident reports the company has found two blanks very useful in recording accident data. One of these is used for entering the data received at the carhouse over the telephone when an accident occurs. The headings on this form, besides those which identify the car, crew, time and place, are: Nature of accident, disposition made, number of passengers, number of witnesses obtained, reported by, received by, remarks. Another form is used to accompany the accident reports sent by the transportation department to the claim department. This form states the nature of the accident and the badge numbers of all employees concerned and contains a column in which may be entered the case number used in the legal department to identify the accident. This case number is written in by the claim department and the form is then returned to the carhouse, where it serves as a receipt for the papers in the cases enumerated. Knowledge of the case number makes it much easier for the station master to help in further inquiries from the claim department.

There are many other forms which are used at every carhouse but which need not be reproduced in this article. Among these forms are daily transfer reports of conductors' cash box cards; time sheets of regular platform men and of platform inspectors; carhouse employees' receipts for wages, and a weekly report on crippled cars.

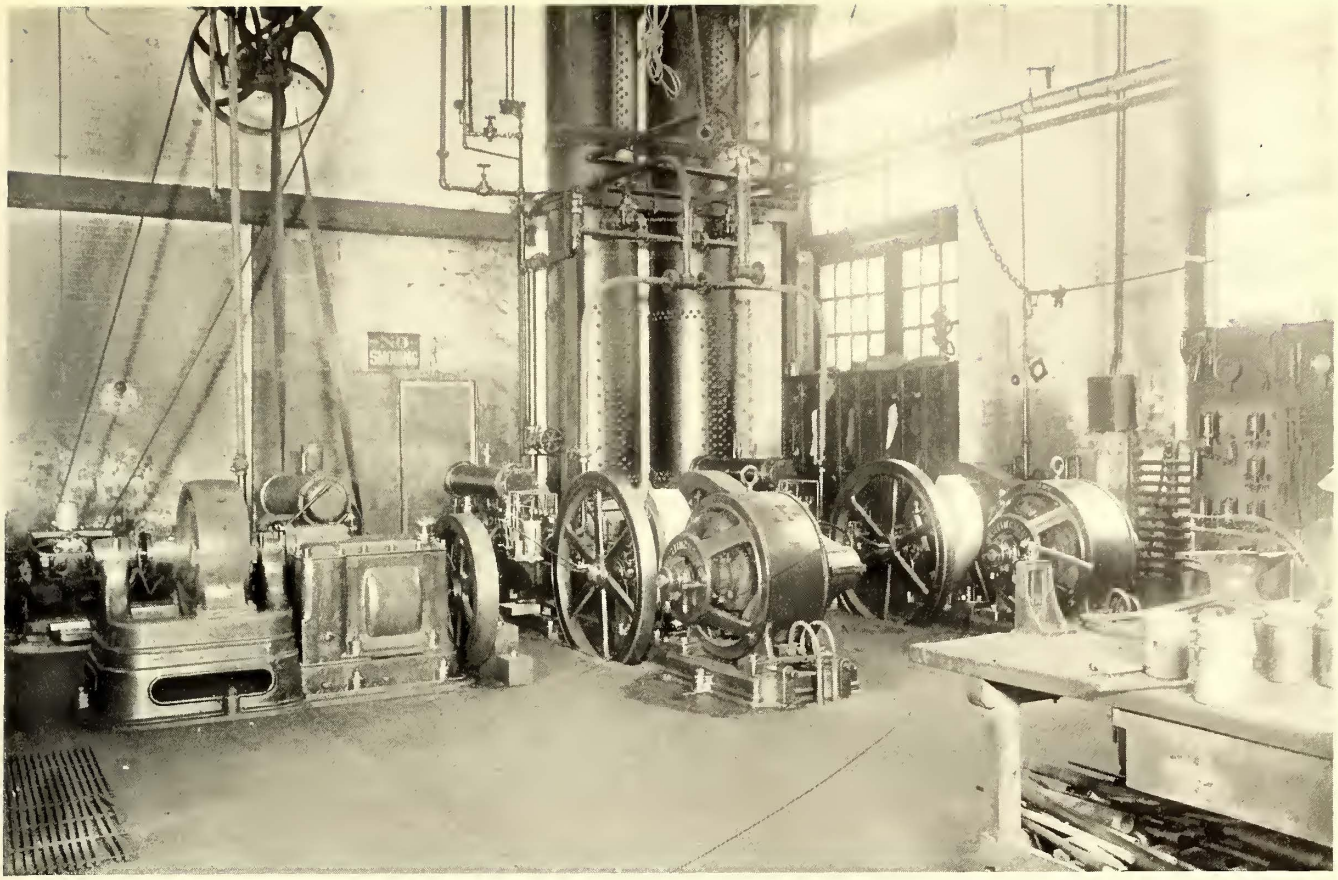
SOCIAL RELATIONS AMONG EMPLOYEES

The Public Service Railway is remarkable for the great variety of social activities participated in by its platform men. Every one of these organizations is managed entirely by the men, but the company is always prepared to help to defray extraordinary expenses. The organizations vary in character throughout the system, depending largely upon local conditions. Some carhouses happen to be favored with good actors; others are fortunate in having boxers, bag punchers, or good pool and billiard players. The many tournaments in outdoor and indoor games which follow bring picked men from each division into friendly competition.

Entertainments for children form perhaps the most delightful feature of the work of these organizations. At Christmas they take the form of Santa Claus parties at the several carhouses, the bachelors naturally paying the greater share of the cost of the gifts. One entertainment of this kind, as given at the Plank Road carhouse, is shown in plate XLIV. In summer the children and their elders are amused by picnics and baby parades. One of two views on plate XLVI shows a baby parade in progress and another illustrates a part of the audience and the prizes.

The good relations which the rank and file have with their superiors are also pleasantly demonstrated by the dinners which are given from time to time in honor of officials who have been transferred, who have left the service for one reason or another or who have returned to old scenes. The illustration on plate XLV shows the guests at a banquet which was tendered to a division superintendent who had returned after three months' absence on account of ill health.

The friendly attitude of the company toward these organizations is apparent from the fact that every carhouse is provided with an assembly room, with a piano and pool tables.

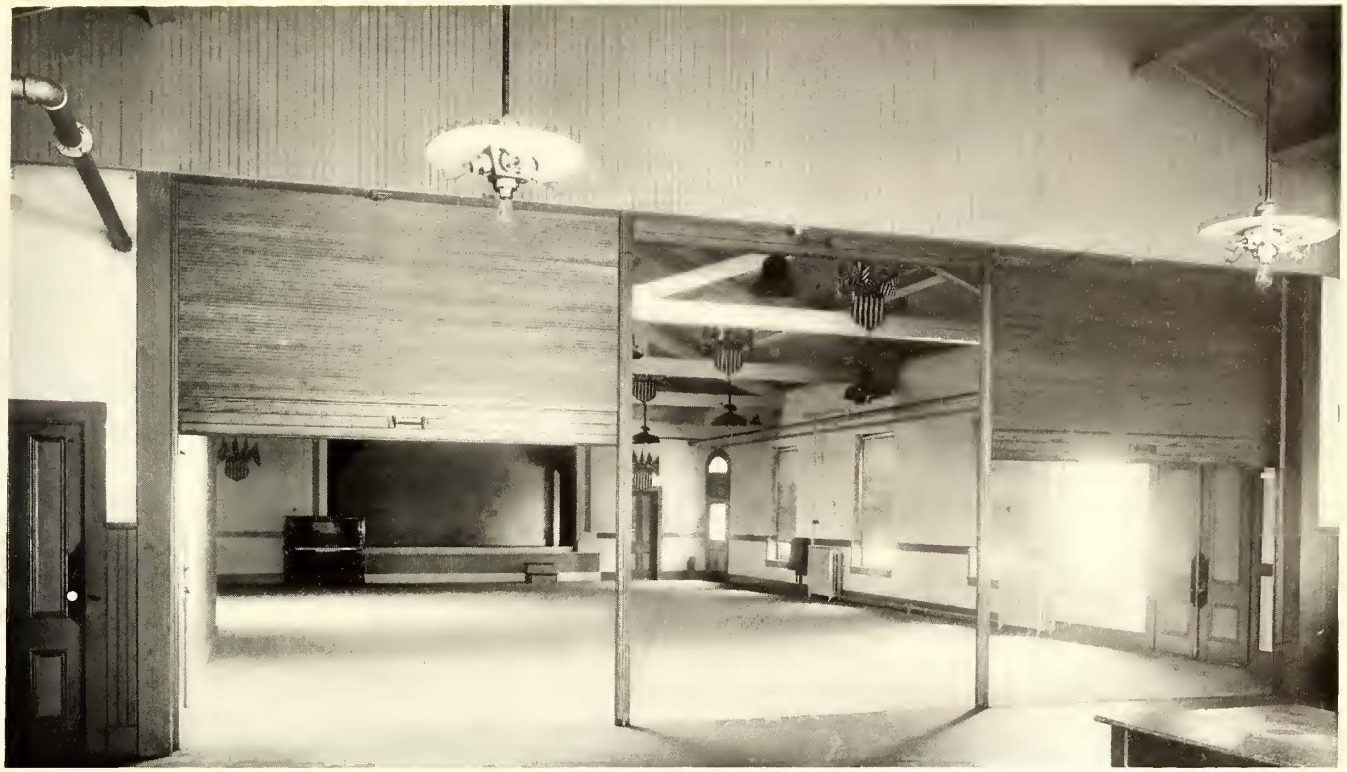


Storage Air-Brake Compressor Plant at West Hoboken Carhouse

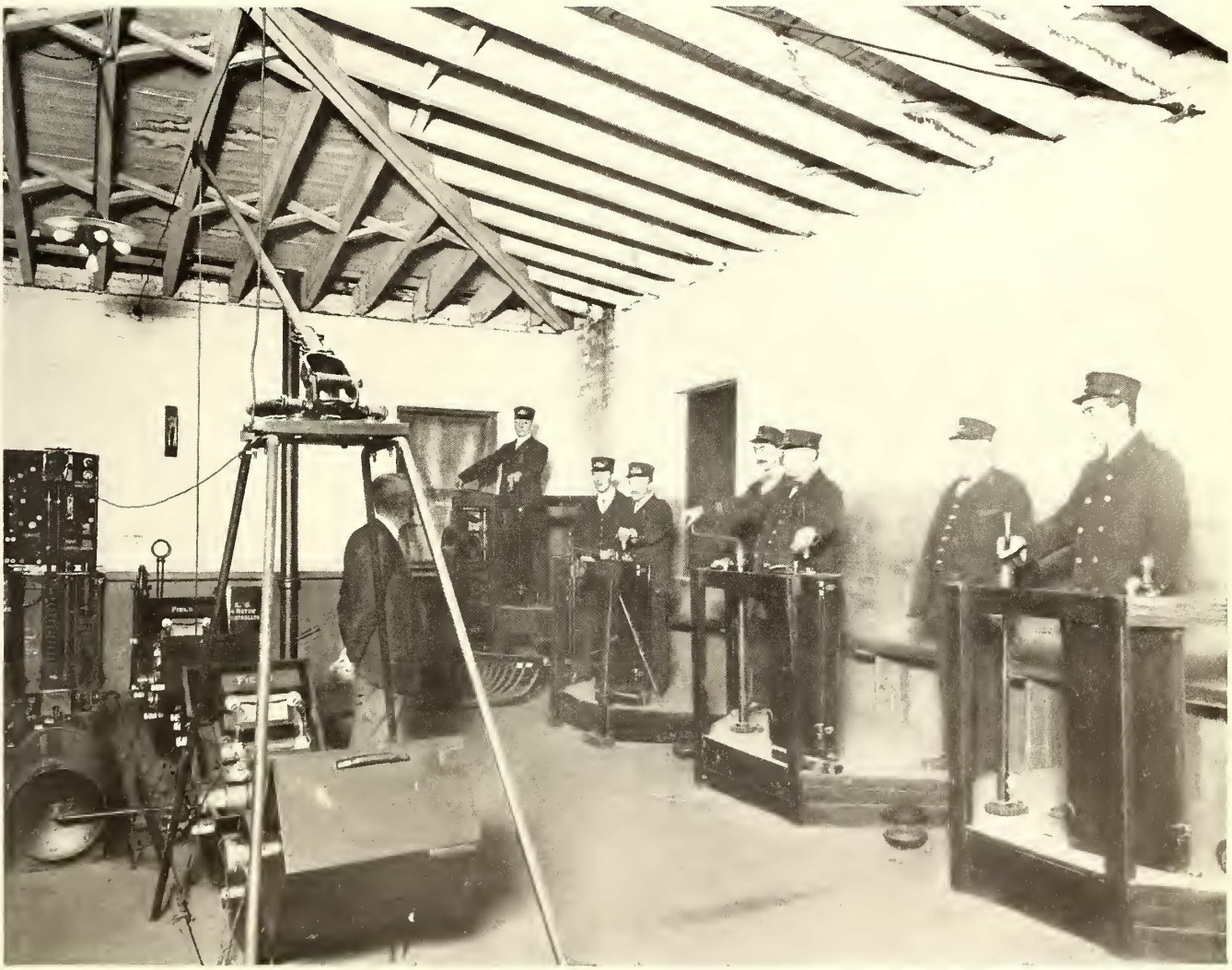
Machine Shop at West Hoboken Carhouse

Blacksmith Shop at West Hoboken Carhouse

Machine Shop at Camden



Employees' Club Room, with Stage, Montgomery Street Carhouse, Jersey City



Student Motormen Under Instruction at the West Hoboken Carhouse

A Baseball Game in Progress at the Hilton Grounds

Plank Road Christmas Party for the Children

The Baseball Team of the Southern Division

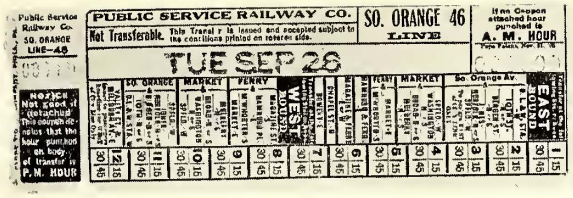
Montclair Pool Victors in the Tournament for the President's Cup

Scene at an Employees' Banquet Given in Honor of a Division Official

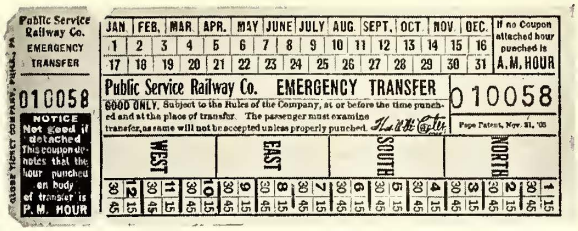
Plate XLVI

The Audience and the Prizes at the Woodlynne Park Baby Show Parade

Competitors at the Baby Show in Woodlynne Park—Parading for Prizes

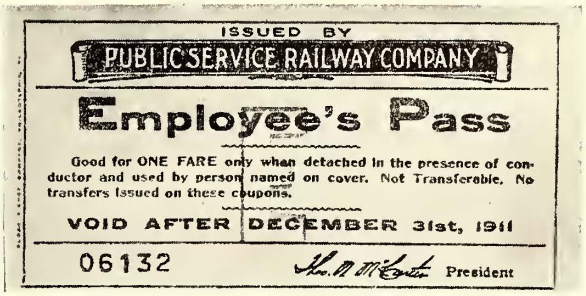


Transfer Adopted to Save Time in Punching

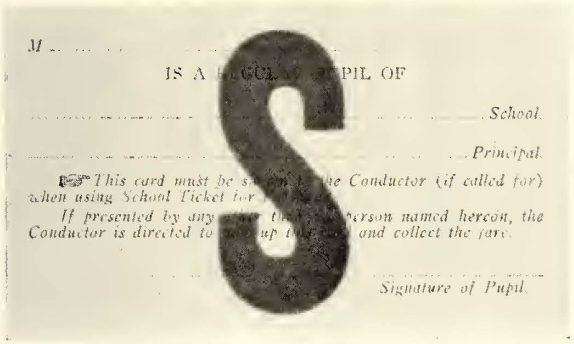


Form of Emergency Transfer

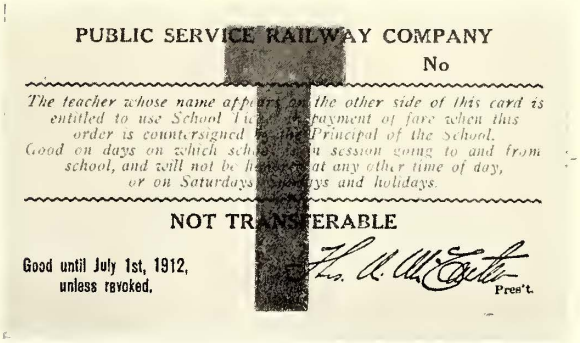
School Ticket



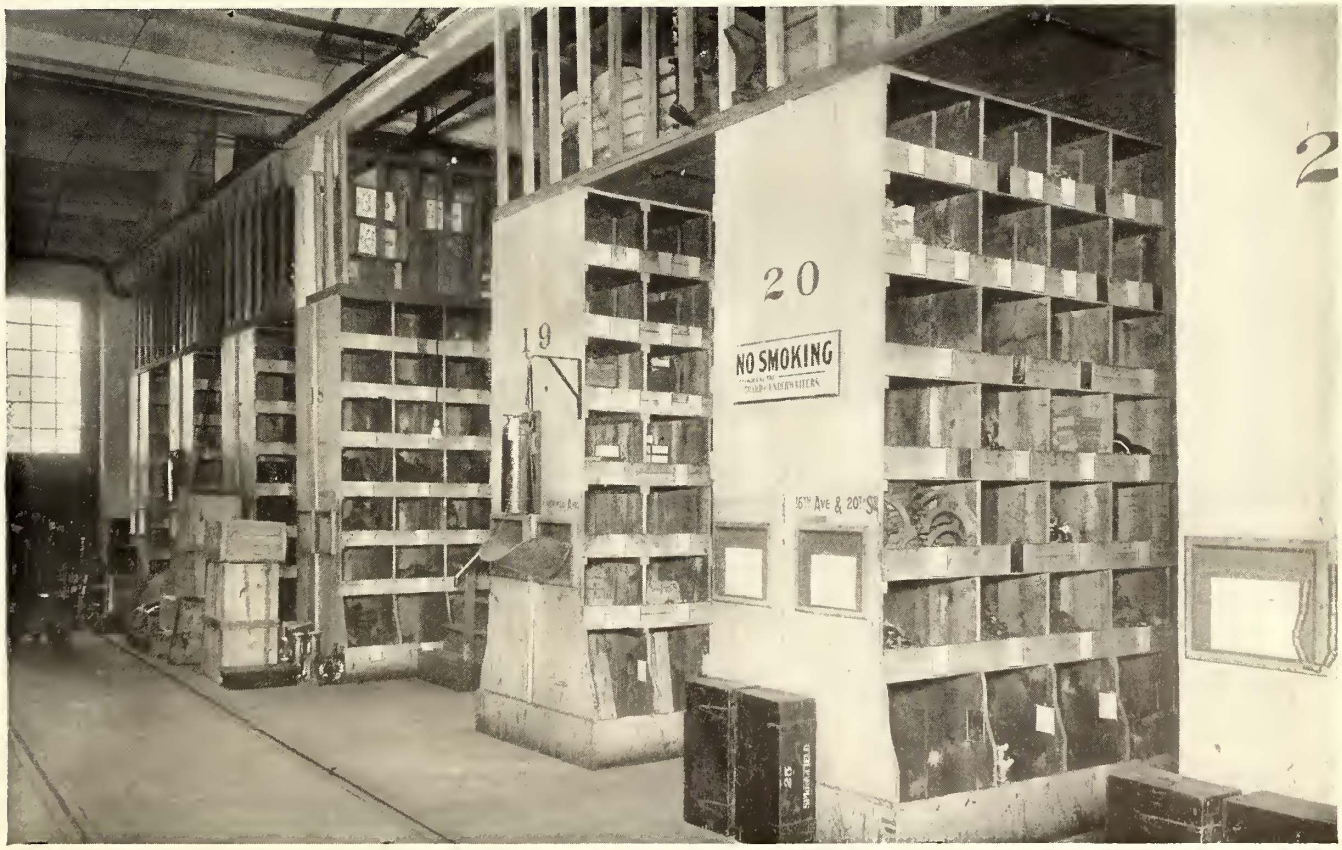
Employee's Ticket



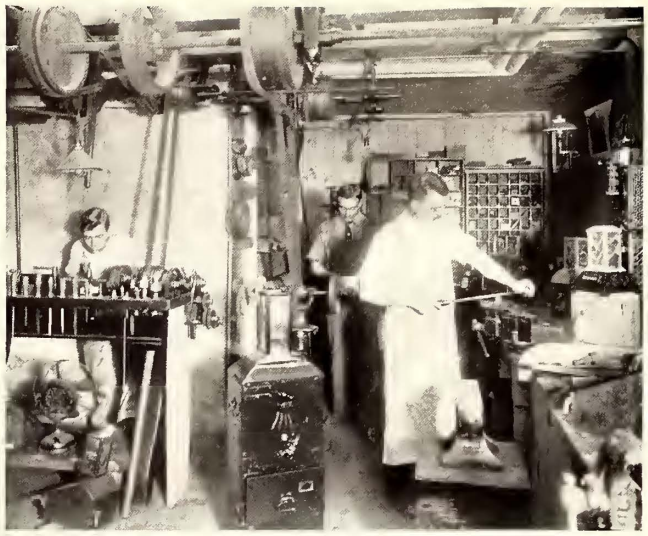
One Side of School Children's Identification Card



One Side of School Teacher's Identification Card



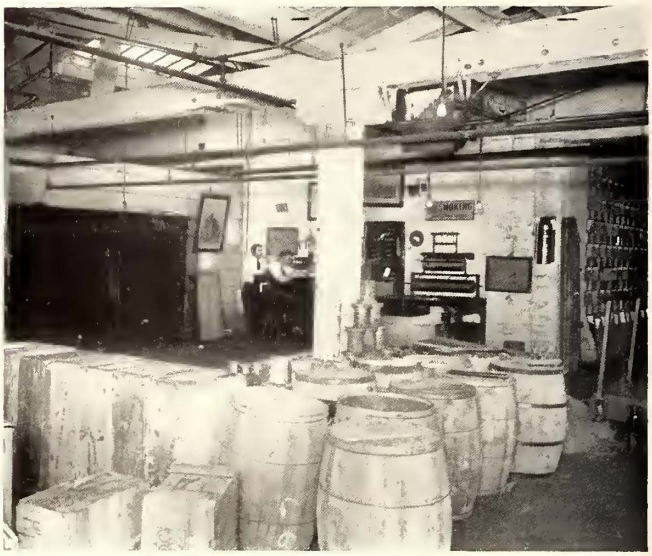
View of Section of Bins at Plank Road Storeroom



Fare-Box Repair Department

Delivery Windows at Plank Road Storeroom

Crates of Fare-Box Compartments



Receiving Room at Plank Road Storeroom

Room of Cashier in Which Conductors' Receipts Are Counted

PURCHASING AND STOREROOM DEPARTMENTS

THE purchasing agent acts jointly for the Public Service Corporation and the subsidiary railway, electric and gas companies. He is also the purchasing agent of the United Gas Improvement Company, and is located at Philadelphia, where he has a large office force that devotes its time entirely to the work of the Public Service Corporation properties. A local railway purchasing agent, located at Newark, is the direct representative of the general purchasing agent. Similar local purchasing agents, with offices at Newark, represent the general purchasing agent in the electric and gas companies.

Individual storerooms were maintained formerly for the line, mechanical, stationery and way departments. The storerooms for the mechanical and line departments were consolidated first and finally the stationery storeroom was added, making the one large storeroom which now exists at the Plank Road shops.

It is the policy of the company to keep its supplies at as low a point as is possible without any interruption of work. This policy, of course, does not prevent the purchase of supplies from time to time when market conditions are favorable. It is believed that the policy of buying material only so far in advance as will

PURCHASING AGENT'S COPY

PUBLIC SERVICE RAILWAY COMPANY

No. 59402 ORIGINAL

REQUISITION ON PURCHASING AGENT

PURCHASING AGENT:

PLEASE ORDER THE FOLLOWING FOR SHIPMENT TO

DATE ..... 19...

..... VIA .....

QUANTITY ON HAND	LOT NO.	QUANTITY REQUIRED	ARTICLE	FOR WHAT PURPOSE REQUIRED

St. Ry. 521 O.D.T.Q. 10M. 6-11. Order D 28163

APPROVED ..... DATE ..... 19..... SIGNED:

APPROVED ..... DATE ..... 19.....

APPROVED ..... DATE ..... 19.....
GENERAL MANAGER

ORDER ISSUED NO. ..... PLACE ORDER WITH .....

Purchasing and Storeroom Departments—Form of Requisition on Purchasing Agent

The storeroom for line department, mechanical department and stationery supplies for all the northern divisions of the company is located at the Plank Road shops, Newark. A separate storeroom for the way department is maintained at Passaic wharf, Newark. This is under the direction of the general storekeeper at the Plank Road shops, and provides the greater amount of space needed for track materials which could not be furnished at the Plank Road shops. The requirements of the southern division are met by the maintenance of a separate storeroom at Camden. In order that supplies may be used as advantageously as possible all requisitions issued by the storekeeper at Camden are sent to the storekeeper at Newark before submission to the purchasing agent. If the storekeeper at Newark can furnish the material desired at any saving to the company he does so.

meet all necessities not only effects a saving in interest on the investment, but also tends to prevent the accumulation of material which, although required at one time, may not be used continuously in the history of the company. It is the intention to simplify the work in every way feasible and consistent with the provision of the necessary safeguards. New methods involving greater simplicity of operation in the storeroom which were adopted recently have been found to produce a material saving in cost and to yield satisfactory results.

REQUISITIONS ON PURCHASING AGENT

All material is purchased on requisitions signed by the head of the department interested and approved by the general manager. All requisitions for material for shops are approved by the mechanical engineer, while

the superintendent of distribution approves requisitions for material for the line department and the engineer of maintenance of way and superintendent of maintenance of way pass on requisitions for the way department. These requisitions are made out in quadruplicate. The original is sent to the purchasing agent, the general manager retains one copy and two copies are sent to the storeroom department. The latter two are filed by the storeroom department, one in a numerical file and the other in an alphabetical file, according to the name of the material ordered.

The purchasing agent issues an order for the material and sends a copy thereof to the storeroom department. The number of the order is then placed on the copies of the requisitions held by the storeroom department. The alphabetical file copy is given to the receiving clerk in the storeroom department and the copy of the requisition in the numerical file is given to the storekeeper personally. The date on which the material is wanted is placed on this copy of the requisition. These requisitions are filed according to the dates on which the material is wanted and the record is watched carefully by the general storekeeper. If the material is not received on the date specified the matter is referred to the purchasing agent in Philadelphia. A copy of the original requisition is published on page 623.

When material is received in the storeroom the principal facts relating to it are entered by the receiving clerk in the receiving book. This provides a complete record of the entire transaction in loose-leaf ledger form. It shows the date on which the material is received, the name and address of the shipper, the order number, the weight or quantity, the name of the article and lot number in the Public Service storeroom, the price, the amount of the invoice, express or freight charges if any, the cash discount, the net price, the total cost, the invoice number and any remarks which may be pertinent. The invoice number is furnished by the auditor. These pages are 20 3-8 in. wide x 14⅛ in. high. As each page is completed it is removed from the ledger and filed. The storekeeper stamps the copy of the original order issued by the purchasing agent "complete" when he ascertains that the quantity of material received is correct and that the specifications were carried out in all details.

Before requisitions are passed by the storeroom department the condition of the stock of the material on hand is noted on the storeroom stock memorandum which is published on this page. This is checked against the ledger record of material on hand as a precaution before the requisition is passed. The stores orders are added once a month and must check with the totals in the stores ledger.

While the use of the storeroom stock memorandum slips permits practically a perpetual inventory of the stock on hand, it does not provide for material which is used very rarely, or not at all, during the course of the year. This material is checked at the time of the regular inventory made once a year. The stock balance is checked monthly with the auditor's record.

A loose-leaf stock sheet is used for the store's ledger. This shows the lot number and name of the material. It provides for the date, statement of the amount on hand on the last day of the previous month, the amount received on requisition, the total, the amount consumed and the amount remaining on hand. At the bottom of the sheet a record of material used is kept by days and months. The form of this statement is shown on page 625.

Provision is made on each stock sheet for a statement of the average monthly requirements of that class of material and the amount of stock which should be on hand. These figures are based on the average results for the last three years. It is planned to carry a sufficient supply of all materials which are in constant use to last about two months.

As both sides of the sheets are used in the same manner, the record of material used enables the storekeeper to give a total report on material required by

STORE ROOM STOCK MEMORANDUM

Date.....—191

To Stock Clerk—Please note condition of Stock, Lot No.....on hand this date.

ARTICLE	ON HAND	MINIMUM	ORDERED	
			QUANTITY	REQ. NO.

SIGNATURE .....

Purchasing and Storeroom Departments—Storeroom Stock Memorandum

months or years. The sheets are filed for permanent reference after the two years for which they are intended to be used expire.

ORGANIZATION OF STOREKEEPER

The organization of the storekeeper at Plank Road shops comprises comparatively few men. Twenty-four men are employed in the mechanical, line and stationery store departments. Three men are employed at the way department storeroom. These figures include two men for each of the three supply cars which carry materials from the storeroom to the various carhouses on the system. Two men are employed continuously in giving out material required for the Plank Road shops. One man is employed regularly in packing up material for the different carhouses.

The supply cars follow a regular schedule, making two deliveries a week to the large carhouses and one a week to the small carhouses. One of the cars is used for the general supplies, one for armatures and one for wheels and other similar heavy material. Employees at carhouses are instructed to calculate their requirements in advance as carefully as possible so as to avoid extra trips of supply cars. An extra car, however, is kept for emergency deliveries.

The division foremen at the carhouses are provided with requisitions on the storekeeper which must be approved by the head of the department before they are honored. These are in three parts. The original is sent to the storeroom, one is retained by the division foreman and another is sent to the general auditor. This requisition provides for a statement of the amount used last month, the amount on hand, the quantity wanted, the lot number, the unit cost and the amount. The storeroom employee who makes up the order initials it. When goods are delivered on these manifests, the motorman of the supply car signs his name and gives the number of the car. The foreman at the carhouse is obliged to receipt in full for the material.

The catalogue starts with lot No. 1 and shows an aggregate of about 15,000 lot numbers. These numbers, however, are not entirely consecutive, as space and numbers were left for the insertion of new classes of material.

If work of a new character is undertaken, and material is required therefor which has not been carried in stock previously and it is apparent that there will be a continued demand for the material, a request is sent by the storekeeper to the mechanical, line or way department for an order large enough to provide a working supply.

Special material that may be wanted for the Plank Road shops is ordered on a separate blank addressed to the general storekeeper and approved by the department foreman of the shops, the superintendent of shops and the mechanical engineer.

PUBLIC SERVICE RAILWAY COMPANY

STOCK SHEET

NET COST

LOT NO.....

NAME.....

DATE	ON HAND LAST DAY PREV. MONTH	RECEIVED ON REQUISITION	TOTAL	AMOUNT CONSUMED	REMAINING ON HAND
JANUARY					
FEBRUARY					
MARCH					

RECORD OF MATERIAL USED

DATE	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
1												
2												
3												

Purchasing and Storeroom Departments—Form of Stock Sheet

Shop material is given out on store's orders which are signed by the foreman of the department that needs the material. These are made out in duplicate, one of which is kept by the storeroom while the other is sent to the auditing department. These forms show the number of the car on which the material is to be used, the job number, the number of the account to which the cost is to be charged and the order number. They also show the quantity wanted, the unit, the name of the article, the lot number, the quantity issued and the unit cost and amount. The order is initialed by both the storeroom employee who delivers the material and the shop employee who receives the material. The supplies of the stationery department are delivered in the same way.

A catalogue is published by the company in which an alphabetical list of articles used at the carhouse shops is given. Division foremen use this catalogue in ascertaining the lot number of material wanted. Orders are placed and honored by the lot number.

MATERIAL SECURED FROM SHOPS

Some manufacturing is done at the shops. The mechanical engineer, before approving requisitions on the purchasing agent, considers the possibility of economy in the manufacture of small articles by the use of the shop forces of the company. Occasionally quotations for material and work are secured outside and submitted to the mechanical engineer in order that he may decide whether it would be cheaper to purchase or to manufacture the material desired.

When the storekeeper wants to have material manufactured by the mechanical engineer, he prepares a requisition showing the amount on hand, the quantity wanted, a description of the material and the lot number. Provision is made for insertion of the number of the shop order if the requisition is approved by the mechanical engineer. Estimates, divided between ma-

terial and labor costs, are required on all requisitions of this nature amounting to $25 or over. The shop order made out by the mechanical engineer is in triplicate and on the reverse side space is provided for a statement of the detail cost divided between labor and material. One copy of the order is sent to the general manager and one to the general auditor.

When material for the storeroom is manufactured by the shop department a report is made to the general auditor in order that the proper accounts may be charged. This report shows the job order number, the quantity, the articles, the amount, lot number and the distribution of cost between labor and material. The report is made in duplicate and is approved by the head of the department. The duplicate is retained by the person who made the report. The general storekeeper places his name on the report, indicating that he has entered the facts in his record. If requisitions are received by the storekeeper for material which he has not on hand but for which he can furnish a substitute, he communicates with the head of the department concerned to see whether use can be made of the material in stock.

INVENTORY SHEET

A loose-leaf inventory sheet is used when the annual inventory is taken. As shown by the illustration published on this page, the sheet is initialed by five persons, those who count, price, examine and list the material and check the figures. A column provided for a statement of the surplus is not filled at the time of the inventory but is used by the storekeeper, who states the excess amount of the material on hand if it has been used very little or not at all during the year.

When the storekeeper has occasion to pay charges for freight or express on material, he takes a receipt in duplicate. Both the original and duplicate are sent to the auditor, one with the freight or express bill and the other with the bill of the material. For the purpose primarily of meeting such charges, the storekeeper has a small petty cash fund. This provides also for small emergency purchases which may have to be made. A statement accompanying material for exchange is used when old articles or broken articles which need repair are returned to the general storekeeper. This form shows the quantity and article and also provides space for information to be furnished by the storekeeper as to the price and amount of the material and the disposition that he makes of it. This form is signed by the motorman of the car in which the material is carried, the foreman of the carhouse and the receiving clerk at the storeroom. It also shows above the signature of the chief clerk of the storeroom the account to which the material is credited. It is made out in three parts; one is sent to the storekeeper, one is kept by the carhouse foreman and the other is sent to the auditor.

If material is received by the store department that is not satisfactory for any reason, or is not in accordance with specifications, authority is asked of the purchasing agent to return it. A return purchase slip is used for these transactions. This is made out in triplicate. The original is sent to the general auditor, who issues a charge against the manufacturer. The duplicate is used for posting the cost and summary. The triplicate is used for posting the quantity.

Bills are received by the storeroom directly from the general auditor and are returned to the auditing department after the material has been received and found in accordance with specifications.

The card on each bin in the storeroom shows the lot number, the minimum amount that should be on hand, the size, name of the article and the date and quantity when additional supplies of the material are received. Originally the quantity issued was stated in each case on the bin card. This required more men than are needed now, when the bin card is used only to record the amount received. The complete record of the movement of material is kept from the store's orders.

COUNTED BY ..... LISTED BY .....
PRICED BY ..... EXTENDED BY .....
EXAMINED BY ..... CLASS .....

INVENTORY SHEET

PAGE .....
DATE ..... 19 ..... SHEET .....

SURPLUS		ARTICLE	LOT NO.	QUANTITY	UNIT	UNIT COST	AMOUNT	TOTAL	

Purchasing and Storeroom Departments—Form of Inventory Sheet

SCRAP MATERIAL

The general manager requests the purchasing agent to advertise for bids for scrap material, to be forwarded to the executive committee. After the acceptance of any bids, the general manager notifies the general auditor, the purchasing agent and the superintendents interested. The general auditor credits the proper accounts. The purchasing agent notifies the party whose bid is accepted. All material must be weighed before removal, on the premises if scales are available, otherwise at a standard scale.

The general purchasing agent keeps in touch with the movement of market prices on all classes of material which fluctuate from time to time and are in constant use. In order that he may be posted as to the facts before the purchase of a large amount of material of this character, the general manager requests the storekeeper occasionally for a statement of the amount on hand and the estimated amount that will be required in say four to six months.

ACCOUNTING DEPARTMENT

THE work of the general auditor of the Public Service Railway is unusually broad in its scope. In addition to the supervision of the accounting departments he has charge of the transfer and ticket systems on all lines of the company. The general auditor has also conducted an exhaustive investigation into the safeguards afforded by registering and other fare boxes. As all the statistical compilations desired by all departments of the company are prepared under the direction of the general auditor, this department of the company is in close touch with the work of all other departments and takes a more active part in their work than is the usual practice. The accounting department is under the jurisdiction of the comptroller, who is an official of the controlling Public Service Corporation and the underlying railway, gas and electric companies.

St. Ry. 443-100-11-10

.....Co.,

.....Division

CAR RECORD BOOK.

The Station Master must take the Reading from the Register and record directly in this Book in Ink.

Register Readings for.....*191*

All changes of Registers and Register Readings must be noted in this Book.

Register Reading must be taken when the car leaves the Car House in the morning and also when the Car comes in the Car House at night. Report the reading of every Register daily whether used or not. Note all transfers of Cars or Registers from this Car House, also all Cars and Registers received. Never report more than one Car or Register on any one line of the page.

Car No.	Reg. No.	Reg. Reading	Cash Box No.	Reg. Reading	Initial	Cash Box No.	Car No.	Reg. No.	Reg. Reading	Cash Box No	Reg. Reading	Initial	Cash Box No.

Accounting Department—Headings of Facing Pages of Car Record Book Used at Carhouses

In brief, the organization consists of the general auditor, assistant general auditor, two traveling auditors and the following office departments: Bookkeeping, statistical, register, transfer and mileage, timekeeping and fare box repair departments. The auditor of disbursements acts in this capacity not only for the railway company but also for the allied Public Service Electric Company and the Public Service Gas Company and he is directly under the jurisdiction of the comptroller. The traveling auditors do not have like duties. One devotes his time entirely to the work of auditing accounts at carhouses at which funds are handled, the claim department and offices at which tickets of any character are sold; this assures the auditing of all contingent or emergency funds. The other traveling auditor devotes his time to general work, including the investigation of the accounts of storekeepers.

ACCOUNTING FOR THE RECEIPTS

A daily record blank is placed in the car each day and the changes in the registers are indicated thereon, no matter how many conductors may operate the car during the twenty-four hours. This form of card has been changed recently from the original record compiled for this purpose and illustrated in a paper presented before the American Electric Railway Accountants' Association at the 1910 convention. This record provides space for a report of the commencing and ending numbers of both the cash register and the ticket and transfer register whenever during the day a change of conductors is made. Space is also provided for the cash box number and compartment number. When the station master places the records in the cars he notes the register readings in books provided for that purpose. The headings in these books are published herewith. Separate books are used for a record of the cash and transfer registers. About five books are kept in use for each division in order that holidays and Sundays may not prevent the regular auditing of the books and that each carhouse may be supplied constantly.

As transfers redeemed must be accounted for at five cents each, the work of accounting therefor is one feature of the operations affecting receipts. Conductors are supplied with envelopes in which they place at the end of each trip the collected transfers and tickets of every description. The envelopes are sealed and the number of transfers and tickets inclosed is marked on the outside; from these envelopes the conductors make up their daily reports. This report has been changed somewhat since the form was shown in a paper presented before the 1910 convention of the American Electric Railway Accountants' Association at Atlantic City. On the reverse side separate spaces are provided for remarks pertaining particularly to prepayment cars and old-style cars. For the registering or multiple-fare box the information given is as follows: Car number, cash box number, compartment number, starting number of register, total fares registered and ending number of register.

There is also a space on which the conductor is required to indicate whether or not any accidents occurred on or near his car on the day in question. If the report does not specifically include an answer to this question the auditing department notifies the supervisor in the division of the transportation department affected and the conductor is required to report over his signature upon this fact. The motorman is also required to sign below the inquiry on this point. Largely on account of this record affecting accidents these reports are kept for six years, or until the statute of limitations is operative.

Space is provided on the front side for the conductor to register his punch, and as a similar space is indicated on the envelopes in which the transfers and tickets are returned, the auditing department is enabled to see that no transfers are accepted which were punched by the conductor himself. Conductors are required to report the amount of change with which they start and end the day. Trip reports are made out by carhouse clerks and show the run number, the number of trips made and the number of envelopes containing tickets and transfers forwarded to the auditor. This permits a check on the number of trips reported by conductors. Any shortages of transfers or tickets that are found in the auditing department are marked by the counters on the envelopes. As this checking is done the employee inspects the transfers in order to see that the time and date are properly indicated. The existence of shortages or wrong dates is marked on the envelopes. All tickets that might be of value are placed in bags, which are dated. They are sold to a paper mill and are destroyed in the presence of two representatives of the company. Transfers that have been used are placed in separate bags in a similar manner and are sold to a paper mill. The envelope records of tickets are kept for one month. If any envelope shows a shortage of transfers or tickets all the transfers and tickets are kept for an interview with the conductor.

St. Ry D. 284. 1M Sets-2-11-Order D 25570.

Public Service Railway Company

OFFICE OF THE GENERAL AUDITOR

NEWARK, N. J.

No. 11995

REGISTER COMPLAINT CARD

Date 191

Division .....

Car No. .....

Remarks .....

GENERAL AUDITOR

Public Service Railway Company

INVESTIGATION

Date 191

STATEMENT OF STATION MASTER

Signature .....

ACTION TAKEN BY SUPERVISOR

..... Supervisor

Respectfully referred to

..... Div. Supt.

Returned to Gen'l Auditor .....

Accounting Department—Two Sides of Card Used for Complaint and Report Regarding Register Discrepancy.

WEEK ENDED .....

	LINES	Miles per Hour	RECEIPTS P. C. Mile	RECEIPTS P. C. Hour
HUDSON DIVISION	Newark Ave.			
	Pacific Ave.			
	Montgomery			
	Erie			
	Henderson			
	Lafayette			
	Plank Road			
	Turnpike			
	Greenville			
	22d Street			
	5th St., Bayonne			
	Pavonia			
	Oakland			
	Nk. & Summit Avenue			
	Washington			
	Willow			
	Grove			
	Jackson			
	Summit			
	Bergenline			
	Union Hill			
	Fourteenth			
	Palisades			
	White Line			
	Bergen Pike			
	Homestead			
	TOTAL			

Accounting Department—Part of Form for Speed Record

TRANSFERS

Transfers are ordered by the auditing department on requisitions issued by the transportation department. Transfers on the system are generally of the same design. Requisitions for transfers originate with the supervisors, who estimate each month the number that will be required in the ensuing month for daily, Saturday and Sunday and emergency use. These requisitions are checked against previous orders.

A new transfer which has been adopted and is illustrated on plate XLVII is designed to have the time of conductors in punching. The conductor punches only the time in fifteen-minute intervals and the direction in which the car is bound. The transfer points are listed according to the direction. This form of transfer bears a p. m. coupon, so that if no coupon is attached the transfer is good only in the morning. The use of this form is being extended to the entire system. The emergency transfer is used at times of interruption in service. On the back of the transfer there is printed the substance of the law of the State of New Jersey which prohibits persons from giving or selling tickets or transfers. Transfers are accepted by conductors only at the diverging points indicated thereon.

DISCREPANCIES IN REGISTER REPORTS

The daily car records are checked against the daily reports of conductors. In the event of a discrepancy in the register a complaint card is sent by the general auditor to the division affected and a carbon copy thereof is retained until a reply has been received. These cards are numbered and contain spaces for the date, name of the division affected, the number of the car and remarks. The reverse side is used for a report on the case. Both sides of the register complaint card are shown above.

There is no ledger record of individual shortages; this is kept, however, by lines, separately for transfers and cash, and entries are made of each individual short list so that they can be traced easily. A record

of individual shortages is kept by each carhouse. Overages are returned to the conductor concerned if nothing develops to show that they belonged to the company. When return of cash is made in such cases conductors are required to sign and punch a receipt therefor. Shortages on cash fares and transfers, as compared with the register record, are recognized as obligations of the employees and are collected. A memorandum of shortages and overages outstanding affecting any line of a division is given to the traveling auditor and is used by him in his audits of carhouse cash. The carhouse clerk is obliged to collect shortages within twenty-four hours of receipt of short lists by him and to account therefor. The daily transfer report, prepared at each carhouse by the clerk who gives transfers to conductors, is checked against the unused transfers, which must be returned to the auditor daily.

RECEIPTS OF CONDUCTORS

Receipts of other than prepayment cars are deposited by the carhouse receivers directly in the bank before 9 a. m. each day to the credit of the company. The bank teller signs two deposit slips, one of which is sent to the general auditor and the other to the treasurer.

Compartments in fare boxes are placed in fiber crates and are collected daily at each carhouse from which prepayment cars are operated. The crates are taken to the Public Service Building, Newark, and are let into the basement on an incline conveyor built by the Link Belt Company. They are then opened by two men, who mark on slips the box numbers, etc., and drop one in each compartment. This is done so that if the conductor has not attended to that duty the compartment can be identified by the employee who counts the cash. The compartments are placed on small trucks holding 64 boxes, the doors are locked and the trucks are then taken on a special elevator which leads only to the cashier's room. In this room the money is counted by coin-counting machines and the nickels, which comprise 85 per cent of the passenger receipts, are wrapped by coin-wrapping machines.

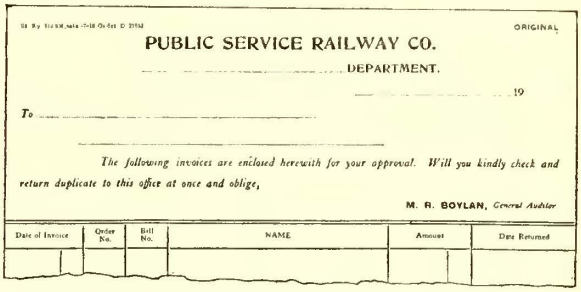
The machine shop at which repairs to fare boxes are made is located in the basement of the Public Service Building in Newark and is under the direct jurisdiction of the general auditor. It is fully equipped.

The company was one of the first in the country to investigate the subject of fare boxes. Before any fare boxes were placed on cars an exhaustive study of all types was made by the general auditor. The first fare boxes were introduced on sixty cars on April 15, 1908. At present 750 multiple fare boxes, 125 single compartment boxes and 300 registering boxes are on cars or on order for installation. This includes nearly all the prepayment cars. Prepayment cars have been introduced on all but the Central and Southern divisions, and their use is being extended gradually to all parts of the system.

INVOICES

All bills against the company are received by the auditor from the purchasing department and are checked against the carbon copy of the order of the purchasing agent. When bills are sent for approval to the departments which received the material a form to accompany them, the original of which is reproduced herewith, is made out in triplicate; two copies are sent to the storekeeper, one of which is receipted and returned. One copy is retained by the auditor. On the last copy mentioned the date on which the bills are returned approved is indicated in each case. This is filed and provides a permanent record showing the course of the bill.

Bills are sent by the auditor daily to the departments affected. Vouchers are made up daily for bills showing a discount. Bills providing for payment in thirty or sixty days are kept in an index. In the case of large manufacturing companies with which the railway does a good deal of business, vouchers are made as soon as a sufficient number of bills are on hand



PUBLIC SERVICE RAILWAY CO.

ORIGINAL

.....DEPARTMENT.

.....19

To .....

The following invoices are enclosed herewith for your approval. Will you kindly check and return duplicate to this office at once and oblige,

M. R. BOYLAN, *General Auditor*

Date of Invoice	Order No.	Bill No.	NAME	Amount	Date Returned

Accounting Department—Heading of Form Sent with Invoices to Be Approved

to fill the lines in a voucher. This prevents an unusual accumulation of bills at the end of each month. Ordinarily bills that do not show a discount for payment in a certain time are allowed to accumulate from the first to the twentieth day of each month and are then paid.

All bills are paid by voucher checks which are printed on safety paper. A standard voucher is used for ordinary invoices and the bills are attached thereto. On payments made by the claim department the attachment of a release or receipt is required for each voucher. About 1500 vouchers per month are issued and these are typewritten. Vouchers are numbered each month beginning with No. 1. The voucher clerk enters the classification every day in a loose-leaf book. Separate classifications are provided for operating expenses and for accidents and damages, both of which are shown by divisions.

In order that payment of the same bill twice may be avoided an individual bill record is kept in a loose-leaf book, which shows the detail amount on each invoice and the date thereof. Whenever a new entry is made a clerk goes over the record of the company supplying the material as far back as the date of the bill attached to the voucher, and if he finds the same amount entered he looks up the original data to see whether the material is the same in each case. For of-

ficials of the company who have petty cash accounts in order that they may make purchases or payments from time to time, for which they are reimbursed on presentation of the purchase slip or similar record, a notation is made in green ink under the name of the firm from which the purchase was made. This is a protection against duplicate payment in another form.

To insure the same precautions against duplicate payments of claims for accidents and damages as have been described for other classes of bills, a separate claim voucher card index is kept. This shows the number of the claim department case, the name of the person affected, the date on which the accident happened, the voucher number, the date on which the service was performed in the case of payment to a physician and a record of witness fee payments. Different cards are used for settlement payments and for witness fee or service payments. Claim department payments are indexed in this record under the names of the claimant, the attorney and the physician, or any others whose names are shown on the voucher.

CLASSIFICATION OF OPERATING EXPENSES

The company uses the eighty-eight operating expense accounts prescribed by the Board of Public Utility Commissioners of New Jersey. This is the standard system of the American Electric Railway Accountants' Association with the addition of accounts for depreciation of equipment and depreciation of way and structures. A number of sub-accounts have been added by the company in order that additional details may be furnished. The sub-accounts are as follows:

MAINTENANCE OF WAY AND STRUCTURES

SUB-ACCOUNTS OF PRIMARY ACCOUNT BUILDINGS AND STRUCTURES

	No.
Superintendence (track)	1A
Superintendence (line)	1B
Superintendence (buildings)	1C
Power plants	25A
Substations, including storage battery buildings	25B
Carhouses	25C
Shops	25D
General office	25E
Stations, waiting rooms and platforms	25F
Docks and wharves	25G
Miscellaneous buildings and structures	25H
Expenses	25I

MAINTENANCE OF EQUIPMENT

SUB-ACCOUNTS OF PRIMARY ACCOUNT PASSENGER AND COMBINATION CARS

Car bodies	32A
Painting and varnishing	32B
Fenders	32C
Headlights	32D
Fare registers and fixtures	32E
Window glass	32F
Heaters and fixtures	32G
Trucks and truck parts	32H
Air brakes and fixtures (storage)	32I
Other brakes and fixtures	32J
Wheels and axles	32K
Journals	32L
Brake shoes	32M
Shifting equipment	32N
Air brakes and fixtures (independent)	32O

SUB-ACCOUNTS OF PRIMARY ACCOUNT ELECTRIC EQUIPMENT OF CARS

Trolley stands, poles and harps	36A
Wiring	36B
Armatures	36C
Commutators	36D
Fields	36E
Controllers	36F
Gears and pinions	36G
Gear cases	36H
Motor frames	36I
Motor bearings	36J
Brush holders	36K
Miscellaneous electrical parts	36L
Shifting equipment	36M
Trolley wheels	36N

SUB-ACCOUNT OF PRIMARY ACCOUNT SHOP MACHINERY AND TOOLS

Repairs air plant	38A

CONDUCTING TRANSPORTATION

SUB-ACCOUNT OF PRIMARY ACCOUNT CARHOUSE EMPLOYEES

Air plant employees	66A

SUB-ACCOUNT OF PRIMARY ACCOUNT CARHOUSE EXPENSES.

Air plant supplies	67A

GENERAL AND MISCELLANEOUS

SUB-ACCOUNTS OF PRIMARY ACCOUNT RELIEF DEPARTMENT EXPENSES

Sick benefits	77A
Death benefits	77B

In addition to the particulars shown by the classification of operating expenses, with the sub-accounts added as indicated, the auditor compiles monthly statements for each division in the system showing more minute details of the charges. Under this plan eleven sheets of detail are compiled monthly giving the cost of labor and material for each division. Part of one of these sheets, showing typical charges to two of the maintenance of equipment sub-accounts for all divisions, is published in Table XV. In the full statement as compiled these figures are shown for each division as well as for the company as a whole.

TABLE XV.—DETAILS OF OPERATING EXPENSES.
32 H-TRUCKS AND TRUCK PARTS.

	Total Labor.	Total Material.
Peckham 14-B-3	$185.06	$56.84
Peckham 14-D	26.43	12.27
Brill 27-G	428.40	75.21
" 27-D	94.74	9.20
" M. C. B.	277.02	7.88
" St'd C.-50	36.01	3.60
" 21-E	85.40	14.70
Baldwin	60.68	15.97
Nuts, bolts, etc.	....	340.58
	$1,193.74	$536.25
36 C-ARMATURES.		
52 Armatures	$14.55	....
75 "	291.53	$405.96
58 "	9.38	21.91
67 "	373.37	561.20
68 "	527.39	513.64
80 "	360.33	329.97
90 "	111.27	80.46
101 "	272.99	491.02
800 "	144.12	78.01
1,000 "	126.36	125.72
1,200 "	5.60	7.42
Tape	....	191.53
Mica	....	88.97
Drilling	....	108.30
Steel banding wire	....	73.67
Webbing	....	10.20
Solder, canvas, etc.	....	102.00
Nuts, bolts, etc.	....	92.08
	$2,236.89	$3,282.06

Under a plan adopted whereby reports of operating expenses are made by the way, transportation and mechanical departments, a separate guide number is assigned for each primary account in the various divisions. For instance operating expense account No. 2 would be 102 in the Hudson division, 202 in the Essex division, etc. A copy of this plan as used by the way department is published on page 631.

A separate classification of operating expenses, containing thirty primary accounts, is used for the ferry boats operated by the company.

JOB ORDERS

Before any expenditures for construction work, additions and betterments can be undertaken they have to be authorized by the executive committee of the company. An estimate is made annually to show the amount to be expended on each division. When the general manager is ready to have the work proceed on a specific job he prepares a requisition in duplicate

for improvements or repairs. This explains the circumstances and the estimated cost. The original is signed as recommended by the general manager and a vice-president. The original and duplicate are sent to the auditor for registration and classification. The original is returned to the comptroller and submitted by him to the executive committee for approval; the duplicate is retained by the auditor. The general auditor places on the requisition the name of the special account in which the expenditure is to be carried and of the account to which the expenditure is to be charged upon completion of the job.

The requisition, if approved by the executive committee, is signed by the secretary of the committee. It is then subject to approval by the board of directors and favorable action thereon is indicated on the requisition by the signature of the secretary of the board. Formal notice of approval by the board of directors is indicated in a form letter sent by the comptroller to the general manager and general auditor.

Before the construction department interested begins work it prepares a job order covering the specific work to be done under the authorization. Statements are compiled each month showing the condition of job orders. The headings of one form as compiled for the mechanical department are published on page 632. The job order used by the mechanical department is an envelope which contains the store orders or material slips. The cost of the labor is also entered by slips on this envelope. The forms on both sides of the envelope are shown on this page. All job orders must be approved by the general manager. The original job order is sent to the auditor and the duplicate is retained by the general manager. All costs of work done on the job are divided between labor and material. When the cost entries on job orders exceed the estimated amount the general manager takes up the matter with the heads of the departments concerned, on the report of the auditing department.

All streets on which the company operates and all buildings owned or leased have a permanent job order. All operating work done on a particular street or building by any department is charged to the permanent job order. In the building department there are

PLAN FOR REPORTING CLASSIFIED ACCOUNTS

STREET RAILWAY DEPARTMENT

MAINTENANCE-WAY AND STRUCTURES

	ACCOUNT NUMBER	HUDSON DIVISION	ESSEX DIVISION	PASSAIC DIVISION	CENTRAL DIVISION	SOUTHERN DIVISION	BERGEN DIVISION
Way and Structures.							
Superintendence, (Track)	1 A	101 A	201 A	301 A	401 A	501 A	601 A
Superintendence, (Line)	1 B	101 B	201 B	301 B	401 B	501 B	601 B
Superintendence, (Buildings)	1 C	101 C	201 C	301 C	401 C	501 C	601 C
Ballast,	2	102	202	302	402	502	602
Ties,	3	103	203	303	403	503	603
Rails,	4	104	204	304	404	504	604
Rail Fastenings and Joints,	5	105	205	305	405	505	605
Special Work,	6	106	206	306	406	506	606
Underground Construction,	7	107	207	307	407	507	607
Roadway and Track Labor,	8	108	208	308	408	508	608
Paving,	9	109	209	309	409	509	609
Misc. Roadway and Track Expenses,	10	110	210	310	410	510	610
Cleaning and Sanding Track,	11	111	211	311	411	511	611
Removal of Snow, Ice & Sand,	12	112	212	312	412	512	612
Tunnels,	13	113	213	313	413	513	613
Elevated Structures and Foundations,	14	114	214	314	414	514	614
Bridges, Trestles and Culverts,	15	115	215	315	415	515	615
Crossings, Fences, Cattle Guards & Signs,	16	116	216	316	416	516	616
Signal and Interlocking Systems,	17	117	217	317	417	517	617
Telephone and Telegraph Systems,	16	116	216	316	416	516	616
Other Miscellaneous Way Expenses,	19	119	219	319	419	519	619
Poles and Fixtures,	20	120	220	320	420	520	620
Underground Conduits,	21	121	221	321	421	521	621
Transmission System,	22	122	222	322	422	522	622
Distribution System,	23	123	223	323	423	523	623
Miscellaneous Electric Line Expenses,	24	124	224	324	424	524	624
Buildings and Structures							
Power Plants,	25 A	125 A	225 A	325 A	425 A	525 A	625 A
Substations, inc. Storage-battery Bldgs.	25 B	125 B	225 B	325 B	425 B	525 B	625 B
Car Houses,	25 C	125 C	225 C	325 C	425 C	525 C	625 C
Shops,	25 D	125 D	225 D	325 D	425 D	525 D	625 D
General Office,	25 E	125 E	225 E	325 E	425 E	525 E	625 E
Stations, Waiting-rooms & Platforms,	25 F	125 F	225 F	325 F	425 F	525 F	625 F
Docks and Wharves,	25 G	125 G	225 G	325 G	425 G	525 G	625 G
Miscellaneous Buildings and Structures,	25 H	125 H	225 H	325 H	425 H	525 H	625 H
Expenses,	25 I	125 I	225 I	325 I	425 I	525 I	625 I
Depreciation of Way and Structures,	26	126	226	326	426	526	626
Other Operations-Dr.,	27	127	227	327	427	527	627
Other Operations-Cr.,	28	128	228	328	428	528	628

Accounting Department—Plan Used by Way Department in Reporting Classified Accounts

Department

Job Order No. _____ Charge { Acct. No. _____ Auth. No. _____ Carhouse _____

DATE _____

Estimate for _____

Total Estimate

Approved: Signed:

GENERAL MANAGER HEAD OF DEPARTMENT

Electric Ry. Journal

Accounting Department—One Side of Envelope Job Order Record Used by Mechanical Department

Job Order	Car No.	Date In	Date Out							
Date	Blacksmith	Carpenter	Motor	Machine	Paint	Pipe	Wiring	TOTAL		
				Labor						
Total										
				Material						
Total					Grand Total, Labor and Material					

Electric Ry. Journal

Accounting Department—Detail of Mechanical Job Order Record

St. Ry. 20-2500-9-10-order 22212

JOB ORDER STATEMENT—MECHANICAL DEPARTMENT

Work Completed in Month of _____ 191

	Work Done	Div.	J. O. No.	Car No	Blacksmith Shop		Carpenter Shop		Motor Shop		Machine Shop		Paint Shop		Pipe Fitting Shop		Wiring Shop				Total		Grand Total Labor and Material
					Labor	Material	Labor	Material	Labor	Material	Labor	Material	Labor	Material	Labor	Material	Labor	Material	Labor	Material	Labor	Material	

Accounting Department—Headings of Monthly Job Order Statement of Mechanical Department

St. Ry. 239-10M-6-11 order. D. 27581

_____ Company _____ Division

PAY ROLL for the week Ending Thursday _____ *191*

Received of the _____ **CO., the amount opposite my name in the following list, in full for all demands for work done during regular and irregular working hours, in the service of the** _____ **Co., up to and including the date of this Pay Roll.**

		Badge Number	NAME	Friday		Saturday		Sunday		Monday		Tuesday		Wed.		Thursday		SPECIAL														Sand Work		Shifting Equipment		Special Car Rev.		Miscellaneous		Total Time		Rate of Pay	Amount of Pay			REMARKS
																		Friday		Saturday		Sunday		Monday		Tuesday		Wed.		Thursday															
				Hrs.	Min.	Hrs	Min.	Hrs.	Min.	Hrs.	Min.	Hrs.	Min.	Hrs.	Min.	Hrs.	Min.	Hrs.	Min.	Hrs.	Min.	Hrs.	Min	Hrs.	Min.	Hrs.	Min.	Hrs.	Min.	Hrs.	Min.	Hrs.	Min.	Hrs.	Min.	Hrs.	Min.	Hrs.	Min.	Hrs.	Min.	Dollars	Cts.	
	1																																									1
	2																																									2
	3																																									3
	4																																									4
	5																																									5
	6																																									6
	7																																									7
	8																																									8

Accounting Department—Form of Pay Roll

ninety-two permanent job orders; in the track department 371, and a like number in the line department.

A time sheet is received each day for every job on which work is being done by the line department. This shows the class of material, the lot number, the size or kind, the value, the place at which the work is done and the details of the time. A similar report is received from the distribution department of the number of bonds installed during the day. From these reports pay rolls are compiled and proper charges to the accounts affected are made. Every week a copy of the pay roll is sent to the foreman for examination before payment.

PAY ROLLS

Pay rolls for trainmen, inspectors, carhouse, shop, line department and office employees are prepared by the auditing department. The track department prepares its own pay rolls, subject to the jurisdiction of the auditing department. At the various carhouses a daily record is kept by lines of all time made. This is sent to the auditing department and is then copied on a pay roll.

Trainmen make out receipt slips for their own pay and when these are signed they are given to the paymaster. The signed receipts are checked with the pay roll by the traveling auditor.

When the pay rolls are ready distribution sheets are prepared showing on one side the number of employees on the weekly pay roll and the number on the pay roll for the corresponding week of the preceding year together with the increase or decrease. On these sheets the employees are classified. The following typical classification relates to the maintenance of equipment employees:

MAINTENANCE OF EQUIPMENT.

General Repair Shops.

Master mechanics, assistants and clerks.
Blacksmiths.
Car repairmen.
Woodworkers.
Car inspectors.
Electricians.
Engineers (stationary).
Machinists.
Motor repairmen.
Truck repairers.
Armature repairers.
Controller repairers.
Painters and rubbers.
Pipe fitters.
Shop helpers and laborers.
Tinsmiths.
Watchmen.
Wiremen.
Electrical equipment repairers.
Fender repairers.
Field repairers.

Car Barns—Repair Department.

Foremen.
Blacksmiths.
Car repairmen.
Woodworkers.
Car inspectors.
Electricians.
Engineers (stationary).
Machinists.
Motor repairmen.
Truck repairers.
Armature repairers.
Controller repairers.
Painters and rubbers.
Pipe fitters.
Shop helpers and laborers.
Tinsmiths.
Watchmen.
Wiremen.
Electrical equipment repairers.
Fender repairers.
Field repairers.
Air station employees.
Oilers.

The distribution between the operating expense accounts affected is shown on the other side of the sheet.

A similar plan of classification is followed for the transportation and the way and structure departments. Pay rolls are prepared in advance on the typewriter and the details are added in indelible ink. The daily line records received from the various carhouses show separately a list of the employees who are absent on account of sickness; this is furnished for a record of the sick and benefit fund.

A weekly comparative pay roll statement for the transportation department is sent to the principal heads of departments. It is divided by divisions. This

REJECTION

IN THE MATTER OF AN ACT ENTITLED "An Act prescribing the liability of an employer to make compensation for injuries received by an employe in the course of employment, establishing an elective schedule of compensation, and regulating procedure for the determination of liability and compensation thereunder"

To the Public Service Railway Company,

Gentlemen:—

I, an employe of your company, hereby notify you that the provisions of Section II of the above entitled Act shall not apply to our relations while I continue in your employ, under either our existing or any future contract or contracts of employment., Dated July 5th, 1911.

In the presence of

_____
Witness to Employe's Signature.

_____ _____
Witness to Employe's Signature. *Signature of Employe.*

PUBLIC SERVICE RAILWAY COMPANY

NAME _____ (*Name in Full*) Badge or Employes No. _____ Register Number _____

ADDRESS _____ (*Number*) (*Street*) (*City or Town*) (*State*)

OCCUPATION _____ AT _____ DIVISION _____

ACCEPTANCE OF EMPLOYER'S LIABILITY ACT

Whereas the New Jersey legislature at its last session passed an Act which is Chapter 95 of laws of 1911, entitled "AN ACT PRESCRIBING THE LIABILITY OF AN EMPLOYER TO MAKE COMPENSATION FOR INJURIES RECEIVED BY AN EMPLOYE IN THE COURSE OF EMPLOYMENT, ESTABLISHING AN ELECTIVE SCHEDULE OF COMPENSATION, AND REGULATING PROCEDURE FOR THE DETERMINATION OF LIABILITY AND COMPENSATION THEREUNDER".

Now, therefore, the undersigned, as a part of our contract of hire and any renewals therof, regardless of the validity or invalidity of the said Act, hereby mutually accept and promise to abide by the provisions of Secton II of said Act, and such part of Section III as relates to the compensation system provided for in Section II.

It is further agreed that should said Act be declared void by the Court of Errors & Appeals of the State of New Jersey, this agreement shall immediately terminate, but any settlement or agreement of compensation theretofore entered into under said Act shall remain in full force and effect.

IN WITNESS WHEREOF the parties hereto have hereunto set their hands this fifth day of July, 1911.

Signed in the presence of

_____ _____
Witness to Employe's Signature. *Signature of Employe.*

_____
Witness to Employe's Signature.

PUBLIC SERVICE RAILWAY COMPANY,
M. R. Boylan, *General Auditor.*

_____ Per _____
Witness to Company's Signature.

Accounting Department—Forms Used by Employees for Acceptance or Rejection of Employers' Liability Law

shows the expense for the current week, the standard pay roll amount, the increase or decrease and the similar expense for the corresponding week of the preceding year. A note at the bottom which is signed by the general auditor states: "The increases and decreases from the standard have been noted by me and authority shown."

In the work of the auditing department in connection with pay rolls, to take the transportation department as an instance, a comparison is made with the standard weekly division pay roll for each division affected and a standard weekly terminal pay roll for the carhouse affected. These standards are changed when the winter or summer schedules are placed in operation. They show the number of men whose

employment has been authorized for each class of work, the rates per day or hour and the total estimated expense per week. These standards are compiled by the district supervisors and approved by the division superintendents. They have been found very useful in the work of checking pay rolls. If any deviation is found in the pay roll from the standard amount an explanation is asked.

CARD RECORD OF EMPLOYEES

A card record is kept for every employee, showing the date of employment and, in the case of trainmen, of changes in the rate to be paid per hour. The card shows whether or not the employee has accepted or rejected the new employers' liability act of the State and payments made, if any, under that act. It also shows the disbursements for sick benefits, insurance and pensions. In connection with the necessity for definite action by the employees regarding the employers' liability act, the company has prepared a form which is published on page 633. One side of this is used for formal acceptance of the act by the employee while the other side is used in the rejection of the act.

A daily statement of cars run, the number of trips, car hours and car miles is received by the general auditor from each division. This shows the standard scheduled number of cars for morning, middle of the day and evening and has provision for additions to or deductions therefrom, with the total. The trips, hours and mileage for each line are given. There is also provision for a notation of the time of conductors and motormen which may be shown on the time sheet in addition to the time required by the cars operated. together with a statement of the reason for the extra time. Space is also provided for a statement of the number of extra trips lost, the terminal points of these trips and the miles. Special attractions on the divisions during the day, if any, are also noted on the statement.

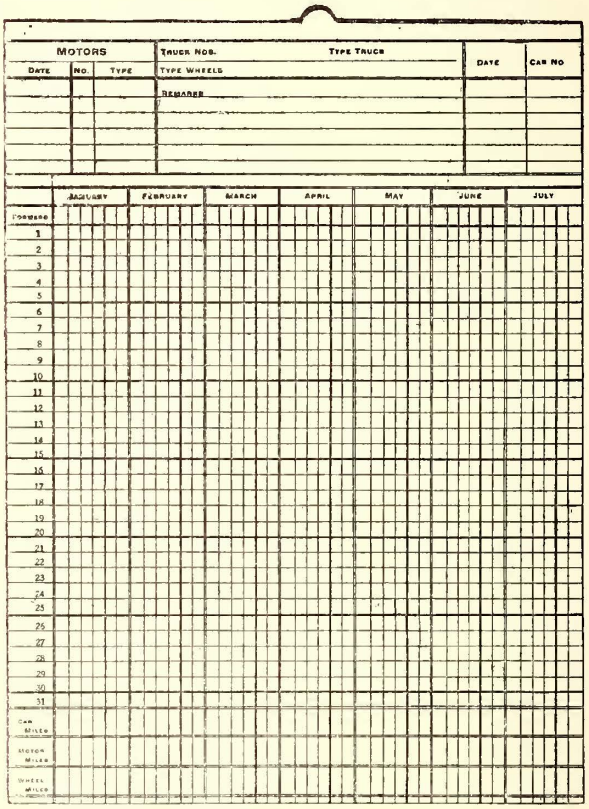
STATEMENTS PREPARED

A "speed report" is prepared each week to show the number of miles per hour and the receipts per car mile and per car hour on each line in the system. One-fourth of the form of this report is shown on page 628. The report is folded in order that it may be carried conveniently in the vest pocket for frequent reference, and is sent to the principal officials of the company. A similar report is made each month.

A statement of receipts and platform expense per car mile and per car hour is made each week for every division. It shows car mileage, car hours, average platform expense per car mile, total receipts from passengers, average receipts per car mile and per car hour and percentage of platform expense; the data are compared for corresponding weeks in two years.

A record of the miles of route in each line under the jurisdiction of every carhouse is used by conductors and in the auditing department when reports are checked. Printed cards are made for each carhouse; they show the miles of route between all points at which cars may be turned back and every crossover. Conductors are enabled by the use of these cards to compute their mileage accurately on each trip.

From the daily reports by conductors of all mileage made, after verification in the auditing department, there is listed a card record for each car. This record, one side of which is reproduced herewith, is compiled each year and shows the number and type of trucks, type of wheels, date of installation and type of motors, car miles, motor miles and wheel miles. The totals of car miles made are given every five days to the mechanical engineer, who is thus furnished with a mileage record for different items of equipment for whose maintenance a special record of this character should be kept. The installation of this system of keeping records was begun in October, 1909, and it



Accounting Department—Mileage Record

has recently been extended gradually to all divisions of the system. The projection at the top of the form is used to show the type of motor for convenience in reference to the file.

MONTHLY STATEMENTS

Every effort is made to compile monthly statements as early in the month as possible. About five years ago the monthly statements were issued by the twenty-fifth day of the following month, but the practice in this respect has been improved steadily and now the advance statements which give the principal actual totals are issued on the sixth or seventh day of the following month. They show, with a comparison with the corresponding month of the previous year, the earnings from operation, earnings from other sources, gross income, operating expenses and percentage, taxes

and percentage, total operating expenses and percentage, fixed charges and percentage, balance.

All the detail financial statements are issued by the tenth day of the following month. A comparative preliminary statement of receipts is made daily for each division. This statement shows receipts for the day and for the same day of the corresponding week of the preceding year, the increase or decrease, percentage of change, total receipts for the current month to date, the same number of days in the month last year, the increase or decrease and the percentage of change. It also shows weather conditions on the day of the current year for which the report is made and on the corresponding day of the preceding year, the temperature on each day at 9 a. m., 12 m., 3 p. m. and 6 p. m., the average receipts per day and the increase or decrease as compared with the corresponding day of the preceding year.

A comparative statement is made each month of the revenue passengers, free passengers, transfer passengers and total passengers, with the percentage of increase or decrease in each and the percentage of transfer to total passenger fares. A similar report of the gross receipts is made monthly for every line of each division. With these reports the practice is followed of giving all details to the general officers of the company and of sending to the divisions only the figures of the division affected.

A comparative statement is prepared of actual receipts of the regular or extra cars operated, car hours, car mileage and receipts per car mile for each day on every line of each division, with weather conditions.

UNIT RESULTS

Unit and total traffic results are embodied in a monthly statement, compared with the same month of the previous year and giving the figures for the cumulative period of each year, together with the percentage of increase or decrease in every case. This statement shows the averages or totals for the following:

Passengers Carried.—Revenue, transfer, complimentary, employees, total, percentage on transfers, average per day, average per car per day.

Earnings and Expenses.—Earnings per passenger, earnings per revenue passenger, expenses per passenger, expenses per revenue passenger, net earnings per passenger, net earnings per revenue passenger, platform expense per passengr, platform expense per revenue passenger, earnings per car mile, expenses per car mile, net earnings per car mile, platform expense per car mile, earnings per car per day, daily average passenger earnings, daily average earnings from operation, daily average expenses, daily average net earnings.

Car Mileage.—Car miles, chartered cars, total car mileage, average per day, average per day per eighteen-hour car, car miles per mile of track.

Car Hours.—Total car hours, average per day, number eighteen-hour cars operated, average number eighteen-hour cars per day.

Power.—Kw-hours sold, kw-hours bought, kw-hours lost, transmission and conversion (d. c.), kw-hours used (d. c.), kw-hours used per car mile (d. c.), cost of power per kw-hour used, percentage of claims paid and expenses of claim department to earnings from operation, unexpended accident reserve, percentage of operating expenses (including taxes) to earnings from operation, percentage of taxes to earnings from operation, percentage of operating expenses (including taxes) to earnings from operation, miles of track operated, depreciation reserve.

A number of machines of different types are used to facilitate the work of the auditing department, including a large mimeograph machine and twelve computing machines of different types.

TICKETS

The stock of tickets of the company is kept by the ticket agent, who is in the department of the general auditor. The tickets used represent principally employees' free tickets, complimentary tickets, special fares for school children, special forms of tickets for ferries, wagon elevators and a toll road owned by the company. A report of tickets sold is made each day by the agents.

On account of the registering fare boxes the school, employee and complimentary tickets are made about 4⅛ in. x 2 in. in size. As the tickets are therefore too large to be deposited directly in the fare boxes, they are handed to conductors and are turned in with transfers.

School tickets are issued on orders signed by the principal of the school and these orders must be shown to the conductor on his request when the school tickets are used for passage. The orders on which school tickets are issued to pupils and teachers are similar except that a large T is printed in red ink on the card issued to teachers and a large S in red ink on the card issued to pupils.

One form of a ticket issued on the Southern division is known as a club car ticket. Under this plan special tickets are issued for the Moorestown Rapid Transit Club and the Merchantville Rapid Transit Club. Each ticket is good for a ride on a special car which is practically an express car between Camden and Moorestown or Merchantville respectively. These cars are run between the hours of 6 and 9 a. m. and 3 and 6 p. m. and make better time than the regular cars, which are operated all day with more frequent stops. Anyone may become a member of one of these rapid transit clubs simply by the purchase of $1 worth of tickets.

St. Ry. 28-1M 3-11 Order D. 2842

PUBLIC SERVICE RAILWAY COMPANY

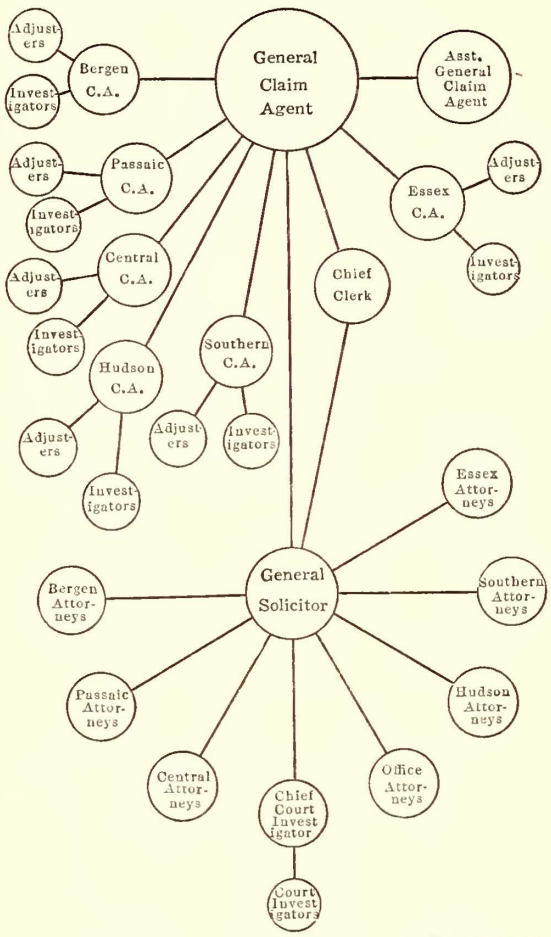
Comparative Statement of Receipts and Platform Expense per Car Mile and per Car Hour for Week Ended 19

DIVISION	CAR MILEAGE		CAR HOURS		AVERAGE PLATFORM EXPENSE PER CAR MILE		TOTAL RECEIPTS FROM PASSENGERS		AVERAGE RECEIPTS PER CAR MILE		AVERAGE RECEIPTS PER CAR HOUR		% of Platform Expense to Total Receipts from Passengers	
	19	19	19	19	19	19	19	19	19	19	19	19	19	19

Accounting Department—Statistical Statement for the Transportation Department

CLAIM DEPARTMENT

THE work of the claim department may be divided into two distinct branches, one relating to the handling of claims outside of court and the other to proceedings after the claimant has sought damages in court. The former branch of the department drops the case as soon as it goes to trial, with the exception of settlement, which is still handled by the division claim agent under the direction of the general claim agent, who is the head of the department.



Claim Department—Organization Diagram

The organization of the claim department will be understood by referring to the accompanying diagram. It will be seen that the staff which carries on the work of investigation and adjustment consists of an assistant general claim agent and six division claim agents, each of whom has his own staff of investigators and adjusters. These division claim agents have the authority to make settlements up to a certain amount, which, if exceeded, must be submitted to the general claim agent and general manager for approval.

The trial branch is headed by the general solicitor, who is assisted by division attorneys, an office attorney and a chief court investigator and staff. The investigators furnish the attorneys all the necessary aid in securing witnesses, making special inquiries and doing such other work as is not covered by the duties of the investigators attached to the claim branch. The general office routine and records of the claim department are in the hands of the chief clerk.

This department also handles the claim work of the allied gas and electric companies, as there is not enough business of this kind to justify separate organizations by those companies. The department is associated with several bureaus for the collection of data concerning "fake" and other accident claims.

In addition to his regular duties, the general claim agent renders active assistance to the transportation department in the prevention of accidents by lecturing on this subject to platform men as occasion may require. A former employee of the claim department also gives instructions to student motormen and conductors on this topic.

CLAIM DEPARTMENT STATISTICS

Most of the blanks of the claim department do not differ materially from the forms used by other companies, but there are some which warrant a description because they indicate the thorough methods of the company. Among these records are five 10¾-in. x 13½-in. loose-leaf forms on which are summarized the comparative statistics of the claim department from month to month. The first form shows the principal traffic statistics, the detailed expenses, the efficiency of the department as shown by the percentage of claims paid to gross receipts, the number of witnesses per accident, etc. All costs are compared with the same month of the preceding year and they are also integrated to compare the same fractions of the past and current year. The headings of this form follow:

HEADINGS OF STATISTICS

Gross receipts.
Passengers carried.
Car miles.
Accidents reported.
Claims made.
Number settlements claim this month.
Number settlements claim prior to month.
Total number settlements.
Number judgments claim this month.
Number judgments claim prior to month.
Total number judgments.
Total number claims paid.
Per cent claims settled of those made this month.
Judgments.
Settlements.
Total claims paid.
Salaries.
Personal expenses.
Medical expenses.
Wheelwright and veterinary expenses.
Office supplies and expenses.
Services.
Sundry miscellaneous expenses.
Legal salaries.
Legal personal expenses.
Counsel fees.
Legal medical expenses.
Medical testimony.
Legal witness fees.
Legal transcripts.
Legal miscellaneous expenses.
Total expenses (from salaries onward).
Total expenditures of department.
Per cent claims paid to gross receipts.
Per cent expenses to gross receipts.
Per cent total expenditures to gross receipts.
Probable cost of unsettled claims as of Dec. 31, 19—.
Per cent claims made to accidents reported.
Per cent suits brought to claims made.
Per cent expenses to total expenditures.
Per cent claims paid.
Witnesses per accident.

The second form is used to record monthly and annually the cost of each kind of accident as classified, the number of each kind and also the number of fatal accidents. These figures are compared with those of five years previous. The classifications follow:

CLASSIFICATION OF PAID ACCIDENT CLAIMS

A—Boarding cars.
B—Leaving cars.
C—Collisions with cars.
D—Collisions with teams.
E—Collisions with bicycles.
F—Collisions with autos.
G—Derailments.
H—Ejectments.
I—Falls from cars.
J—Injuries on cars.
K—Pedestrians struck.
L—Employee accidents.
M—Miscellaneous.
Total.
Expenses.
Total expenditures.
N—Fatal accidents
Payments to employees.

The third form has the same classifications of accidents as the second, but it is arranged to show the statistics for the individual carhouses on each division, including those accidents which were not reported. The fourth form has the same headings as the third, but in this case the cost of each class of accident is given, including payments to injured employees. It might be added that in addition to the standard classification of accidents special statements are made up from time to time to analyze accidents according to the type of rolling stock and equipment.

The last form of this group is the litigation or legal statistics sheet. This is a summary of all trial business for the current month and for the same month of the preceding year, under the headings reproduced herewith:

LEGAL STATISTICS.

SUITS PENDING AND DISPOSITION.

Suits pending, beginning of month.
Suits instituted during month.
Suits revived by appeal, etc. (After verdict for defendant or non-suit.)
Suits revived by opening of non pros. or non-suit.
Suits revived after decision on demurrer.
Suits retained (a, b, c, d, e.)
Suits revived after decision for defendant on appeal, etc.
TOTAL.
Verdicts plaintiff (a).
Verdicts defendant.
Non-suits.
Disagreements (b).
Mistrials (c).
Cases non-prossed.
Decisions for plaintiff on demurrer (d).
Decisions for defendant on demurrer.
Cases discontinued.
Friendly judgments (e).
Cases disposed of by warrant to satisfy.
Decisions for defendant on appeal, etc., including dismissals of plaintiff's appeals, except decisions that leave a verdict to be paid.
TOTAL—DEDUCT FROM FIRST TOTAL UNDER THIS HEAD.
Suits pending, end of month.

CASES APPEALED, ETC., BY PLAINTIFF

Suits pending on appeal, etc., by plaintiff beginning of month.
Suits appealed, etc., during month.
TOTAL.
Decisions for plaintiff.
Decisions for defendant.
Appeals, etc., discontinued or dismissed.
TOTAL—DEDUCT FROM FIRST TOTAL UNDER THIS HEAD.
Suits pending on appeal, etc., by plaintiff end of month.

CASES APPEALED, ETC., BY DEFENDANT

Suits pending on appeal, etc., by defendant beginning of month.
Appealed, etc., during month.
Total.
Decisions for plaintiff.
Decisions for defendant.
Verdicts reduced (original amount).
Appeal, etc., discontinued or abandoned.
TOTAL. DEDUCT FROM FIRST TOTAL UNDER THIS HEAD.
Suits pending on appeal, etc., by defendant end of month.

VERDICTS REDUCED

No.	Amount.	Inc. or Dec. Over Last Year. No.	Amount.
Reduced from.			
Reduced to.			
Saving.			

MONTH OF.....191.....

No.	Report Date	Acc. Date	Route	Car House	Car No.	Prepay Gate	No Gates	Old Style Car	Open Closed	Time	Location	NAMES	ADDRESSES	Relation to Acc.	CLAIM Personal or Property and Date Presented	SETTLEMENTS: Release or Judgment: No.	Date Signed	Amount	Other Payments: To Whom	Month Paid In	Amount	IN SUIT: Date of Entry	Ad Damnum	Plaintiff's Attorney
1																								
2																								
3																								
4																								
5																								

REMARKS	NATURE OF ACCIDENT: Boarding Cars	Leaving Cars	Collisions with Cars	Collisions with Teams	Collisions with Bicycles	Collisions with Autos	Derail-ments	Ejectments	Falls from Cars	Injuries on Cars	Pedestrians Struck	Employe Accidents	Miscellan'us	Total	EXPENSES: Accidents Resulting Fatally	Employes Injured	Number of Witnesses	To Whom Payable	What for and Date of Service	Month Paid In	Amount	To Whom Payable	What for and Date of Service	Month Paid In	Amount	To Whom Payable	What for and Date of Service	Month Paid In	Amount

Claim Department—Ledger Summary of an Accident Case

PAYMENTS MADE

	No.	Amount.	Inc. or Dec. Over Last Year No.	Amount.
Cases settled and paid during month.				
Judgments paid, inc. costs during month.				
Total payments during month.				
*Judgments and settlements paid but open on court record beginning of month.				
Total.				
*Judgments and settlements paid and cleared from record by discontinuance or warrant to satisfy during month.				
*Judgments and settlements paid but open on record, end of month.				

*Refers to cases paid since Jan. 1, 1909, only.

COMPILING DATA ON A CASE

The company has found it good policy to gather all available information on an accident from the moment that the first telephone call is received, no matter how trivial the occurrence seems to be. The procedure followed will be best understood by mentioning the character of the papers which are compiled to make up a record of a given case, say, a collision with a wagon. The order of the papers is as follows: Preliminary accident report received by telephone; signed reports from the crews and witnesses; a synopsis of

Name ESSEX No.

Age Occupation Rel. to Acc.

Address City or Town

Associated Names

Date

Nature

Location

City or Town

Date Reported to H-H. I. B. & A. A. A. F.

Claim Department—Card Index of Accident Case Filed at Newark Headquarters

the foregoing information attached by the filing clerk and indexed in the local division office; reports of investigators; reports of adjuster on value of damaged goods; medical examiner's report on possible plaintiff; veterinary surgeon's report on the horse which drew the damaged wagon; wagon driver's affidavit secured by one of the investigators; newspaper clippings about the accident; statement that the plaintiff was not inclined to settle, so case was turned over to special investigators to look up his personal history: settlement declined and suit brought, thereby bringing the matter into the hands of the legal investigators; preparation for trial; final adjustment.

FILING SYSTEM AND MISCELLANEOUS FORMS

Every case is given a serial number, depending upon the division. A summary of the principal facts of each case is kept in ledgers as the latter are more permanent and not likely to be misplaced so easily as cards. These ledger references are found by referring to index cards which give the name, occupation and address of the claimant and also the names of persons associated with the claimant. These names are carefully examined by the filing clerk who, if he should note any suspicious duplication or resemblance in names, notifies all divisions of the company and the several index bureaus with which the department exchanges information. Each division has a local file in addition to the general file at headquarters.

Conductors' and motormen's accident reports are made out in duplicate, as one copy remains with the division on which the accident occurred. Every conductor is supplied with envelopes containing twelve printed cards which he distributes to accident witnesses with a request for their names, addresses and places of business. This simple procedure is much more effective for securing signatures than having the conductor carry the same paper from person to person.

The reports of investigators and adjusters are made as narratives instead of being put in question and answer form. In a catechism a man is likely to report only those circumstances which are specifically covered by the questions and so overlook special circumstances. Adjusters and investigators are provided with forms upon which they must report their daily work in detail, giving the names of persons called upon, statements of the progress of each case handled, deaths, etc. This record is returned to the local division office after it has been checked up at headquarters.

KINDLY WRITE YOUR NAME AND ADDRESS IN FULL AND RETURN TO CONDUCTOR OR MOTORMAN.

(Name in Full)

(Street and Number) (City or Town)

St. Ry. 328-600M-2-10. (Place of Business)

Claim Department—Witness' Card Distributed by Conductor or Motorman

The examining physicians formerly were provided only with the standard form of report on injured persons. Their work has been facilitated, however, by furnishing them with a memorandum book which contains miniature loose-leaf forms of the regular reports. These miniature forms are 3½ in. x 6 in. in size and serve very well for jotting down briefly the facts, which can afterward be transferred to the regular form.