

# Electric Railway Journal

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## Sensible Act of Omission

THE outgoing Congress, in refusing to be "Moon-struck" by the influence of the chairman of the house committee on post-offices and post roads, took a most sensible stand. We have commented before in these columns on the viciousness of the confiscatory rider relating to railroad mail pay attached to the post-office appropriation bill by the afore-mentioned chairman, Representative Moon, and we desire now only to compliment our national legislators upon their action. The last resort of the proponents of doubtful legislation is always to attach their proposals, if sufficiently germane to the subject to be legally permissible, to some bill, like an appropriation measure, that seems necessary of passage. Too often, in the rush of the closing hours of Congress, such a method has proved successful—which makes its failure in this case all the more commendable. Naturally it is a matter of regret to us that the post-office appropriation bill itself was killed, but the censure created thereby should be directed solely against the unseemly obstinacy of Mr. Moon and his associates in refusing to withdraw the rider in the face of widespread opposition. One would expect that after such a defeat Mr. Moon would realize the absurdity of his efforts, but this Congressman is of a most peculiar type. After due mental labor he has conceived the idea that railroad influences (not corrupt, as far as he is aware) brought about the failure of the bill, but thus far he has given not the slightest indication of any realization that Congress, in acting as it did, only expressed the constantly growing national disposition to treat common carriers more fairly.



## Old Steel Cars Easily Maintained

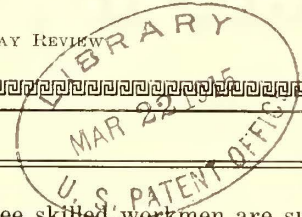
THE prominent feature of the article on steel car repair on the Long Island Railroad, published elsewhere in this issue, is that steel construction doesn't need real routine repairs. Steel cars have been in operation on this system for ten years, and that period is certainly long enough to show up any weaknesses which might be inherent in the steel construction. However, all that has been required for the maintenance during that period is a somewhat glorified tin shop in which only one new class of labor is necessitated by the new equipment. This is the structural ironworker, whose experience is largely confined to the handling of pneumatic tools and whose actual work is

so infrequent that three skilled workmen are sufficient to care for the maintenance of the framing of some 600 large steel cars. Compared with the number of carpenters required for an equal number of wooden cars this figure is enlightening. As a matter of fact, it seems to be the case that any given repair job is somewhat more costly in steel than in wood, but where the steel car excels is in its ability to do without repairs except under the most extraordinary circumstances. Impacts that would practically demolish a wooden car are not necessarily even severe in the case of steel construction. This is clearly shown by the unusual photographs that have been reproduced in the article in question. The lighter blows which are, however, sufficiently severe and sufficiently frequent to make the upkeep of platform sills and draft rigging a burden with wooden construction, are not noticeable with steel. Summed up, the Long Island's long experience with steel cars constitutes an astonishingly strong argument in their behalf. Although the practice described is on a large railway the principles involved apply with equal force to a system of any size. With the increasing number of steel cars in city and interurban railway service electric railway companies will become used to them, and their proper methods of repair will not seem so complicated as they do now on roads where wooden cars have been used exclusively.



## Signal Maintenance and Reliability

JUDGED by the practice of the ordinary interurban line, the signal-maintenance methods of the New York, Westchester & Boston Railway, described elsewhere in this issue, provide for considerably more attention to the signal apparatus than is usual. Contrary to the common practice of assigning but one maintainer to a district and making him subject to calls, the Westchester organization gives continuous supervision by assigning a night man as well as a day man to each signal district, which contains roughly the equivalent of some forty signals. The low cost of approximately \$2 per signal per month which is obtained is clearly due in the main to the limited territory that is covered (less than 9 route-miles for any district), the major part of the maintainer's time being put in on the interlocking plants. To this extent, of course, the physical work of signal maintenance on this line is made easy, but on the other hand, this facility is partly offset, from



the ordinary interurban road's standpoint, by the fact that practically all of the signals have two blades. It would seem, therefore, that increased supervision for signals, at least within certain limits, produces direct results, because the Westchester line's operating record of 20,000 signal movements per failure is far beyond the corresponding figure of 4000 or 5000 that may be expected on an interurban line. Still more important is the fact that, during the road's three years of operation, involving some 11,000,000 signal movements, no false-clear indication has occurred. Whether improved reliability of signals is worth additional expense for maintenance is, of course, a question of considerable magnitude, and it has to be decided on the merits of each particular case. But the fact seems to be clearly established that improved reliability is practicable if a railway company desires it and that it does not by any means involve a prohibitive expense.

### The Labor Side of Maintenance

THE era of the well-lighted, well-ventilated, safe and otherwise generally attractive electric railway shop is at hand. A number of such shops have been described in recent issues of this paper and an account of another appears this week. Such surroundings are bound to be reflected in lower maintenance costs and in a better attitude of the workman toward his work. While these shops leave little to be desired in the way of comfort and facility, there is not apparent as yet in many shops a strong effort systematically to fit the workman for the use of these facilities. While it is true that electric railway maintenance work has peculiar requirements due to its general complexity, at the same time its variety would seem to be an advantage in developing all-round workmen.

The day of the old-fashioned apprentice system has passed, and nothing has yet taken its place. In electric railway shops the mechanics are drawn from all possible sources, having learned their trades usually in a very unsystematic fashion. Grown men, as a rule, are used as helpers as they are much more immediately useful. The work, particularly in large shops, is greatly subdivided, with numerous specialists in narrow lines. For example, in one extensive equipment department there are sixty-four named jobs, while in another there are forty-nine, a large proportion in both cases involving skilled labor. Fendersmiths and fender repairmen are separate specialists, as are gatesmiths, contact-shoe repairmen, acetylene welders, and so on. In the small shop individuals have somewhat varied work because there is not enough to do in one specialty, and they can pick up all-round skill of an uncertain kind.

While the shop man usually gets less money per day than equally-skilled workers in the building trades, his job is a steadier one, the conditions surrounding him are in many ways better, and he probably earns as much or more in the course of a year. The chief trouble is that there is so little opportunity for a boy to learn a trade, and in much of the work there does not seem to be any trade to learn. If jobs of a similar character

could be grouped together so as to form trades, such as electrical equipment repairing and inspection, car machine work, car wiring and conduit fitting, motor repairing, etc., and if some simple apprentice plan could be devised by which boys could learn these, with or without trade-school training, certain apparent advantages would follow.

From the company's standpoint it would be advantageous to be able to shift men from one job to another, say from controller to trolley-base repair, so as to keep the force uniformly occupied. This in some cases would reduce the necessary size of the force. More general work would encourage ambitious boys to enter railway shop service because it would fit them to take jobs elsewhere if work became slack, while the variety would make them more efficient and intelligent workmen.

In the early days the trade guilds looked after the education and training of apprentices. In these times the burden appears to rest upon the employers.

### Increased Maintenance Expenses

THE factors that influence operating expenses are many and varied according to the properties examined, but to a certain extent it is possible to generalize concerning this class of expenditures. The following remarks, based on the forthcoming census report for 1912, afford a general idea of the trend of electric railways in regard to a most important part of operating expenses—those for maintenance.

The total operating expenses of electric railways in this country from 1907 to 1912 increased 32.5 per cent, as compared to an increase in operating revenues of 35.7 per cent. On account of changes in accounting classification, not all of the five primary accounts are strictly comparable, but from the fact that maintenance of way and structures increased 62.6 per cent, maintenance of equipment 27.2 per cent, conducting transportation 34.4 per cent, and general and miscellaneous expenses 28 per cent, it is evident that the increase in the cost of maintenance, particularly for way and structures, was especially large. This fact is emphasized by the operating expense percentages based on the total operating revenues. In 1907 the primary operating expense accounts consumed the following percentages of the total operating revenues; maintenance of way and structures, 6.82 per cent; maintenance of equipment, 7.52 per cent; traffic expenses, 0.41 per cent; conducting transportation, 33.74 per cent; general and miscellaneous expenses, 10.12 per cent, and wages, etc., for electric service not before included, 1.47 per cent. In 1912, with the last item included under conducting transportation, the percentages were: maintenance of way and structures, 8.17 per cent; maintenance of equipment, 7.06 per cent; traffic expenses, 0.46 per cent; conducting transportation, 33.42 per cent, and general and miscellaneous expenses, 9.53 per cent.

The most striking facts shown by these figures are the large comparative decrease in the conducting transportation account, the smaller decreases in the general and the maintenance of equipment accounts and the

large increase in the maintenance of way and structure account. The operating ratio was 1.44 points less in 1912 than in 1907, but while the three accounts which decreased were lower by a total of 2.84 points, the two which were greater increased by 1.40 points, of which maintenance of way and structures accounted for 1.35 points. From this it must not be inferred that equipment maintenance was skimmed during the five-year period. With generally adequate maintenance expenditures for each class of property, it is probable, and quite proper, that the greatest attention was paid to maintenance of way, for the better the track maintenance the less would be the expenses caused by the wear and tear on equipment.

Another interesting point that might be mentioned is the difference in maintenance expense ratios for railways of different sizes. The larger roads showed much larger percentages for maintenance of both way and structures and equipment than the smaller roads, with corresponding smaller percentages for the general and miscellaneous account and for the power subaccount in conducting transportation. It seems that economies in power expense and in the general costs of management accompany growth in size, and that with this there also comes more than relative increases in the amounts used in maintaining the property in an efficient operating state.

#### Coasting Recorders in New York

WE believe that some very important questions are answered by the results of coasting recorder practice on the Third Avenue Railway System, New York, as detailed elsewhere in this issue. Ever since this and other devices have been brought forward as a necessary means to correct and economical car operation, the electric railway manager has asked: How much will I save in my power bill? How can I judge my men fairly and what will a follow-up system cost? How will the change affect collisions? How will it affect the maintenance of equipment? These are the questions that are answered, in part at least, by experience with 1100 instruments used under a wide diversity of conditions by the New York railway, whose practice is described.

The saving in the energy requirements appears very clearly on the Third Avenue Railway, inasmuch as that company is billed by the central station company with so many kilowatt-hours a month. As we have said lately in our discussions of recording devices for rating the efficiency of motormen, railways that buy energy see the savings of scientific car operation more directly than those which have their own power plants. The Third Avenue figures show a maximum saving of 10 per cent with 83 per cent of the cars equipped with coasting recorders, which corresponds to an indicated saving of 12 per cent with 100 per cent of the cars so equipped.

With the excellent follow-up and educational system that is used by the company, there is every reason to believe that 12 per cent will be exceeded. It should be

emphasized here that when the energy requirements for the same months of succeeding years are checked against each other, only the periods covering mild or warm weather may be compared fairly. Otherwise a most unjust conclusion would be drawn from a comparison of the figures for December, 1913 and 1914. As the table shows, the mean temperature in December, 1914, was 32 deg. Fahr., or 7 deg. less than in December, 1913. This greater degree of cold necessitated so much more energy for heating purposes as to absorb the savings that otherwise would have been made by coasting. Seen from another angle, the reduction due to coasting almost offset the addition due to extra heating.

The fair judgment of the motormen is even more important than any saving in energy. The device put on the car must be placed before them in the guise of something that will help them to run a car with the pride of the artisan instead of the indifference of the laborer. And since conditions on no two lines, or even on the same line, are alike, a thorough classification is necessary before men can be judged on a percentage basis. The device itself should show readings that are readily understood by the motorman so that he can anticipate, in a measure, what his record for a given run ought to show. The interest that the Third Avenue men have in reading the coaster tape is not unlike that which the broker has in a ticker tape. We have already outlined in these columns the need for proper classification. Its importance is recognized on the Third Avenue road, for we find that the men are not only divided as to lines but subdivided as to character of run and still further subdivided as to the number of service days per month. Yet all this detail costs but 1.1 cents per man per diem. On a smaller road the cost would probably be greater, but, on the other hand, the company with the smaller energy needs would save more per kilowatt-hour, since it has to pay more for power.

Since some skepticism has been shown with regard to run-down accidents under increased coasting, the collision figures should also be convincing. These, for the period mentioned in the article, show a reduction of 20 per cent. Last is the question of the effect of coasting on the car equipment. Here the follow-up system is of value in checking the men who are doing suspiciously well. Furthermore, all the motormen may be trusted to complain about the "stiff joints" of a car if it does not give the coasting percentages expected. At any rate, the figures on car electrical equipment presented in the article do not bear out the opinions of the pessimist as to increased electrical troubles.

To sum up the lesson of the Third Avenue Railway's work with the coasting recorder: A checking device for use on a car cannot be bought as a piece of mere merchandise and be left to revolutionize car operation unaided. It must be regarded as a tool with which a staff properly organized can analyze men and methods to the end that the railway may be operated with precision in service, economy in energy, care in equipment and justice to the motorman.

# FROM A.C. TO D.C. IN THE NIGHT

A Successful Conversion from 6600-Volt Single-Phase to 1200-Volt D. C.  
 Operation Without Interruption of Service—Unit Costs and Descriptions of Special Features, Including Center-Entrance Cars

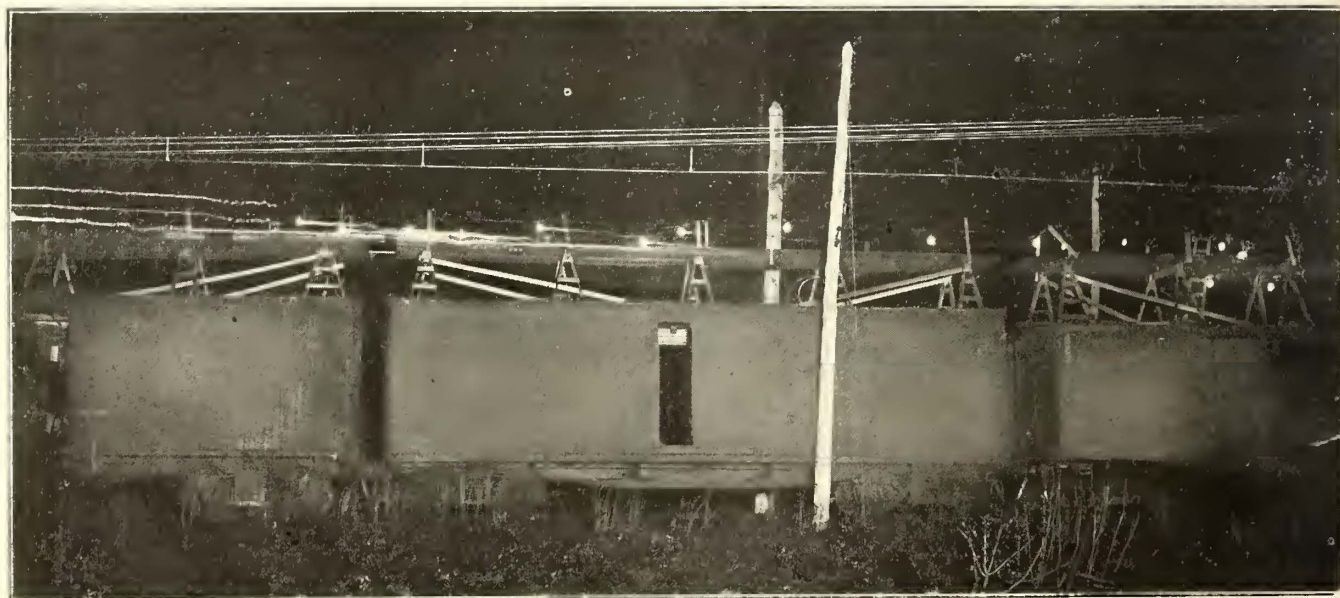
THE Annapolis Short Line is a strictly interurban railway, as it has no city track connections at either of its terminals. It runs between Annapolis and Baltimore, Md., a distance of 25.3 miles, its total trackage as single track being 32.3 miles. The Annapolis terminal is adjacent to the general offices and shops of the company in the center of the city and near all state buildings, while the Baltimore passenger terminal is at Camden station, the main passenger station of the Baltimore & Ohio Railroad, and three blocks from the heart of the business section. The company also has a separate freight-handling terminal in Baltimore.

This property began operation in 1886 as a steam railroad; in May, 1908, it was electrified for 6600 volts, twenty-five cycles, single phase, and in January, 1914,

volt equipment was decided upon. The care with which this study was undertaken could not be better shown than by the following table, which presents the last a.c., the estimated d.c. and the actual d.c. operating costs per car-mile:

	A. C. Cost 6 Months July 1 to Dec. 31, 1912	Allen & Peck, Inc., Estimate of D. C. Cost	Actual D.C. Cost July 1 to Sept. 30, 1914
Way and structure .....	\$0.0401	\$0.0270	\$0.0383
Equipment .....	0.0375	0.0160	0.0118
Traffic .....	0.0081	0.0100	0.0080
Transportation .....	0.1563	0.1060	0.1159
General .....	0.0781	0.0740	0.0594
<b>Total .....</b>	<b>\$0.3201</b>	<b>\$0.2330</b>	<b>\$0.2334</b>

The foregoing classification follows the I.C.C. plan in which traffic is understood to include solicitation,



ANNAPOLIS SHORT LINE—NIGHT VIEW OF THE ERECTING PLATFORM FROM WHICH TWO 120-FT. SPANS OF CATENARY WERE CHANGED FROM A.C. TO D.C. DISTRIBUTION AT ONE TIME

the present 1200-volt d.c. installation was completed for service. Since June 1, 1912, the property has been under the management of Allen & Peck, Inc., with T. C. Cherry as local manager and David E. Crouse as electrical engineer.

The first electrical equipment had been built for a.c.-d.c. operations, but in practice the railway, running as it did over private right-of-way throughout, operated only on alternating current. The Annapolis Short Line was, therefore, in the unenviable position of using apparatus more complex and heavier than necessary, aside from any questions of efficient use of energy and reliability in operation.

One particularly notable improvement which has followed the change to 1200 volts direct current is a reduction in the weight of the electrical equipment per car from 33,175 lb. to 18,920 lb.

Following the advent of the new management a study was made of the situation with the result that 1200-

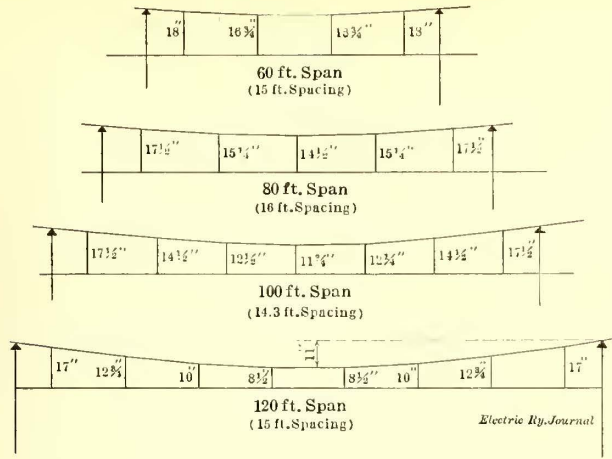
superintendence and advertising, while transportation includes motive power.

## PLANNING AND CARRYING OUT THE WORK

A most striking feature of the change-over from 6600 volts a.c. to 1200 volts d.c. was that the work had to be done between 1 a. m. and 5 a. m. and left in such shape that operation during the following day would not be interfered with in any way. Another even more striking feature was the care with which every step of the work was planned in advance.

The work was laid out in the following fashion:

First, a chart, Table I, was made, showing every pole number and the spacing between these poles as numbered. Then the numbers of hangers of given lengths for each span were tabulated and laid out, as shown in Table II and the accompanying drawing. A detailed tabulation was also made of the steady sticks required at each station, as included in Table I.



ANNAPOLIS SHORT LINE—CATENARY LINE CONSTRUCTION SHOWING HANGER SPACINGS

To follow up the work the management used a progress chart which showed every pole and the length of every span. As the steel trolley was run a red crayon line was drawn vertically between the poles so equipped, a white crayon was drawn to show the progress of feeder wire, a pink crayon line the progress of the transmission and a yellow line the progress of bonding. The date was written alongside each section. In Table III different styles of lines replace the colors.

TABLE I—TROLLEY AND TRANSMISSION POLES, ETC., ANNAPOLIS TO BALTIMORE

Miles	Station	—NORTH BOUND—		—SOUTH BOUND—		
		Pole No.	No. Steady Sticks	Pole No.	No. Steady Sticks	
0	Annapolis	0				Single track.
0.7	West Annapolis	44	32			Single track.
1.4	Wardour	77	25			Single track.
1.73	Severn Draw	93	16			Single track.
1.9	Severn Side	100	6			Single track.
2.9	Winchester	151	41			Single track.
3.9	Arnolds'	201	29	204		Double track.
4.5	Joyce Station	227	16	227	15	Double track.
5.3	Revels'	272	32	236	24	Double track.
6.3	Jones' Station	323	41			Single track.
7.2	Round Bay	367	25			Single track.
7.8	Boone	390	12			Single track.
8.3	Robinson	418	18			Single track.
9.9	Earleigh Heights	491	56			Single track.
10.4	Pasadena	541	32			Single track.
11.8	Elvaton	581	40	585		Double track.
13.3	Marley	647	41	664	46	Double track.
14.8	Saunders' Range	722	53			Single track.
15.4	Glen Burnie	764	26			Single track.
17.1	Wellham	841	46			Single track.
17.9	Woodlawn	882	31			Single track.
18.4	Shipley	907	18			Single track.
18.9	Linthicum	934	19			Single track.
19.9	Pumphrey	983	43			Single track.
20.95	Powder house	1033	46			Single track.
21.2	Baltimore Highlands	1044	30	1033	40	Double track.
22.0	Cliffords	1085	33	1085	31	Double track.
22.9	Fish House Tower	1131	24	1131	20	Double track.
23.25	Westport Power House	1152	24	1152	20	Double track.
23.39	Westport Tower	1166	30	1160		Single track.
				1175		
24.45	B. & O. (Russell St.)	1224	42	1216	30	Double track
25.3	Balto. (Camden Sta.)	1277				Single track.
	Total		903	Total	206	
					1109 Steady Sticks.	

TABLE II—CATENARY LINE CONSTRUCTION SHOWING NUMBER OF HANGERS ORDERED

No. Spans	Length Span, Ft.	Hangers Length, In.	No. Hangers Needed	No. Hangers Extra	Total No. Hangers
891	120	17	891	14	905
	120	12 3/4	891	12	903
	120	10	891	12	903
	120	8 1/2	891	12	903
	120	8 1/2	891	12	903
	120	10	891	12	903
	120	12 3/4	891	12	903
	120	17	891	12	903
373	100	17 1/2	373	9	382
	100	14 1/2	373	8	381
	100	12 1/4	373	8	381
	100	11 3/4	373	14	387
	100	12 1/4	373	8	381
	100	14 1/2	373	8	381
	100	17 1/2	373	18	391
149	80	17 1/2	149	9	158
	80	15 1/4	149	16	165
	80	14 1/2	149	32	181
	80	15 1/4	149	16	165
	80	17 1/2	149	18	167
158	60	18	158	31	189
	60	16 3/4	158	30	188
	60	16 3/4	158	30	188
	60	18	158	31	189
Totals	1571		11,116	384	11,500

The work of conversion was begun on Oct. 12, 1913, and completed on Jan. 4, 1914, in time for the opening of the Legislature at Annapolis.

The work gangs operated with two steam locomotives. One of these hauled the reels from which the steel wire was strung and secured to the passenger with tie wires; the other locomotive hauled six freight cars, on the top of which a continuous platform equal to two pole spans in length was erected. The men on this train removed the old hangers and installed the new ones. The speed of the work was high owing to the fact that the supply man had a chart which showed him just what length and number of hangers were needed step by step.

As the line, of course, was dead during these operations light had to be obtained from an outside source. This light was therefore generated from a gasoline-electric set mounted in one of the freight cars, as illustrated. Part of the bonding was also done at night with a machine of the Electric Welding Improvement Company.

CHANGES IN THE TROLLEY AND FEEDER LINE

The original trolley line was a bracket type catenary with wooden strains or steady sticks for the alignment of the trolley on every pole at curves and at every other pole on tangents. The poles on tangents were spaced 120 ft. and on curves from 100 ft. down to 60 ft. The messenger was of 7/16-in. Siemens-Martin steel, the hangers were of 1/4-in. solid pipe spaced 10 ft. and the trolley was of No. 000 grooved copper.

TABLE III—PROGRESS CHART OF EACH STYLE OF LINE, INDICATING KIND OF WORK DONE

Station	Pole No.	Length Span		Station	Pole No.	Length Span	
		North Bound	South Bound			North Bound	South Bound
	642				771		
	643	120	120	Glen Burnie 1 1/4 mi. Nov. 12	772	80	
	644	120	120		773	100	
	645	120	120		774	100	
	646				775	120	
	647	120	120		776	120	
Marley 13.3 mi. Nov. 11	648	120	120	Nov. 13	777	120	
	649	100	100		778	120	
	650	100	100		779	120	
	651	120	120		780	120	
	652	120	120		Dec. 10	781	120
653	120	120	782	120			

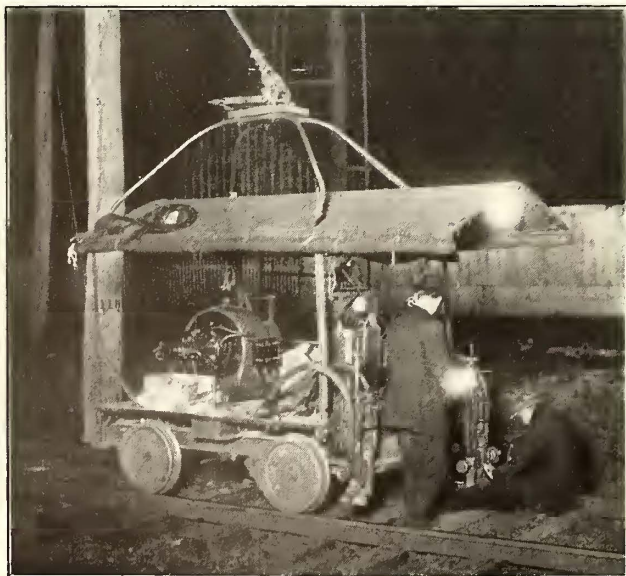
In examining the line for the forthcoming operation at 1200 volts d.c. it was found that five to six years' operation of 3,313,314 car-miles at 6600 volts with sliding pantographs had worn down the copper to about 50 per cent of its original section. Experience indicated the desirability of using a steel contact wire while retaining the conductivity advantage of copper, but the old wire was evidently too weak to carry a second wire together with the necessary clips. The new double-galvanized steel wire, which is of No. 0000 size, is therefore carried directly from the messenger by means of hangers spaced 15 ft. apart.

The new hanger comprises a standard malleable iron duplex clamp with a full loop of  $\frac{3}{4}$ -in. x  $\frac{1}{8}$ -in. strap over the messenger. This type of hanger gives a smooth under-running wire for the pantograph. One hanger in each span is of bronze in order to secure a good bond between the present steel contact and original trolley wire. The special clip, shown in an accompanying drawing alongside the hanger, was installed at the ends of the steady sticks to take care of the double wire.

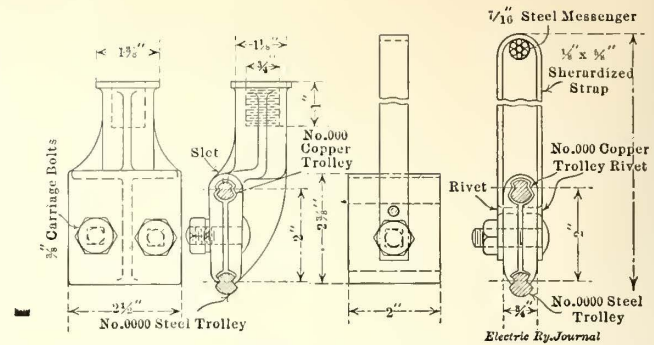
One mile of the steel construction described was tried out for a year before the entire line was equipped. This installation was the first on a d.c. railway to show that a sliding steel shoe could collect ample current from a steel wire for cars of the weight and speed suitable for high-class interurban service. This change accomplished the object of transferring the faster rate of wear to the easily-renewed pantograph shoe for, after two and one-half year's operation of 863,903 car-miles, the wear on the original steel wire is but 0.002 in. The slight flattening from wear actually is advantageous in promoting the life of the pantograph shoe.

The addition of the steel contact wire reduced the clearance to the head of the rails by 2 in., making the present figure 21 ft. 10 in. The relative position of the messenger was not changed except in taking up the slack due to the extra weight of the steel trolley wire. A few additional anchors were placed in the line to keep the trolley from running out.

The insulators of the original line were retained, as they were to be applied to a lower voltage. The a.c. arresters were also retained except that their gaps were cut down from  $\frac{3}{4}$  in. to  $\frac{1}{4}$  in. These arresters have a fuse in circuit with a tripping device which opens the circuit mechanically and blows the fuse. A few Garton-Daniels 1200-volt d.c. arresters, General Electric ME and Westinghouse arresters are also in use. The



ANNAPOLIS SHORT LINE—BRAZING BONDS AT NIGHT DURING THE CHANGE-OVER PERIOD



ANNAPOLIS SHORT LINE—STEADY STRAIN TROLLEY CLAMP AND RECONSTRUCTED CATENARY SUSPENSION

arresters are installed at every other feed tap. The latter are located about 1000 ft. apart. The section breaks installed in the trolley every 5 miles are of the original hickory design.

The alignment of the trolley wire was changed to come over the center of the trucks instead of the center line of the car.

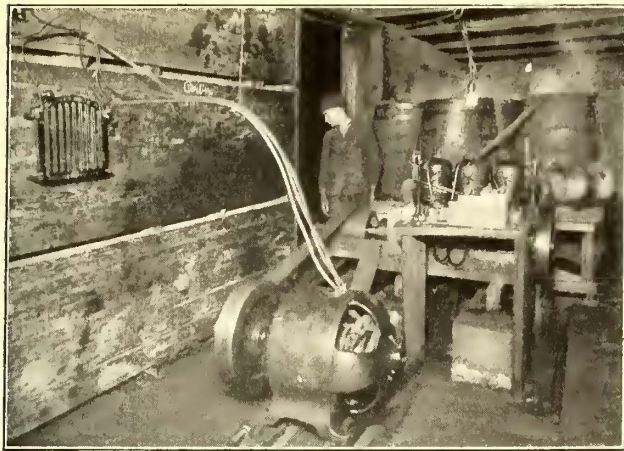
An aluminum feeder of 477,000 circ. mil between Westport and Annapolis is the only addition to the low-tension system outside of the trolley suspension itself. This fact is of significance since it shows the difference in distribution efficiency existing between 6600-volt a.c. and 1200-volt d.c. on a 25-mile interurban road with no change in substation location. Roughly speaking, the distribution circuit as originally built had about 64 per cent less conductivity than the present combination of old copper trolley, new steel trolley and aluminum feeder.

The steady sticks would not serve as originally mounted owing to their lack of clearance. A longer shank was, therefore, needed on the hanger to get sufficient distance between the messenger and trolley and to enable the steady stick to be mounted at an angle that would give 8 in. clearance from the pantograph horn in a vertical plane. The steady stick brackets are now made for horizontal as well as vertical swiveling of the stick, thus eliminating stick breakage.

With 6600-volt a.c. operation the cars coasted with lowered pantograph over the crossings with 600-volt



ANNAPOLIS SHORT LINE—PREPARING TO WORK FROM FREIGHT CAR PLATFORM AT NIGHT



ANNAPOLIS SHORT LINE—GAS-ELECTRIC CAR SUPPLYING LIGHTING CURRENT FOR THE NIGHT RECONSTRUCTION

lines near Baltimore at speeds as high as 25 m.p.h. Now the crossing is so arranged that for a distance of 50 ft. on each side of the intersection 600 volts is used instead of 1200 volts. The cars, therefore, go over with all lights burning and at half speed but under full control and with no danger of stalling at the crossing. Two accompanying illustrations show how the respective trolley wires of the interurban and city cars were made to permit the riding of the trolley wheel across the bronze strip of the interurban.

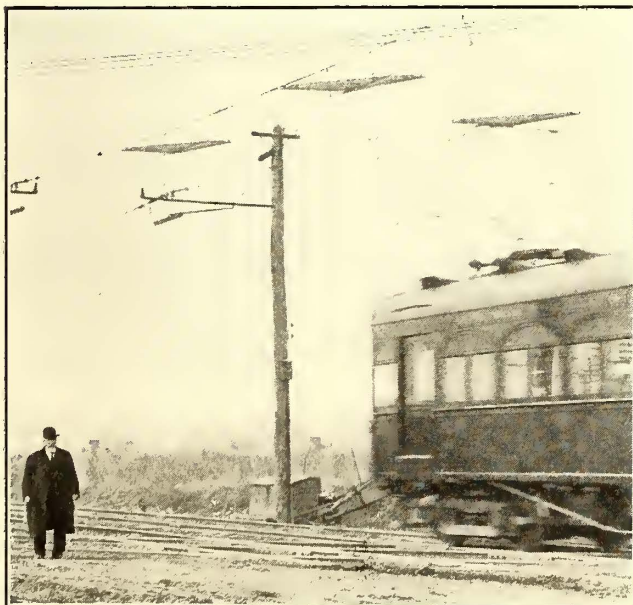
**COSTS OF FEEDER, CATENARY AND SUBSTATION**

The cost on a unit basis of the feeder and catenary work follows, all as per the detailed bills of material reproduced, as in Table IV.

Cost of 477,000 circ.-mil aluminum cable, 23.5 miles: Material, \$16,790.78, or \$714.20 per mile; labor, \$2,516.59, or \$107.40 per mile; total, \$19,307.37, or \$821.60 per mile.

Cost of No. 0000 grooved steel galvanized trolley, 32 miles of track: Material, \$13,543.01, or \$423.22 per mile; labor, \$5,760.22, or \$180 per mile; total, \$19,303.23, or \$603.22 per mile.

Cost of bonding No. 0000 7-in. EU-5 electric weld, 32.25 miles of track, 10,500 joints: Material, \$6,680.03, or \$207.13 per mile; labor, \$2,390.58, or \$74.12 per



ANNAPOLIS SHORT LINE—SHOWING SUSPENSION AT CROSSING OF 1200-VOLT AND 600-VOLT LINES

TABLE IV—BILL OF MATERIAL FOR CATENARY.

32 Miles	No. 0000 Grooved steel double galvanized trolley wire.
1200	Steady stick clamps.
34	Splicing ears.
50	Feed-in clamps.
100	Steady sticks.
	120-ft. Span
1862	Length 8 1/2-in. duplex catenary hangers.
1862	Length 10-in. duplex catenary hangers.
1862	Length 12 3/4-in. duplex catenary hangers.
1862	Length 17-in. duplex catenary hangers.
	100-ft. Span
357	Length 11 3/4-in. duplex catenary hangers.
714	Length 12 1/4-in. duplex catenary hangers.
714	Length 14 1/2-in. duplex catenary hangers.
714	Length 17 1/2-in. duplex catenary hangers.
	80-ft. Span
186	Length 14 1/2-in. duplex catenary hangers.
372	Length 15 1/4-in. duplex catenary hangers.
372	Length 17 1/2-in. duplex catenary hangers.
	60-ft. Span
188	Length 16 3/4-in. duplex catenary hangers.
188	Length 18-in. duplex catenary hangers.

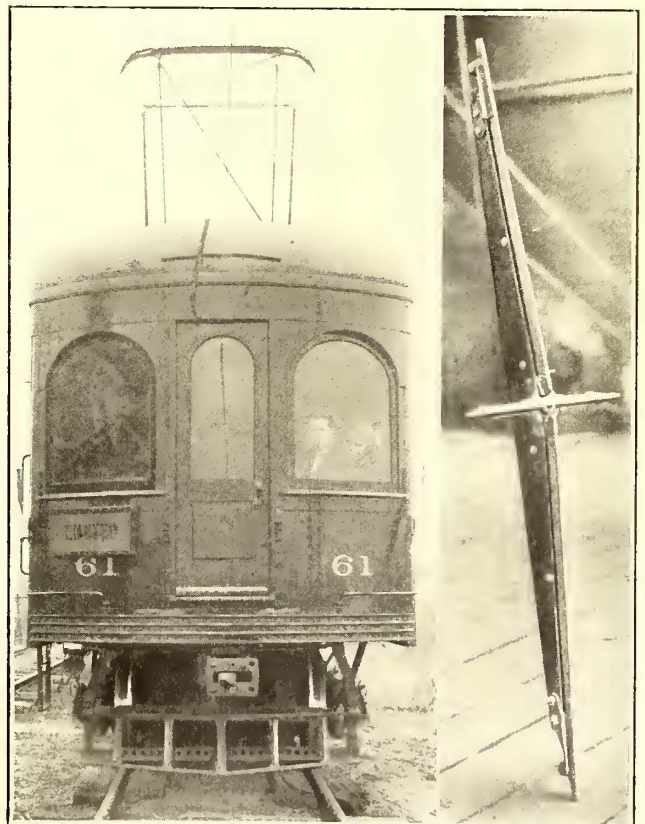
BILL OF MATERIAL FOR FEEDER

23.5	Miles nineteen-strand feeder cable 477,000 circ. mils
1170	Feed wire insulators.
1170	Iron side brackets
3600	1/2-in. x 4-in. Lag screws.
	Three-piece compressing joints
6	Extra dowel pins.
2	Eye bolts
47	Parallel grooved feeder taps.
5	Compression dead ends
1	Hydraulic press with dies.
12	Single piece compressing joints
	No. 2 tie wire for feeder.

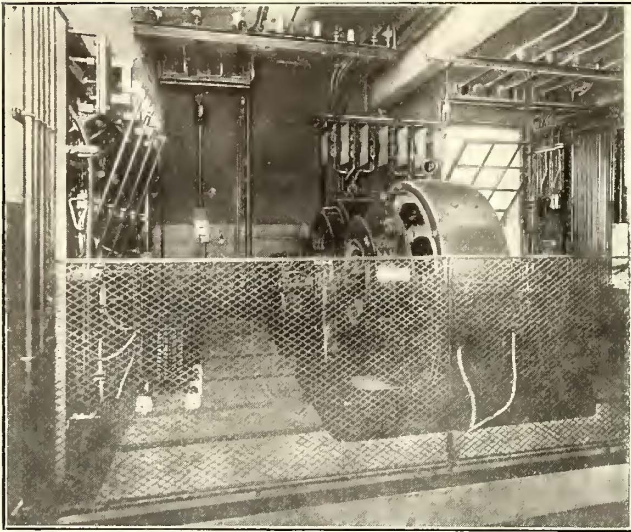
mile. Including the bonding car the cost per joint was as follows: Material, 63 cents; labor, 23 cents; total, 86 cents. Excluding the bonding car, the cost was as follows: Material, 39 cents; labor, 23 cents; total, 62 cents. The incidentals in connection with the catenary feeder and transmission job (noted later) are as shown in Table V.

TABLE V—TYPICAL TOTAL COST STATEMENT

Job No. 111	25.3 Miles	Per Mile
Labor	\$2,454.95	\$97.03
Material	1,911.05	75.53
Liability insurance	543.90	21.49
Engine rental	177.17	7.00
Drafting material	172.62	6.82
Casualties	113.72	4.49
Law	54.79	2.16
Telephone calls	15.00	0.59
	10.60	0.41



ANNAPOLIS SHORT LINE—OBSERVATION END OF CAR; 1200-600-VOLT CROSSING PIECE



ANNAPOLIS SHORT LINE—INTERIOR OF SUBSTATION AT WESTPORT

The original substation spacing has been retained for operating reasons. For example, the Westport station near Baltimore is cut out at night so that the entire load may be carried from Jones substation. The Westport substation is located 1.5 miles from Baltimore at the power house of the Consolidated Gas, Electric Light & Power Company, from which this company purchases electric energy. The Jones substation is 17.5 miles from Westport and 6.3 miles from Annapolis.

The Jones substation, which was constructed in 1914, is a one-story structure built up of 13-in. brick walls on a concrete foundation and with a concrete and three-ply asbestos roof. Its over-all dimensions are as follows: Length, 45 ft. 2 in.; width, 30 ft. 8 in., and height from ground line, 20 ft. 6 in. The present equipment in this station consists of two 300-kw oil-insulated self-cooled transformers, 13,200 volt primary 765 volts secondary three-phase twenty-five cycles; two 300-kw rotary converters with 1200-volt d.c. side; low-equivalent type lightning arresters for the 13,200-volt lines; electrolytic arresters for the 1200-volt d.c. feeders; hand-operated oil switches and two 25-kw 13,000/6600-volt transformers. The latter are used for supply lines to the shops and for an accommodation lighting and power service to a few small towns along the right-of-way.

A number of interesting features of the Jones substation will be noted from the accompanying drawings and other illustrations. In the first place it will be seen that the station is large enough for a third main transformer and rotary. A prime feature in the design was to keep the incoming high-tension and the outgoing low-tension lines as far apart as possible. The a.c. lines come in at one corner to the oil switches, whence they drop from the switching gallery to the transformers beneath, passing from the transformers via fiber conduits to a tunnel which extends under the rotaries. The d.c. feeders pass from this tunnel to the busbars and thence go out at the opposite corner of the station.

Owing to the layout described the

starting panels had to be placed between the transformer and rotary instead of on the switchboard.

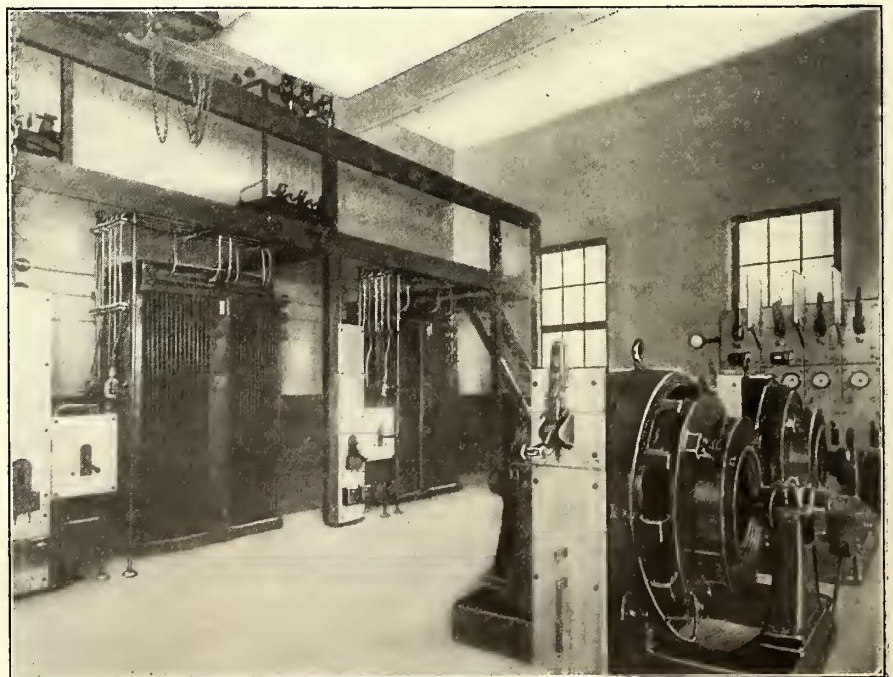
In operating this station at first some annoying flashovers occurred on the rotaries. These have been minimized by moving the feeder taps which are nearest the station to a distance of 2 miles instead of 1 mile. The frames of the rotaries were also insulated by placing treated hardwood bases below them and connecting the frames to ground through high resistance. Another safety feature is the provision of an oil drain for the transformers as a guard against fire. This drain takes the form of a brick gutter in the floor.

To start a machine, the operator closes the high-tension oil switch which has manually-operated remote control connection to the gallery. Next he throws the starting switch to a position which will give half voltage on the rotary. While doing this he stands at a place, as illustrated, from which he can see a voltmeter on the swinging arm of the switchboard to determine the polarity. If the polarity is wrong he corrects it with the field break-up switch, then throws the starting switch to the full voltage position and finally closes the negative switch on the panel at the machine.

The total cost of the Jones substation, inclusive of land costing \$200, was \$5,430.49, or \$6.03 per kw on the basis of 900-kw capacity. The cost of the land and material was \$3,435.19, or \$3.81 per kw, and of labor \$1,995.30, or \$2.22 per kw. This cost included the main busbar structure, conduit and all fixtures inside and outside the substation, but did not include apparatus or conducting material. The gallery erected for the high-tension switching apparatus is supported on one of the two rows of steel columns which carry a track for a 10-ton Maris crane.

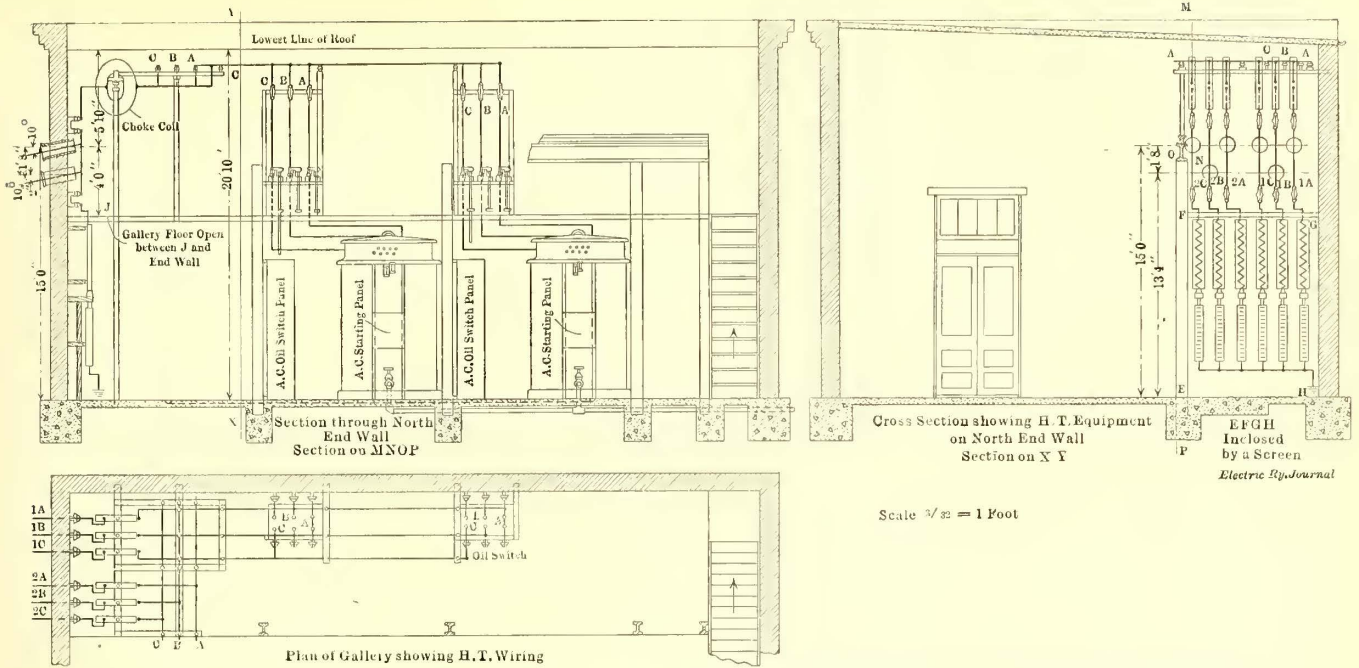
The apparatus in the Westport substation is a duplicate of the Jones installation except that the oil switches are electrically operated and that there are no auxiliary transformers. The reasons for electrical operation of switches here are the facts that the power company's apparatus is of that type and that the switches are much further from the operator.

An unusually interesting log sheet is prepared daily by the operators at the Jones substation. In addition to the reports of interruptions, transformer tempera-

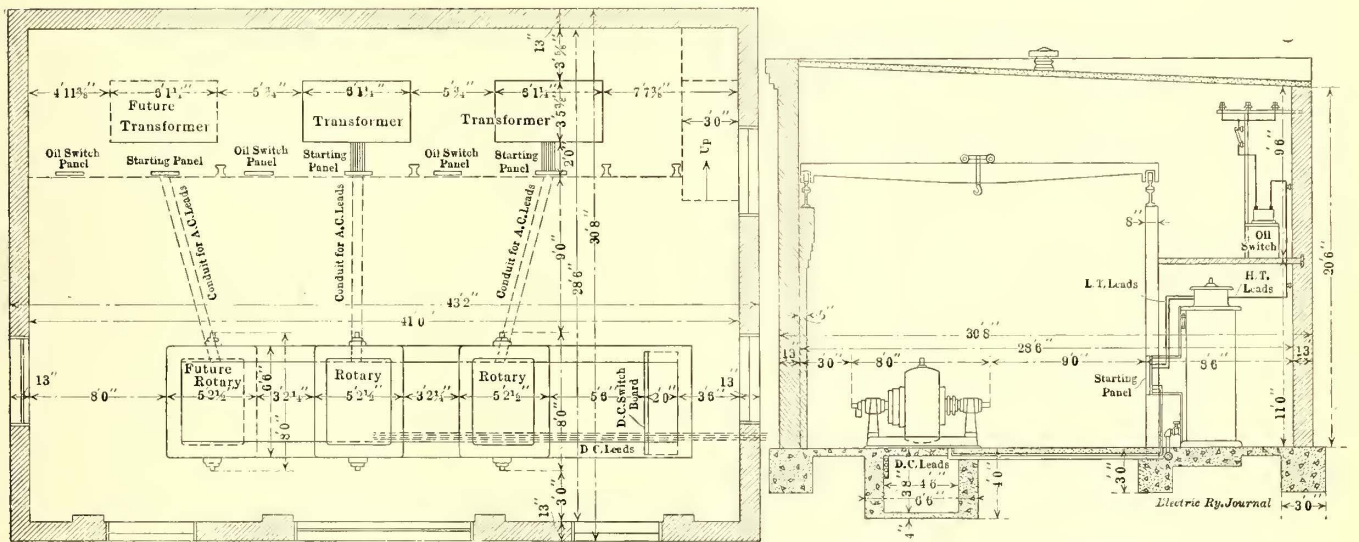


ANNAPOLIS SHORT LINE—INTERIOR OF SUBSTATION AT JONES, SHOWING HIGH-TENSION EQUIPMENT; SWITCHBOARD BEHIND ROTARIES

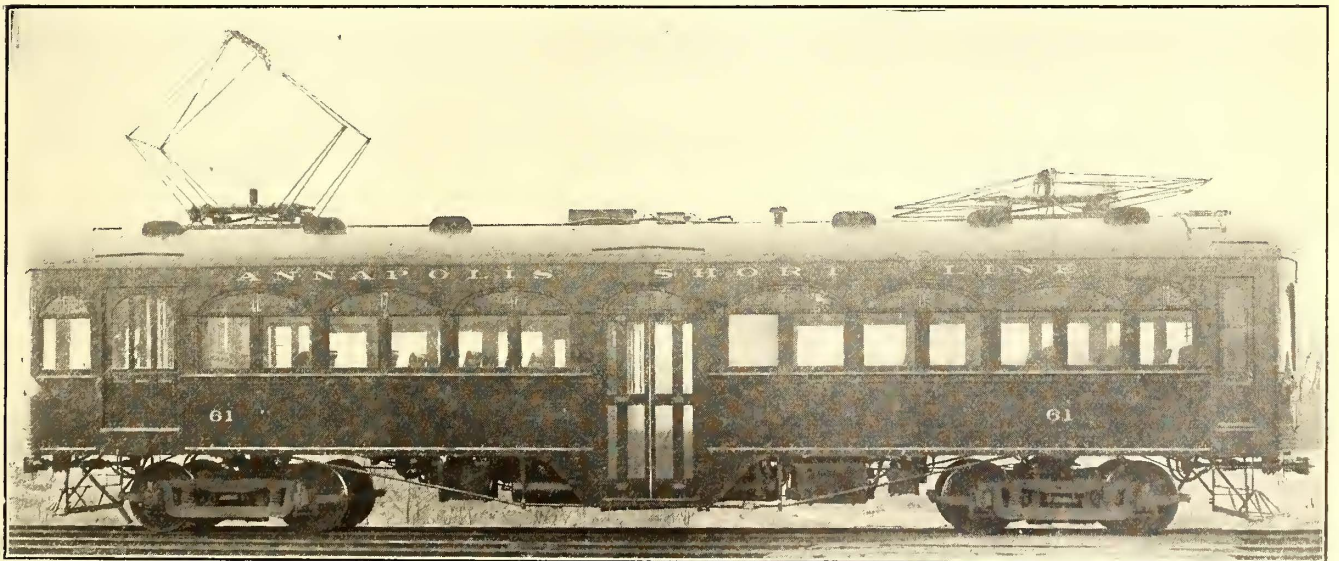




ANNAPOLIS SHORT LINE—ARRANGEMENT OF ELECTRICAL EQUIPMENT IN THE JONES SUBSTATION



ANNAPOLIS SHORT LINE—FLOOR PLAN AND SOUTHERN-END SECTION OF JONES SUBSTATION



ANNAPOLIS SHORT LINE—CENTER-ENTRANCE CAR WHICH WAS ADOPTED FOR THE 1200-VOLT SERVICE TO GET GREATEST CAPACITY AND QUICK INTERCHANGE OF PASSENGERS

TABLE VI—MONTHLY POWER RECORD, ANNAPOLIS SHORT LINE

1914 Month	Car-Miles	A. C. Kw-Hr. Purchases	Less A. C. Kw-Hr. Disposed of	D. C. Jones	D. C. Westport	D. C. Total	A. C. and D. C. Effic.	A. C. Kw-Hr. per Car-Mile	D. C. Kw-Hr. per Car-Mile	Stops	Aver. Mean Length Run	D. C. Watt-Hr. per Ton-Mile	A. C. Watt-Hr. per Ton-Mile
Nov.	60,283	268,440	262,478	125,980	110,660	236,640	90	4.35	3.91	20,512	2.9	97	108
Dec.	59,425	262,410	255,609	124,980	109,160	234,140	91	4.30	3.91	20,472	2.9	97	107

TABLE VII—TYPICAL HEADS OF TWO DAILY POWER RECORD CARDS

Jan. 1	Hour Peaks in Kw-Hr.	A. C. Watt-Meter Reading of	Total Kw-Hr.	Car-Miles	Kw-Hr. per Car-Mile	Stops	Mean Length of Run-Miles	Watt-Hour per Ton Mile
Jan. 1	580-560-640-340	123,864	8220	1907	4.31	589	3.2	107

Jan. 1	Westport D.-C. Read.	Kw-Hr.	Jones D. C. Read.	Kw-Hr.	Total A. C. Kw-Hr.	Power Line Reading	A. C. Kw-Hr.	Total A. C. to D. C. Kw-Hr.	Total D. C. Kw-Hr.	Effic.
Jan. 1	152,830	3440	358,710	3720	8390	29,750	170	8220	7160	89 per cent

tures, power readings and defects, individual and combined graphs are made up in the manner illustrated. The top of the sheet shows a curve of total a.c. kilowatt-hour peaks at Westport, the power-purchasing point, superimposed on a curve of total a.c. load in kilowatt-hours. Below these are shown pairs of curves comparing the d.c. load and d.c. capacity of each substation, then follows a graph showing the loss in transmission and conversion, and finally the graphs representing the working periods of the different rotaries.

The records of the individual substations comparing load and capacity are of value to the operators in showing them how efficiently they are using their rotaries to secure good machine load factors.

The efficiency of conversion from alternating current to direct current is very high, ranging from 90 per cent to 92 per cent. For example, the following estimated performance of transmission and guaranteed efficiency of apparatus at the Jones and Westport substations was made on the record of energy consumption obtained for the months of July, August, September and October, 1914, appear in Table IX:

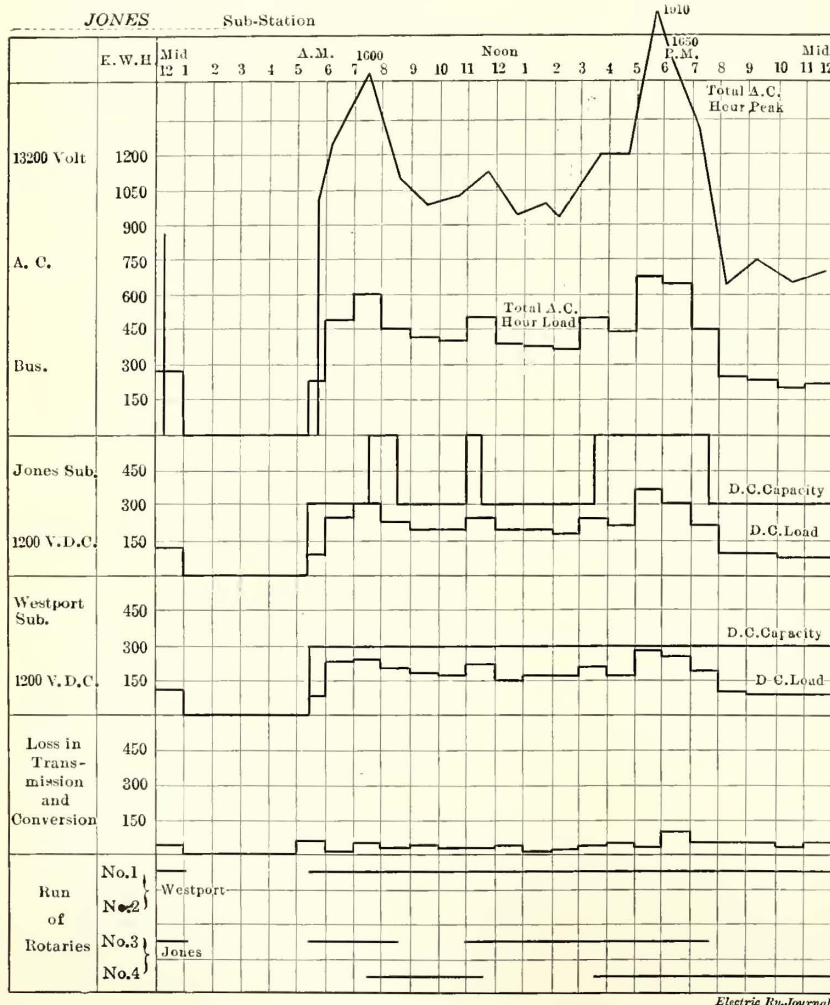
TABLE VIII—BILL OF MATERIAL FOR TRANSMISSION

- 35 Miles seven-strand aluminum transmission wire No. 0.
- McIntire joints.
- 1 set McIntire twisting clamps.
- 6 Aluminum tap-off joints.
- Aluminum tie wire No. 2.
- 850 6-ft. cross arms, 3 1/4 in. x 4 1/4 in.
- 1700 28-in. braces.
- 400 14-in. bolts.
- 200 16-in. bolts.
- 800 14-in. bolt washers.
- 400 16-in. bolt washers.
- 1700 3/8-in. x 5-in. bolts.
- 1700 3/8-in. x 5-in. bolt washers.
- 850 1/2-in. x 3-in. lag screws.
- 1686 Transmission insulators.
- 1686 Transmission insulator pins.

TABLE IX—ESTIMATED EFFICIENCY, TRANSMISSION, 98 PER CENT

Westinghouse Company's guaranteed efficiency—Jones	
Lowering transformers	97.5 per cent
Rotary converters	94.0 per cent
Total a. c. to d. c.	89.9 per cent
Westinghouse Company's guaranteed efficiency—Westport	
Lowering transformers	97.5 per cent
Rotary converters	94.0 per cent
Total a. c. to d. c.	91.6 per cent*

\*No transmission allowance required.



The Westinghouse efficiencies given for apparatus were equalled in service due to the very good machine-load factor. The average load factor at each substation was 55 per cent. The power record, which is presented in Table VI on this page, shows how closely the watt-hours per ton-mile follow the average mean length of run, that is to say, when proper allowance is made for stops. These figures were obtained before coasting instructions and ampere-hour meters were introduced with beneficial results.

Power data from the substation log sheets and other sources are recorded daily on cards which are ruled for half a month. Typical heads of the two cards used and actual figures for the first day of this year are shown in Table VII near the top of this page.

TRANSMISSION SYSTEM

As the Westport substation is located in the plant of the power-selling company, the transmission lines extend only for the 17.5 miles between Westport and Jones. The original transmission system comprised two single-phase lines of No. 2 copper mounted on one cross-arm. To make the same pole line carry the present three-phase system in duplicate a cross-arm for two wires was added below the original arm and wires. Each of the new transmission circuits is of No. 0 (105,530 circ. mil) steel-cored aluminum wire, the size being the equivalent of No. 2 copper and the coring permitting approximately the same sag as copper. The wires are mounted in triangular arrange-

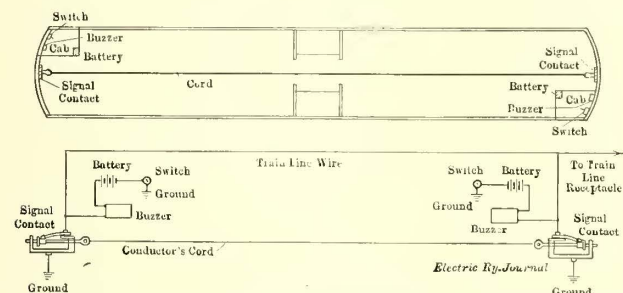
ment on 35,000-volt O.B. porcelain insulators. The iron grounding wire for lightning protection is mounted on the top of the poles and is grounded to the rails every tenth pole, equivalent to a distance of 1200 ft. Telephone interference is minimized by giving each wire two complete turns in the 17.5 miles of run.

The cost of changing over the transmission system was as follows: For materials covering 35 miles of new aluminum wire, or 17.5 miles of track, \$8,913.68; for labor, \$3,024.85. The bill of material is presented in Table VIII on page 548. In considering labor cost it should be remembered that the work was done at night.

ROLLING STOCK

The original rolling stock was of the usual end-platform type and of heavy wooden construction, some with steel underframes. In changing over the line it was felt that much of the benefit would go unappreciated by the public if there was no apparent improvement in the cars. The management decided that in the first place new cars of all-steel construction should be used, in the second, that they should be lighter than the a.c. cars and, finally, that they should be of center-entrance type.

As the accompanying plan shows, the center-entrance car is divided into a main compartment, toilet and motorman's cab on one side, and into a smoking compartment, baggage compartment, heater room and



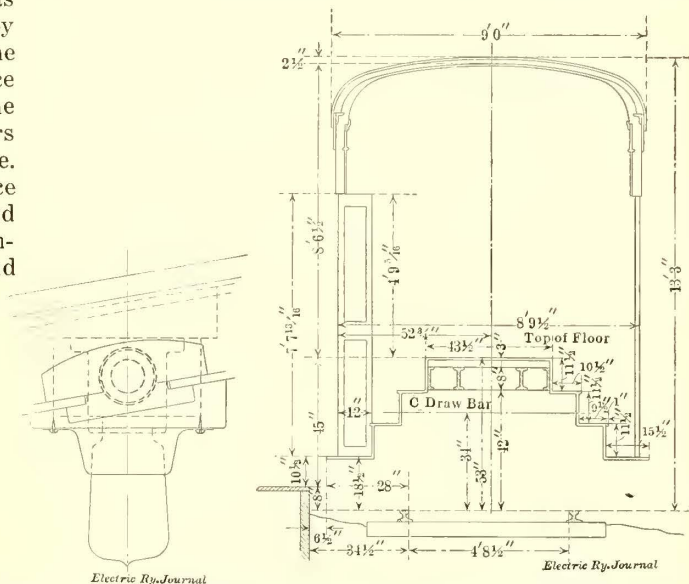
ANNAPOLIS SHORT LINE—DIAGRAM OF BUZZER SIGNAL CONNECTIONS, ETC.

motorman's cab on the other side. With the center-entrance arrangement no passenger has any good reason for going into the baggage compartment, while ladies are never obliged to go through the smoking section. Furthermore, the conductor stands in the center of the car at all times in the best possible location to maintain supervision. Another advantage of the center entrance, which is of real importance at the short stops of "limiteds," is that the rate of passenger interchange is higher because people can go in and out at the same time. In accordance with State regulations, colored passengers are directed to take the seats at the rear.

Since the car is operated double-ended it was desirable to know in advance whether a car of the width proposed would allow ample room for the conductor and passengers if stairways were provided on opposite sides of the center platform; also if the treads and risers would be comfortable for women and other passengers. Hence before deciding upon this feature a model platform was built and a number of people were invited to walk up and down the steps and to walk by each other in opposite directions on the platform. As shown in an

accompanying drawing, these tests indicated that a platform 43½ in. wide with three risers of the uniform height of 11½ in. and treads of the widths marked on the drawing would give satisfactory passenger interchange conditions. The same plan was followed in connection with the motorman's cabs, a dummy with standard control apparatus therein being constructed to ascertain the most satisfactory minimum clearances. The results are indicated in the general plan, from which it will be seen that room was left for an observation window at the main compartment end, while the similar layout of sash at the baggage compartment end is especially welcome when this section is used as a post-office car.

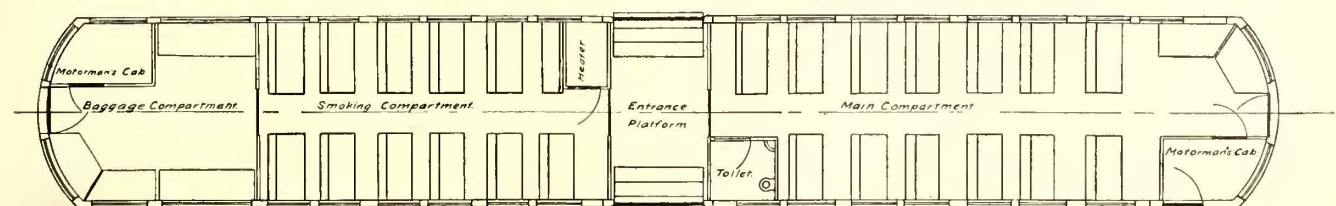
The new Wason cars are 55 ft. long, 8 ft. 9 in. wide, 15 ft. 6 in. high to top of lowered pantograph, and



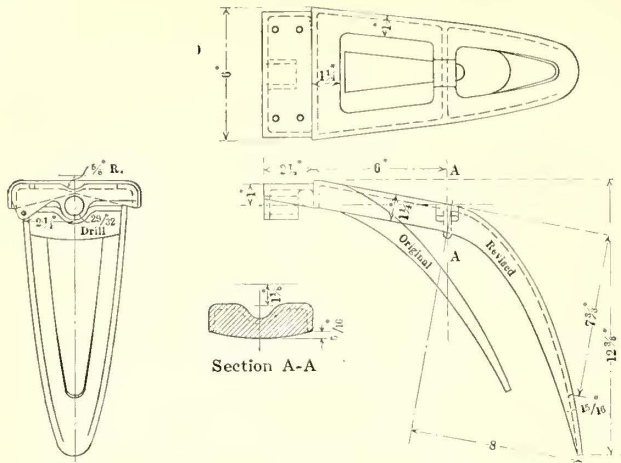
ANNAPOLIS SHORT LINE—LIGHT SOCKET; STEP ARRANGEMENT FOR CENTER-ENTRANCE CAR

weigh 80,300 lbs. They seat fifty-two passengers each. The trucks are Brill MCB-2X of 6-ft. 6-in. wheelbase with 36-in. rolled steel wheels. The underframe includes 10-in. 15-lb. channels for the side sills, four intermediate 8-in. 18-lb. I-beams and cross connections of 5 in., and 6-in. 8-lb. channels. At the center of the car all longitudinal members are interrupted except the center intermediate sills. To take care of this a plate 11 ft. 6 in. x 38 in. x ¼ in. thick is riveted to these center sills and also to the cross-members nearest the platform. Additional diagonal bracing is also provided. The important members of the framing are the T-posts for sides and roof and the side sheathing of No. 10 steel plate. The arch roof is of wood with twelve Automatic ventilators. The floors in the passenger and motorman's sections are also of wood covered with elastic tiling. The interior finish is mahogany with agasote ceilings, in the passenger sections.

The cars are furnished with four 75-hp commutating pole motors Westinghouse 317-A-4 geared 20:69. They are wound for field control, the change from full field to short field being made by means of four switches



ANNAPOLIS SHORT LINE—PLAN OF DOUBLE-END CENTER-ENTRANCE PASSENGER AND BAGGAGE CAR



ANNAPOLIS SHORT LINE—REVISED COLLECTOR

in the unit switch group. The control is the motor builder's HLF design with resistance to cut down the line voltage to 210 for the switch group magnets. No dynamotor is used, the Westinghouse D2K compressor being operated directly on 1200 volts, while the lamps are wired ten in series at 120 volts each. These lamps are mounted in Mogul sockets with condulets. The arrangement illustrated on page 549 places the conduit as far back from the headlining as possible and secures a slightly appearance.

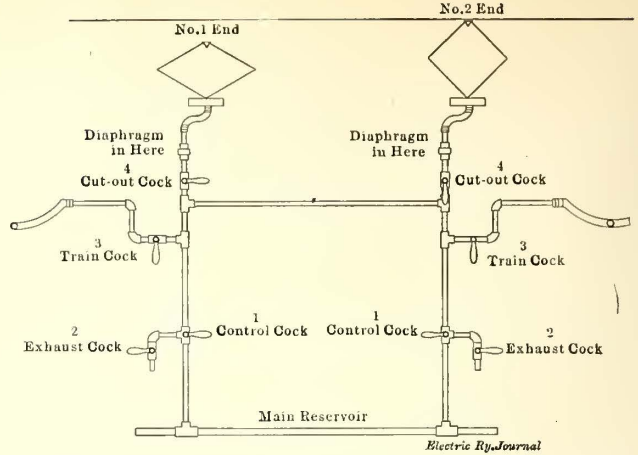
The signal system is of the buzzer type, which was adopted in preference to bell signals because it may be used for instantaneous signaling throughout any number of multiple-unit cars.

The Westinghouse AMM brake has the straight air feature for single-car operation and automatic for train service. It includes the Type J slack adjuster. The air sanders are Ohio Brass "Universal" design and the hand brakes are of Peacock type.

Instead of using the heavy M.C.B. coupler with accompanying draft rigging and anchorage casting the company adopted the Tomlinson radial coupler which saves 1400 lb. per unit. Hedley anti-climbers are used.

The cars carry two sliding pantographs. Only one pantograph is used at a time except when the other serves as a sleet cutter. These collectors are equipped with sheet steel shoes bearing against the wire with a pressure of 10 lb. to 15 lb. Experience indicates that grease grooves are unnecessary.

The shoe is built of 1/16-in. sheet steel 6 in. wide, 4 ft. long and flanged 3/4 in. on each side. This, the

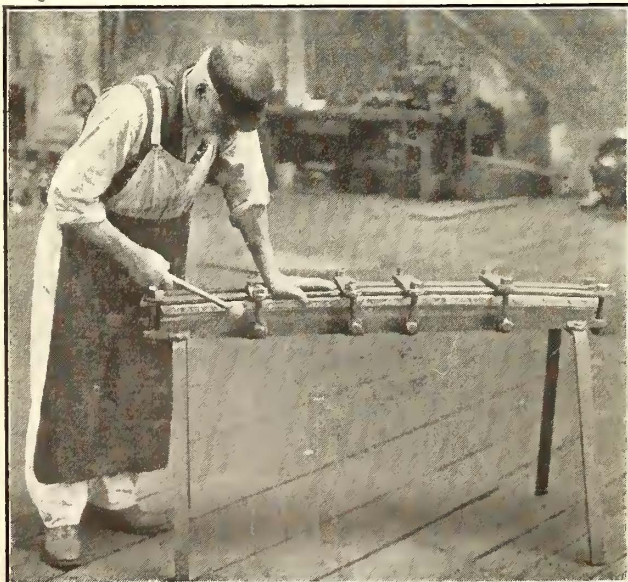


ANNAPOLIS SHORT LINE—PANTOGRAPH AIR CONTROL

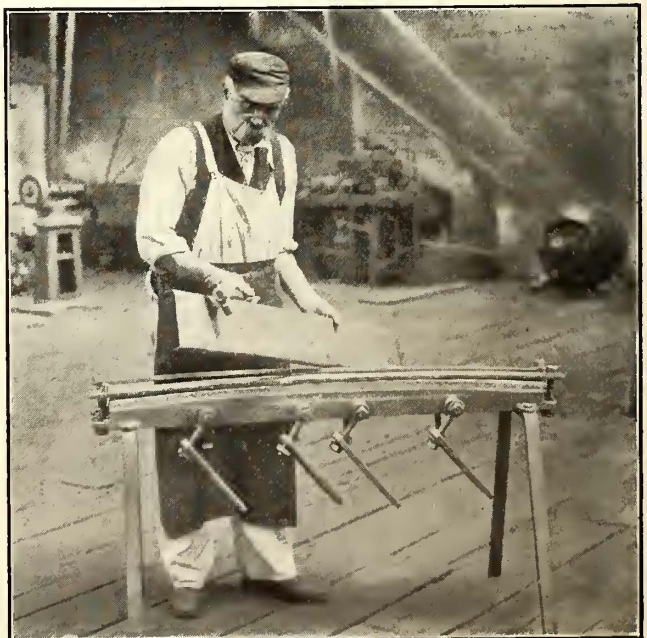
only part which requires renewal, costs about 26 cents in labor and material for its average life of 1000 car-miles. Templets are used for the manufacture of shoes. As shown in an accompanying drawing, the aluminum pantograph horns have been altered in shape after they have been received from the maker to permit greater contact area for the shoe where oscillations are unusually heavy.

The pantographs are now arranged for straight air operation whereas they were formerly manipulated through combined air and magnet control. All locking devices have also been eliminated. Assuming that a man is to operate a car from the No. 1 end his first act would be to open the exhaust cock at that end and to close the exhaust cock at the No. 2 end. He could then close the train cocks at both ends of the car. Next he would open the cut-out at the No. 1 end and close the cut-out cock at the No. 2 end.

In every-day service the motorman does not have to go through this sequence of operations. But one pantograph is used each day, and all of the preparatory steps are cared for by the yard inspector. Hence, in regular service, the motorman has to change the exhaust cock only. He closes this cock in the cab from which he is not operating and opens it in the one from which he is going to operate. He is then ready to bring the pantograph into service by means of a three-way cock. Hose connections permit the operation of all active pantographs in a train from one cab.



ANNAPOLIS SHORT LINE—FORMING PANTOGRAPH SHOE



ANNAPOLIS SHORT LINE—PANTOGRAPH SHOE COMPLETED

# CHICAGO ELEVATED SHOP PRACTICE

Some of the Practices and Kinks Employed in Removing the Causes of Equipment Defects and Reducing Maintenance Costs

THE mechanical department of the Elevated Railroads of Chicago, in pursuance of a general policy of removing the cause of defects, in addition to devoting attention to the reduction of the cost of making repairs, has obtained most satisfactory and gratifying results with limited shop equipment.

## WHEEL PRACTICE

In fixing a wear limit for steel wheels it was realized that, while there is a point at which flange wear may be limited to reduce to a minimum the amount of metal

provided, namely, thin flange, low flange, high flange, pointed flange and straight flange. The dimensions of these limits are indicated, and the method of application of the different limiting points is shown in one of the illustrations.

In order to furnish some definite working standard, minimum and maximum pressures for pressing wheels on axles have also been adopted for the various sizes of axles. A hydraulagraph record is taken for each wheel at the time it is pressed on an axle, and this becomes a part of the permanent shop records. The maximum and minimum pressures adopted for the various axle diameters are as follows:

Form 1307 IM 514 L.R.C.  
NORTHWESTERN ELEVATED RAILROAD CO.

AXLE NO. *A723* MOTOR NUMBER

DATE INSTALLED *Jan 25-15* DIAMETER *33*  
*21017*

MAKE OF AXLE *Standard* HEAT TREAT NO. *3*

OUR WHEEL NOS. *A1445-A1446*

MAKER *Standard*

HYDRAULOGRAPH RECORD NO.

TONS PRESSURE *60-61 Tons*

WHEEL FITTED BY *C. Wideman*

WHEELS PRESSED ON BY *C. Wideman*

DATE PRESSED ON *Jan. 11 1915*

INSPECTED AND OK'ED BY *L. C. Olney*

Form 1377 IM 514 L.R.C.  
NORTHWESTERN ELEVATED RAILROAD CO.

REPORT OF TURNING TIRES

AXLE NO. *A723*

WHEEL NOS. *A1445-A1446*

REASON FOR TURNING *High Flange*

DIAMETER BEFORE TURNING *33 3/4*

DIAMETER AFTER TURNING *35*

SIZE OF JOURNAL *4 1/4*

DATE OF TURNING *January 10 1915*

INSPECTED BY *L. C. Olney*

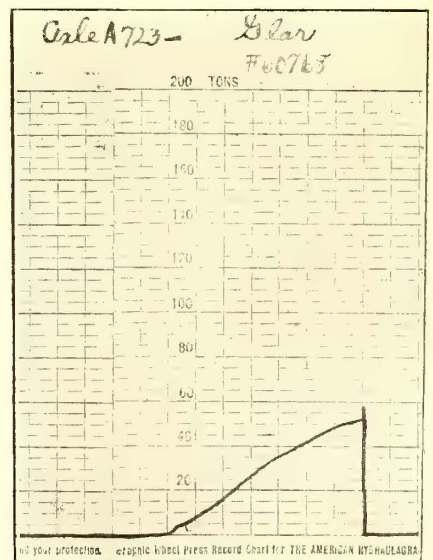
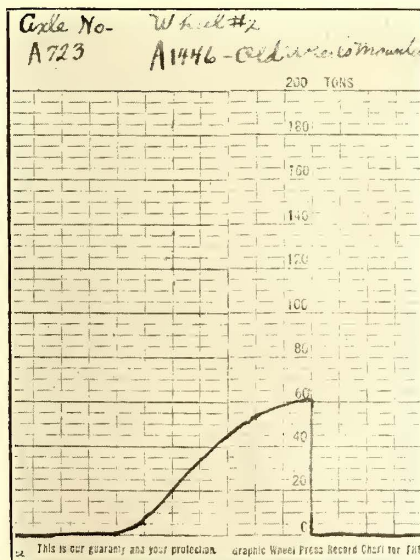
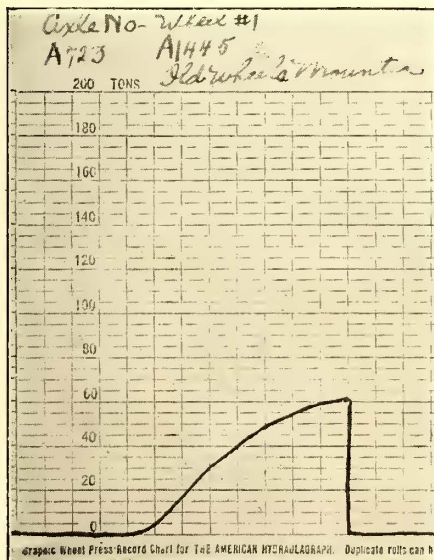
Diameter of Axle at Wheel Fit, in.	Minimum Pressures, Tons.	Maximum Pressures, Tons.
4	40	60
4 1/2	45	65
4 3/4	45	65
5	50	75
5 1/4	50	75
5 1/2	55	80
5 3/4	55	80
6	60	90
6 1/4	60	90
6 1/2	65	95
6 3/4	65	95
7	70	100

## WHEEL AND AXLE RECORDS

Wheel and axle records are filed by axle number in an envelope which contains the records of all wheels and gears fitted to an axle during its life in service. Each envelope contains a hydraulagraph record of the wheel and gear fits, a turning record, a record of the position of the axle under the car from which it was removed and a record of the car number and the position of the axle when it is again restored to service. In addition to the axle number on the face of the record envelope, the size of the axle, the type (whether used on a motor or a trailer), the date on which it was put in service and the name of the manufacturer are shown. These axle and wheel records are then filed under the car numbers. To distinguish between axles in service and those in the shop, a separate file is kept for the latter. Records of the operations necessary to fit a new

CHICAGO ELEVATED—WHEEL AND AXLE RECORD; WHEEL TURNING RECORD

lost in turning, this consideration alone cannot determine the wear limits at which wheels should be removed from service. A practical wheel defect gage also must allow for reasonable wear on track special work. Following an investigation of many contours of worn wheels, and of the wear on rails, switches and frogs at a number of locations on the system and accurate measurement of wheels, switches and frogs at points where derailments occurred, the gage shown on page 553 of this issue was adopted. On this gage five limits are pro-



CHICAGO ELEVATED—TYPICAL HYDRAULAGRAPH RECORDS OF WHEELS AND GEARS

axle or to renew wheels are prepared by the foreman in charge of boring mill, wheel lathe and wheel press.

EMERGENCY METHODS OF REMOVING WHEELS FROM AXLES

In the few cases where the pressure required to remove a wheel from an axle exceeds the capacity of the 200-ton wheel press, a gas heater is used to expand the wheel until the press will remove it. This heater consists of 1 1/4-in. pipe burner curved to fit the tire, several sizes being provided to fit different sizes of wheels.

air control valve is operated by a key which is inserted in position only when the hoist is in use.

AXLE TESTING OUTFIT

When cars are overhauled all axles are carefully examined and receive an impact test on both journals. The axle is set on two substantially-built horses placed just inside the wheel hubs, and, in this position is thoroughly cleaned and examined for flaws with a magnifying glass. If none is found, an axle-testing tool, consisting of a saddle striking block fitted with a babbitted

Form J. B. 178. 1M. 11-14		AXLE NO. <u>A723</u>		
NORTHWESTERN ELEVATED RAILROAD CO.		CO.		
WHEELS OUT AND IN		DATE <u>Jan. 25, 1915</u>		
CAR <u>1043</u>				
POSITION	OUR AXLE NUMBER	OUR WHEEL NUMBER	CONDITION	REMARKS
REMOVED				
APPLIED	<u>A723</u>	<u>A1445</u>	<u>Good</u>	<u>New Axle</u>
		<u>A1446</u>		
SIGNED: <u>J. F. Riley</u>				

CHICAGO ELEVATED—RECORD OF WHEEL APPLIED

Form J. B. 178. 1M. 11-14		AXLE NO. <u>676</u>		
NORTHWESTERN ELEVATED RAILROAD CO.		CO.		
WHEELS OUT AND IN		DATE <u>January 25</u>		
CAR <u>1043</u>				
POSITION	OUR AXLE NUMBER	OUR WHEEL NUMBER	CONDITION	REMARKS
REMOVED	<u>1</u>	<u>723</u>	<u>A1445</u>	<u>Sharp</u>
		<u>A1446</u>	<u>Flange</u>	<u>Worn out Axle</u>
APPLIED				
SIGNED: <u>J. F. Riley</u>				

CHICAGO ELEVATED—RECORD OF WHEEL REMOVED

Holes drilled on the inside of the burner rings permit the flame to play on the tire, and a smaller burner of the same size of pipe is used to heat the hub. These burners are connected into the shop gas and compressed air systems through a mixer located at the junction of the air and gas pipes and the burner ring. For the most obstinate cases approximately fifteen minutes are needed to heat the wheel to the required temperature.

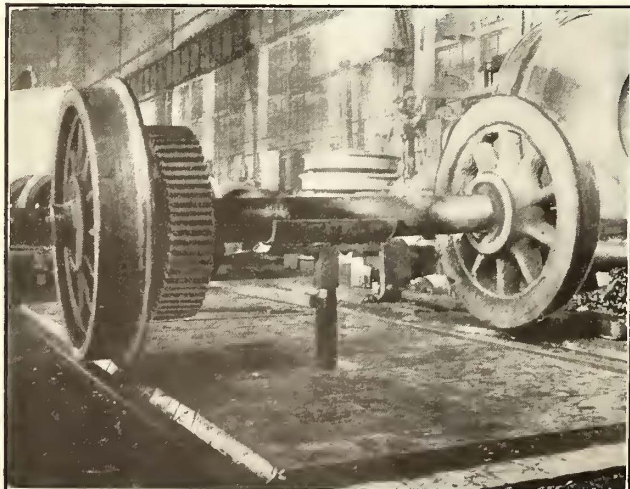
WHEEL HOIST

As the shop tracks parallel the axis of the wheel lathe, it is necessary to turn the wheels by hand or with the overhead bridge crane before they can be rolled between the lathe centers. To facilitate this operation, an old 10-in. x 12-in. brake cylinder was mounted in a pit beneath the shop floor and connected into the shop compressed-air system. A hollow piston was fitted to this brake cylinder so that the hoist saddle which received the axle could be inserted for turning a pair of wheels and then removed to keep the track and floor clear. The

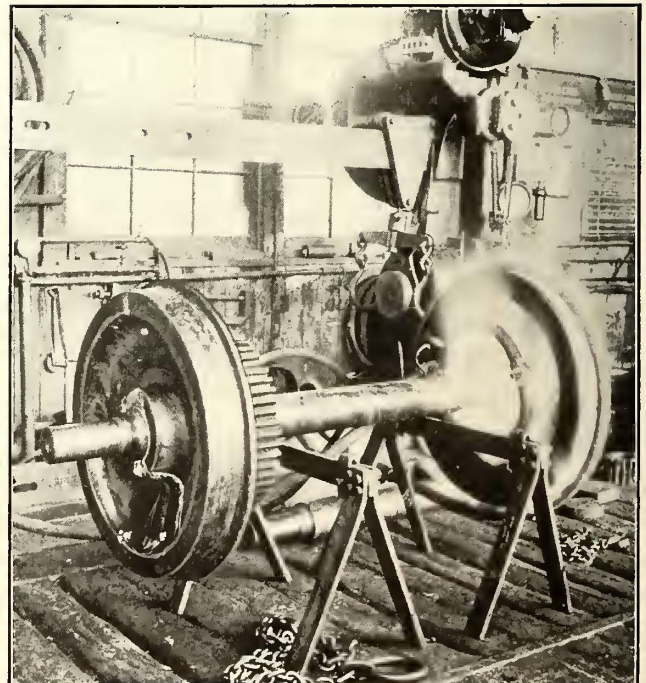
bearing to prevent scarring, is set in position on the end of the journal. This striking block then receives four blows from a 12-lb. hammer, the axle being turned 90 deg. with each blow. If there is a flaw which is not evident under the magnifying glass, the sledge-hammer blows are quite certain to bring it out, its presence being indicated by thin film of oil which appears along the crack. This simple method of locating flaws in journals and axles has resulted in the removal of several defective axles from service.

METHOD OF MOUNTING PINIONS

The first operation in mounting a pinion is to prepare the key for a driving fit on the armature shaft.



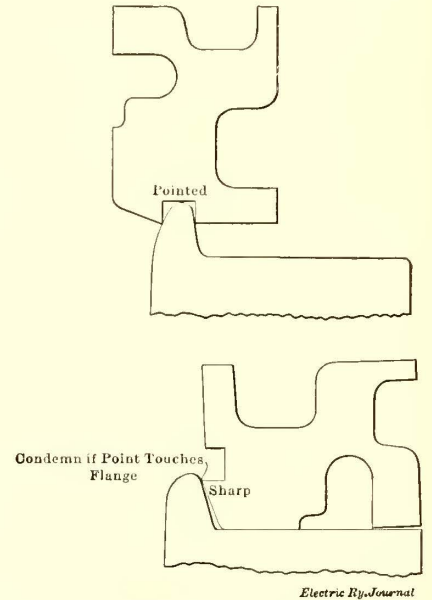
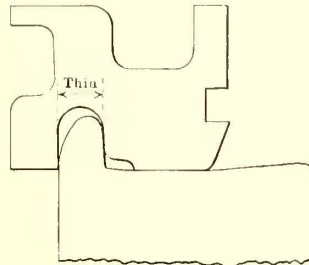
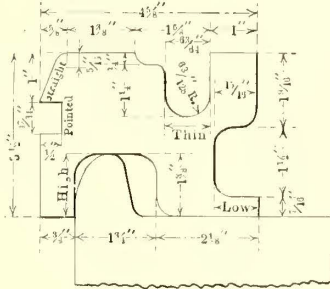
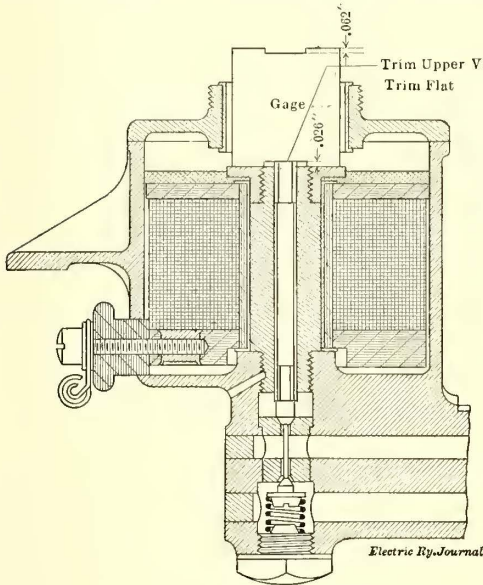
CHICAGO ELEVATED—WHEEL AND AXLE-TURNING HOIST



CHICAGO ELEVATED—VIEW OF WHEEL HEATING OUTFIT

Keys are required to fit snugly against the sides of the pinion keyways but not as tightly as on the shaft. After a key has been fitted, the pinion is slipped on the shaft to insure clearance between the key and the bottom of the pinion keyway. A "feeler" gage, 1/64 in. thick, is used to determine the keyway clearance, and it must pass the entire length of the keyway. The taper fits of pinion and

Running water is so connected to the molds that there is sufficient flow of cold water to cool the mandrels during molding operations. While the molds are out of service, they are coated with heavy petroleum grease to keep them in good condition.



CHICAGO ELEVATED—GAP GAGE FOR SHORT VALVE STEM; APPLICATION OF WHEEL-DEFECT GAGE

shaft are compared by chalk-marking the shaft. A pinion may not be thrust against the collar at the back end of the shaft fit, since this introduces unusual stresses and may cause loosening.

After a pinion has been fitted to the shaft, it is heated in boiling water for twenty minutes. After treatment by the boiling process, it is placed upon the shaft and tapped lightly into place, and the nut is applied to keep it from backing off. After the nut is in place the pinion is again tapped with a sledge hammer, and any movement is followed up with the nut. The pinion is not forced into place by hard blows as this introduces internal stresses when the metal cools, greatly decreasing its ability to resist service shocks.

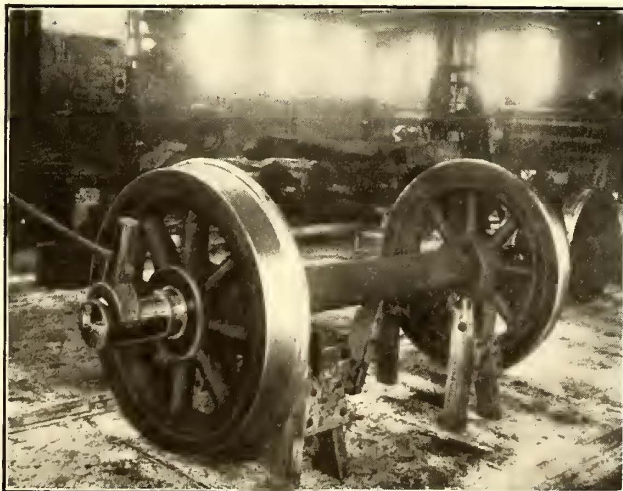
WATER-COOLED MANDREL BABBITTING MOLDS

The water-cooled babbitting molds used in this company's shops have greatly increased the output. A set of these is shown in an accompanying illustration.

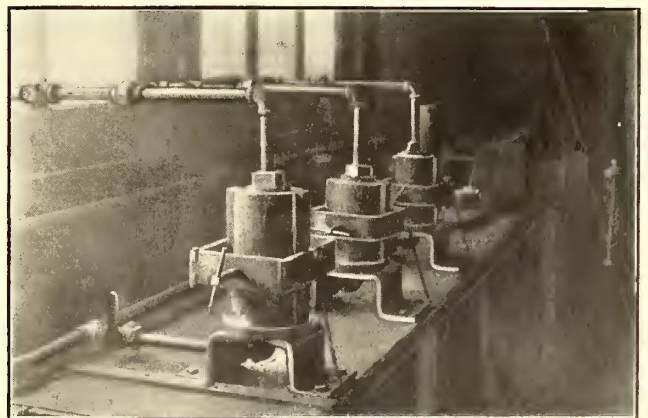
A strap-iron collar with two setscrews is fitted to each mandrel and serves to fasten the bearing shells in position while the babbit is being poured. After the babbit has been poured cold water is allowed to circulate through the mandrel to chill and harden the bearing surface. An excellent bearing surface is obtained without the blisters often produced by heated mandrels. The greatest advantage of the use of this method lies in the increased output, for, as compared with the use of a mandrel not water-cooled, the water-cooled mandrel has made it possible to increase the output of bearings eight to twelve times.

MOTOR TESTING

All motors are thoroughly tested after they have been completely assembled on the shop floor before being returned to service. This test, which is made primarily to determine the condition of the bearings, lasts for an hour, the motor being operated at the maximum speed attained in service. Inaccuracies in bearing sizes and fits, as well as damage to bearings or armature



CHICAGO ELEVATED—AXLE-TESTING SET



CHICAGO ELEVATED—WATER-COOLED BABBITTING MOLDS

shafts in assembling, are indicated thereby. Motors which do not develop hot bearings at speeds from 750 r.p.m. to 800 r.p.m. may run hot at 1400 r.p.m.

In this test the current is controlled by resistance between limits of 90 amp to 400 amp, which permits a 175-hp motor to be run as a shunt motor at its maximum service speed. The shunt connection allows full line voltage to be applied between brushes, and this serves as a final check on the condition of the armature. Finally, the motor receives a 1200-volt a.c. breakdown test, before going into service.

#### AIR COMPRESSOR TEST

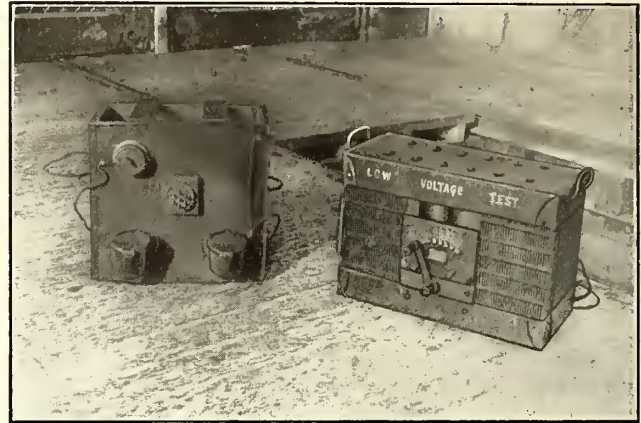
After compressors are overhauled they are connected to the shop air supply system and are operated for at least twelve hours. While thus under test they are inspected and adjusted. As the compressors are controlled automatically during the test run, the operating conditions are analogous to a service test.

#### MULTIPLE-UNIT-CONTROL TESTING OUTFIT

Control equipment is usually tested only at line voltage, sight being lost of the fact that under normal operating conditions the voltage at the car sometimes drops to two-thirds or less of the substation voltage. For this reason the control repairmen of the Elevated Railroads are equipped with a voltage-control rheostat with resistance sufficient to reduce the line voltages to 300 or 350, for use between substations or at the end of a line where failures occur most frequently. By reproducing low-voltage conditions a repairman is able to determine whether the failure was due to this cause.

The rheostat is shown at the right in the cut in the next column. It is a perforated steel box with handles, in which a set of ordinary car heater coils is mounted. On a slate base fastened to the side of the box is a rheostat arm with contact points so tapped into the heater-coil circuits as to give a range of voltage from 250 to 450 in 25-volt steps. To conduct a test this outfit is arranged with one end of the heater circuit connected through a switch and fuse to the trolley, and the other end is grounded on the track rail. A third wire leading from the rheostat arm is then connected to the main switch in the car. All of the heaters and

is reduced to 350 volts and the control is notched up to a position in which the maximum number of contactors is in service. An ordinary spring balance is employed to test the contactor pull if necessary. Very obstinate cases of trouble have been discovered in this way. In making the test the hook end of the spring balance



CHICAGO ELEVATED—CONTROL AND JUMPER TEST SETS

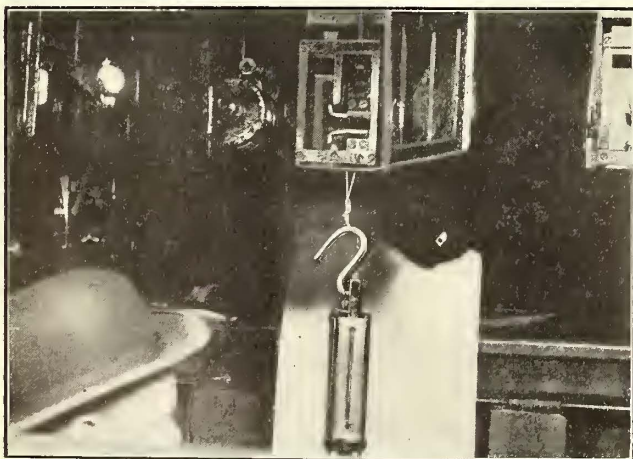
is fastened to the contactor switch mechanism. In this position the repairman reads the force required to pull out the contactor plunger. If the contactor coils are not short-circuited, a condition which the rheostat tests should show, the contactor, as a rule, will pull out at about 75 lb., providing the brass bushing and air-gap washer in the contactor are not unduly worn. This test indicates contactors which have worn air-gap washers or bushings. Contactors requiring a force of 100 lb. or more to pull them out are quite certain to cause trouble in service. Cases have been found where the air-gap washers were worn through and a 250-lb. force was required to move the contactor plunger.

Pneumatic control is also tested with the voltage-varying rheostat. If any particular magnet fails to operate in this test, the inspector resorts to his valve gage as a means of checking or adjusting the air-gap. This gage is shown on page 553. In making this check adjustment, the magnet cap and armature are removed, and the gage is inserted with the 0.026-in. slot over the end of the upper valve stem. With the gage in this position and the switch closed the valve should be tight, showing that the final gap is more than 0.026 in., if the valve is in good condition. By inverting the valve gage so that the 0.062-in. slot may be pressed over the valve stem, the lower valve should not blow, a condition indicating that the final gap is not more than 0.062 in. If the gap is too long the upper valve stem is trimmed, and if too short the upper valve stem is stretched by peening, or a new valve stem is inserted.

#### TRAIN LINE AND JUMPER TEST SET

A unique outfit for testing 600-volt control train line and jumpers, as used in Chicago, is shown at the left in the cut in this column. Essentially it consists of a transite-lined wooden resistance box with handles, containing two circuits, one for testing for open circuits and grounds, and the other for testing for short circuits. Circuit diagrams appear in the next column.

The method of inspection employed in these tests is this: After the ends of the jumper have been blown out they are connected to the two receptacles on the test set cabinet, shown diagrammatically. The current is turned on through a snap switch, and the jumper is twisted and shaken. If, during this operation, smoke or sparking is observed, or the pilot lamp on the top of the cabinet flickers, it is an indication that there is an open circuit or a ground to the plug casting.



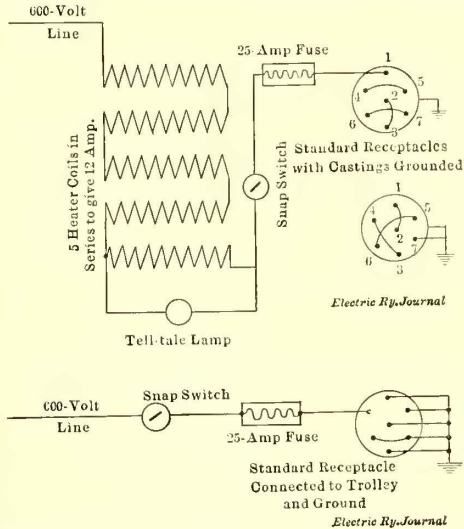
CHICAGO ELEVATED—SPRING BALANCE IN CONTACTOR TEST

the compressor may not be in operation at the time the test is made, since the rheostat is of insufficient capacity to operate them. After the testing outfit has been connected in this manner, the circuit breaker is tripped and reset on low voltage, the reverses are thrown and the car control is run up on one-half line voltage.

If the control repairman is unable to locate defects by varying the voltage on the contactors, the pressure



In testing for short circuits, one end of the jumper is inserted in a third receptacle on the test cabinet, which is in the circuit shown in the lower diagram. The jumper is twisted and shaken in the short-circuit test, and short-circuited wires are indicated by smoke, sparking or the blowing of the fuse in the test circuit. One jumper circuit is tested at a time, the jumper plug being removed and rotated until each of the seven cir-



CHICAGO ELEVATED—DIAGRAMS OF TEST CABINET CIRCUITS

uits has been connected to the live terminal. When jumpers are found to be in good condition, they are cleaned, the fiber ends are shellacked, and the cables and receptacles receive a coat of insulating paint. In a similar manner the train-line control cables for motor and trail cars are tested, two special jumper cables being provided for this purpose, one 8 ft. long and another 52 ft. long.

All jumpers and motor-control circuits are tested every month, and to designate the month, the receptacle lid and jumper head are painted a color corresponding to a month of the year. All jumpers are numbered, brass tags fastened to the cable showing the numbers. These are used in compiling records of tests.

As the life of a jumper cable is between two and one-half and three years, all are renewed after this period of service.

**TROUBLE BOARD RECORD**

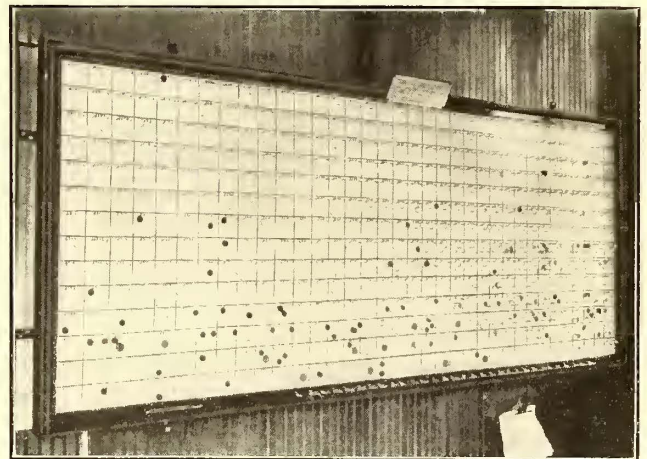
The trouble board which is shown in one of the accompanying illustrations was devised to keep track of the work of six divisions involving repairs in any one of six shops. Its purpose primarily was to obtain a record of troubles at each division headquarters, so that incipient defects might be cared for and a special effort made to remedy the cause of defects which occur in the same equipment more than once. This board, in connection with the interchanging of reports of car repairs between division headquarters, makes possible a record of every case of trouble. Each terminal shop keeps a daily log-book of cars repaired. Copies of the records are exchanged among the divisions, a separate record being made for cars from each division. From these records, as well as from those returned by each division shop force, the trouble board is maintained. Each day the foreman's clerk records upon it the information contained on all repair reports for cars operating out of his division tags of different colors and dates.

The board contains a number of squares representing the different car numbers, and in each square are two, three or five hooks. Each hook is used for a certain class of trouble, and each record tag is dated the day

the trouble was remedied. The squares containing two hooks are for trailers, one hook being for brake, and the other for bearing trouble. The squares containing three hooks are for trailers with control equipment, one hook being for brake, another for bearing, and a third for controller trouble. The squares containing five hooks are for motor cars, with one hook set aside for controller, another for motor, another for brake and compressor, and the fourth for bearing trouble. The center hook is for "no trouble found," or to indicate that the car has been overhauled.

Since each hook is used for a certain kind of trouble, the weaker parts of the equipment may be readily discerned, and if more than two tags representing one kind of trouble are mounted on the same hook of a particular car, it is inspected thoroughly to find a remedy. When a special effort has been made, a white tag is hung from this hook, the regular tag for the trouble record being red. If the same trouble is reported for the third time, the car is ordered out of service and to the main repair shops, where it is overhauled if necessary. When, as frequently occurs, trouble is repeated and no cause for it is found by the inspectors, a record is kept of it by a tag placed on the center hook of the particular car in question. When four tags representing "no trouble found" appear on the center hook, an expert is assigned to locate the defect.

This system enables the foreman to call the inspection-shop foreman's attention to the defect, and he in turn instructs the inspectors to give particular attention to the defect in question. In this manner inspectors are also educated up to the requirements of the service. Whenever a defect has occurred and two weeks have elapsed without its being repeated, the tags are removed from the board. A yellow tag, hung on the center hook, is used to indicate that a car has been overhauled. Like the other tags, this one bears the date on which the overhauling was completed.



CHICAGO ELEVATED—TROUBLE BOARD FOR 490 CARS

The trouble board also gives the division-shop foreman a comprehensive view of the condition of the equipment under his care, and automatically the defects which are repeated are indicated. The number of tags on a trouble board is an indication of the repair force efficiency, and at the same time the trouble-detecting ability of the various inspectors may be readily observed by the way in which they keep the board clear of tags. As shown in the accompanying illustration, a small shelf is provided along the base of the board, which is divided into thirty-one compartments, each containing tags of a particular number to indicate the day of the month.

# SPRINGFIELD SHOPS AND CARHOUSE

Economical Use of Space and Provision for Convenient Handling of Cars Are Features of the New Plant of the Springfield, Ohio, Railway

**E**XTENSIVE improvements in the plant of the Springfield, Ohio, Railway Company, a subsidiary of the American Railways Company, are now nearing completion. These include new shops and carhouse which have been built on a site superior in every way to the site of the old ones, which were on low ground subject to flooding. While some of the maintenance work of the Springfield Railway is now done and will continue for the present to be done in the shops of the People's Railway Company at Dayton, about 25 miles away, the new shops have been constructed with a view to handling all of this work ultimately. For the present, one motor-driven 36-in. lathe, one motor-driven 24-in. shaper, one power hack saw, one wet grinder, one dry grinder, with a few small tools, work benches, etc., have been purchased. These, with the tools from the old shop, will be sufficient to care for ordinary up-keep.

There are at present 37¼ miles of single track in Springfield, and the rolling stock consists of sixty-nine cars of all classes. Ten new semi-steel cars of steel girder construction were delivered the first of the year, making twenty of this type now in service. The railway serves a territory with a population of slightly more than 50,000.

## GENERAL LAYOUT

The shops and carhouse occupy a lot 190 ft. in width and averaging more than 900 ft. in depth, the shops being at the back of the lot, while at the front a large space is left for future expansion of the carhouse. The general layout is shown in the accompanying block plan, which is designed to call attention to the following features: The carhouse containing ten tracks and separated into a six-track and a four-track section by means of a brick curtain wall; the shops and storeroom, forming three sides of a rectangle; the heating plant centrally located.

The track layout is designed to furnish storage space and reasonable facility for moving cars from this car-

house to the shop department. The shops are at the rear of the carhouse, and a track loop skirts the east, west and south property lines, passing around the building.

## THE CARHOUSE

The carhouse, 119 ft. x 234 ft. in size, has the following among other features of special interest:

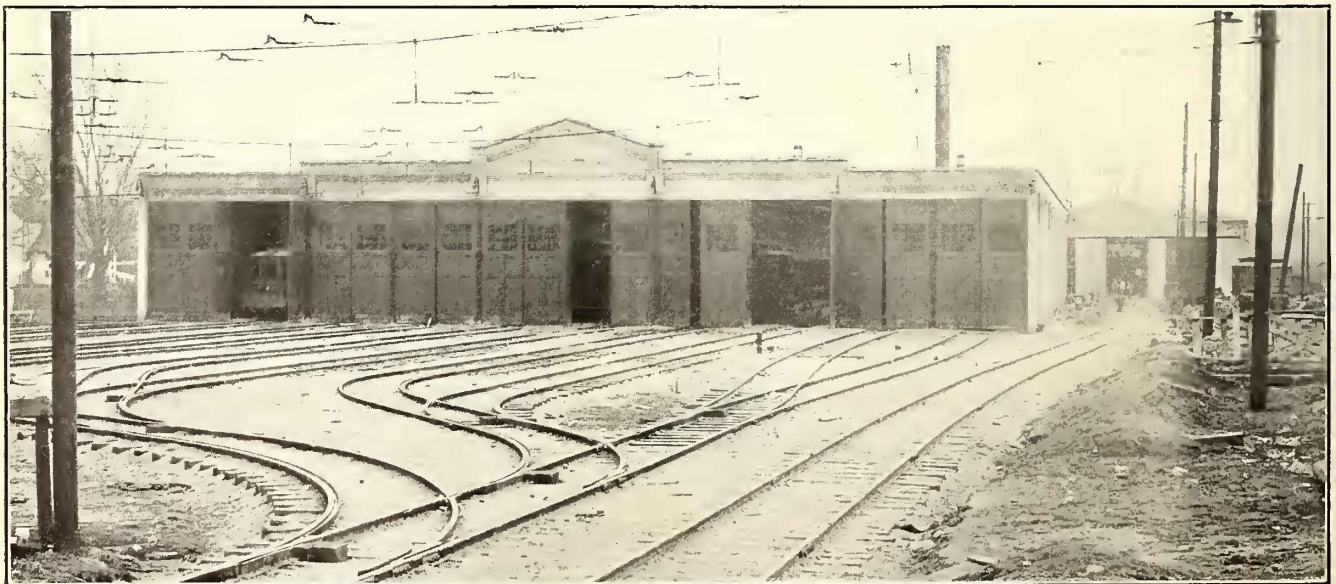
The building is divided into two-track bays by 2-in. curtain fire walls suspended between columns from the roof girders by steel straps. The wall comes down to within 8½ ft. of the floor. It is of concrete, plastered on both sides of a metal lath foundation, framed and supported as shown in detail in an accompanying illustration.

About two-thirds of the floor area is taken up with pits between which are reinforced concrete runways mounted on cross piers 12 in. thick spaced 12 ft. on centers. These piers also support the rails which form an integral part of the runway floor slabs. T-rails weighing 106 lb. per yard were used to furnish girder support for the cars between piers. The inner rails of parallel tracks are held to gage by tie rods on 4-ft. centers, and the floor slabs are molded down to their bases as shown in an illustration.

The floor slabs, which are well crowned, are 5 in. thick in the center. Concrete corbels cast solid with the floor slabs, engaging with the bearing projections on the piers, serve to keep the slabs in place. The concrete floor throughout the carhouse is surfaced with the Master Builders' hardener surface.

The roof of the carhouse is of 3-in. concrete slabs covered with a roofing cement known as Armorcote, applied directly to the concrete. This material has not been used on such large buildings before. It is a plastic, bituminous material. The frame of the building is of steel with 9-in. brick walls. Excepting in the outside walls, the steel work is exposed.

The north end of the carhouse is closed with wooden, swinging doors. While this plan appears somewhat re-



SPRINGFIELD SHOPS—VIEW OF CARHOUSE, WITH SHOPS IN BACKGROUND

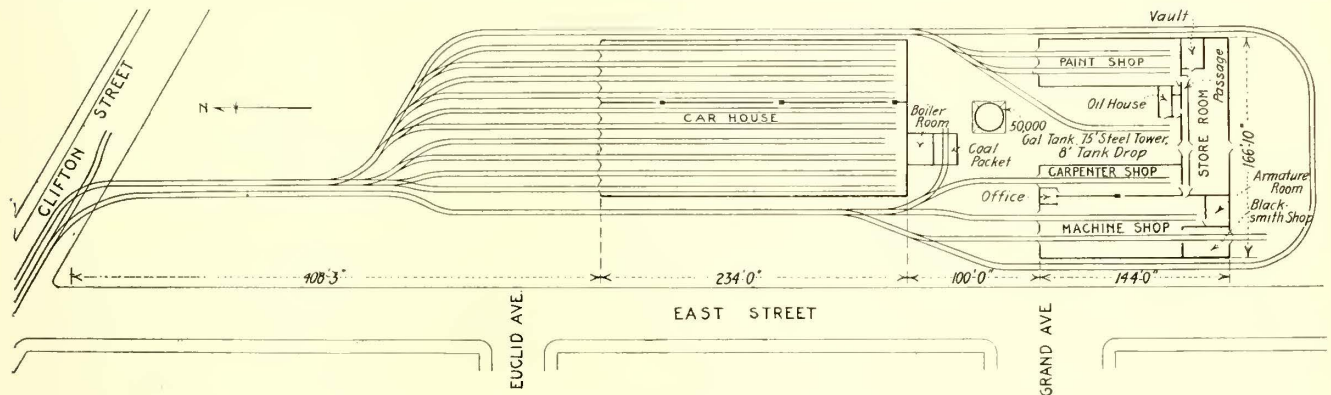
actionary it has been used here because the construction, with exposed steel work, is not strictly fireproof and it was considered essential to have doors that could be broken out easily if necessary.

THE SHOPS

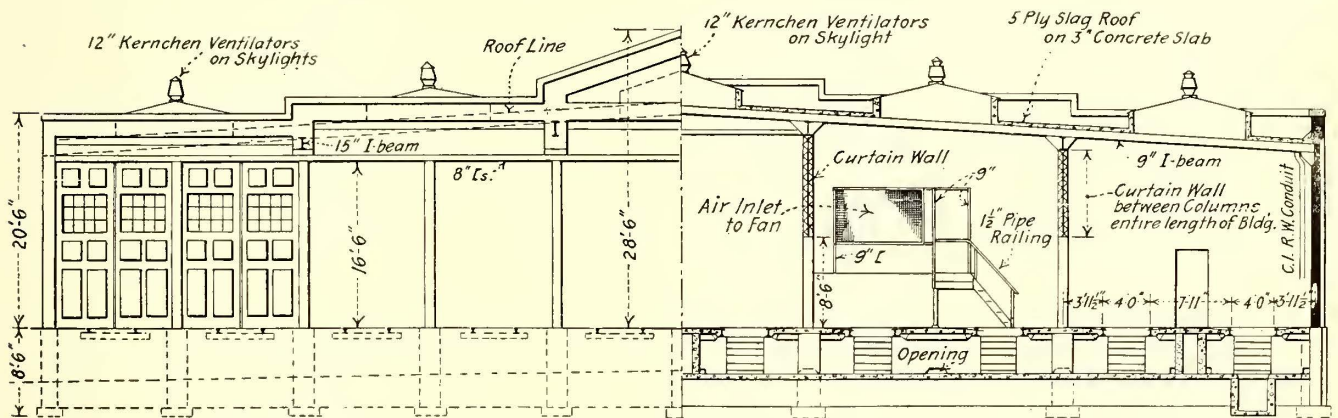
The shops are placed at the rear of the lot and are housed in a U-shaped building, of which the storeroom occupies the central portion, the paint shop one wing and the carpenter and repair shops the other. The storeroom is large enough to house supplies in sufficient quantities for the several departments of the company. A passageway along one side not only gives access to the storeroom but provides an inclosed passageway between the two wings of the shop building. By this arrangement the storeroom is readily accessible from all shops and at the same time is conveniently located for receipt and delivery of supplies to team trucks

or supply cars. A platform for the latter purpose is placed on the south side.

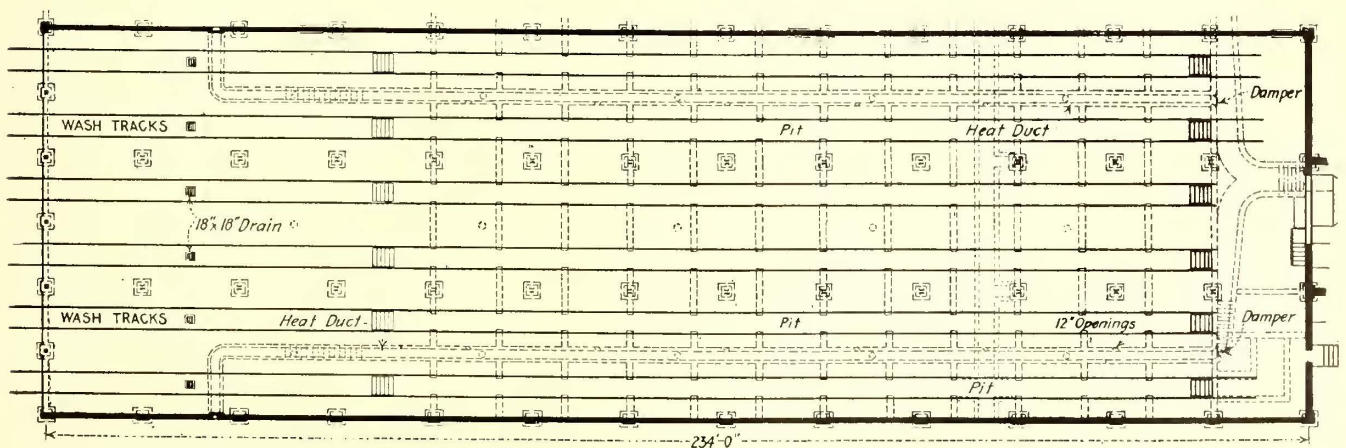
The storeroom is fitted with steel shelving, and at one end a fireproof vault for the storage of inflammable material, other than oil and paint, is provided. Oil and paint are stored in a separate room located in the angle formed by the paint shop and the storeroom. This paint and oilroom is inclosed with fireproof concrete walls and is located where it is reasonably well isolated for fire protection, but convenient for the handling of supplies, a track spur reaching the door. It is subdivided into a large oilroom, a paintroom and a closet opening into the paint shop for the storage of a day's supplies. The oilroom contains nine tanks, made by the American Oil Pump & Tank Company, with standard fittings and a convenient hoisting and track arrangement for rolling barrels over the tanks for filling purposes. The shelving in the paintroom is of steel check



SPRINGFIELD SHOPS—GENERAL PLAN OF PROPERTY



SPRINGFIELD SHOPS—HALF ELEVATION AND HALF VERTICAL SECTION OF CARHOUSE



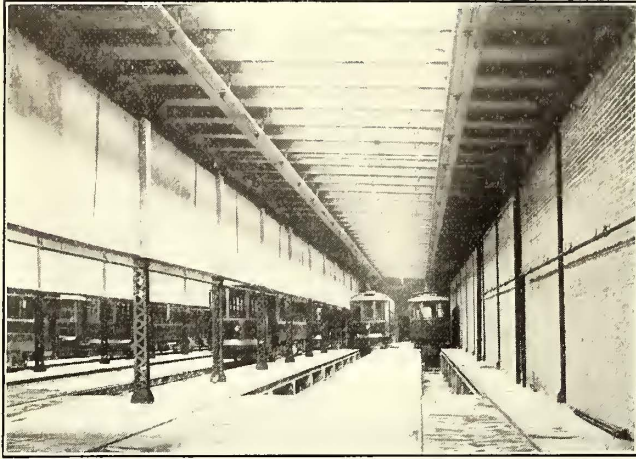
SPRINGFIELD SHOPS—PLAN OF ONE BAY OF CARHOUSE

plates riveted to skeleton steel brackets supported from 2-in. x 2-in. x 1/4-in. angle irons attached to the walls.

In the machine shop there are two tracks, one of which is served by a Columbia electric car hoist and a Columbia wheel drop. These types of hoist were described in the issue of the ELECTRIC RAILWAY JOURNAL

for Sept. 19, 1914, page 535. The wheel drop in the Springfield shops is driven by means of a crank, spur gear and chain instead of the motor drive described in the above-mentioned article.

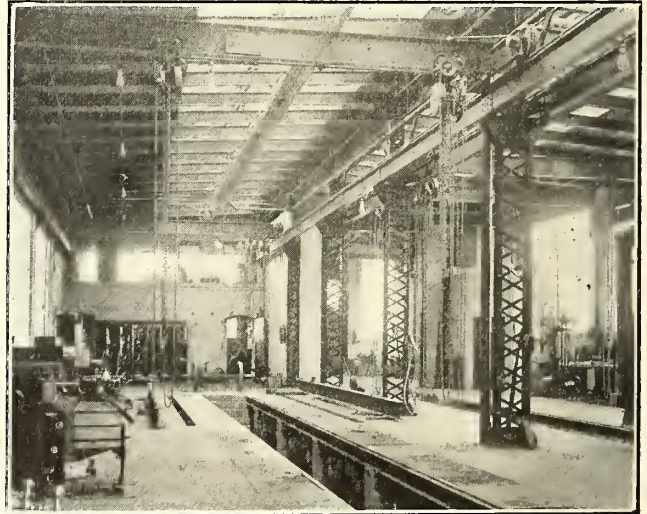
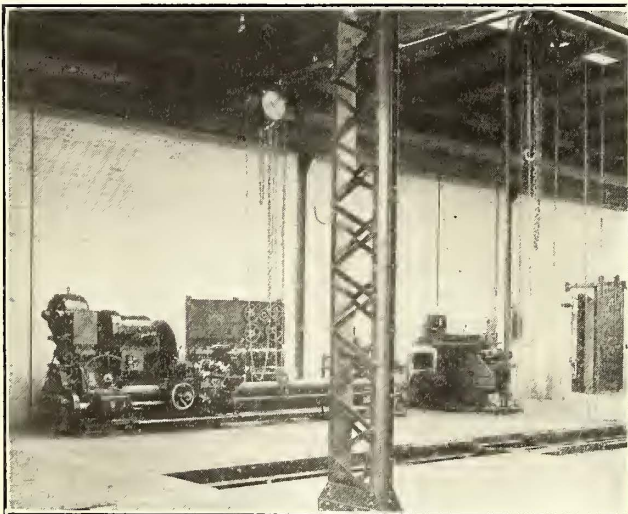
Each track is served by two light I-beam cranes equipped with two 4-ton chain hoists on each crane.



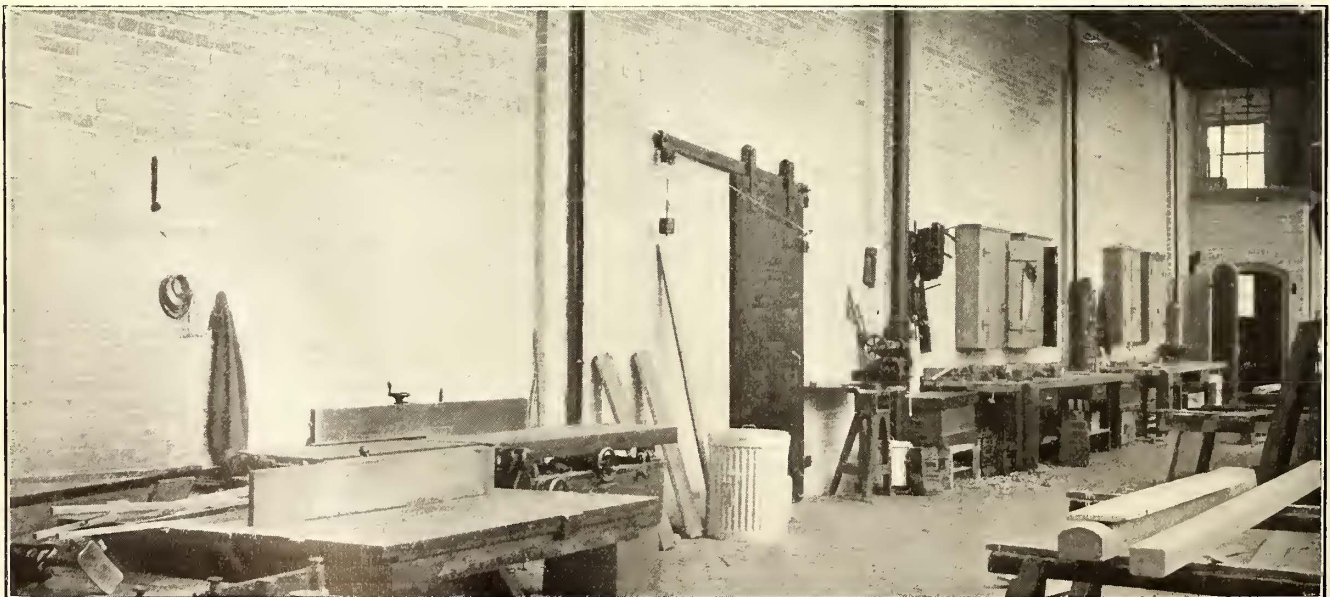
SPRINGFIELD SHOPS—VIEW IN CARHOUSE



SPRINGFIELD SHOPS—VIEW IN BLACKSMITH SHOP



SPRINGFIELD SHOPS—TWO VIEWS IN MACHINE SHOP



SPRINGFIELD SHOPS—VIEW IN WOOD SHOP

Practically all of the track in this shop and the adjacent wood shop is over pits. The machine, wood and paint shops and the storeroom are floored with hexagonal wood blocks. Special attention was directed by the designers to the location of shop toilet rooms, which are distributed so as to be accessible and to simplify the plumbing. The foreman's office, which is placed with its center line a continuation of the partition between machine and wood shops, is elevated and inclosed with glass, giving a direct outlook into both shops. The armature room is partitioned off from the rear of the machine shop, and over it is the drafting office.

All of the shop bays are brilliantly lighted through steel-framed windows, filling all of the span between columns. They are steam heated from the boiler plant described below.

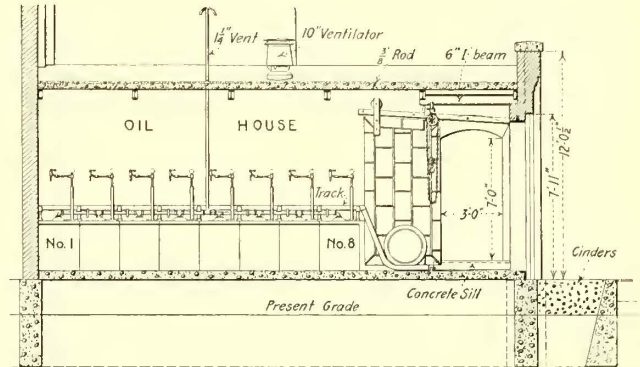
TRACK AND OVERHEAD CONSTRUCTION IN YARD

The two tracks entering the property from Clifton Street fan out into twelve tracks in front of the carhouse. The special work here is somewhat similar to that employed by steam roads, being of the standard short manganese construction. The switches and frogs are of manganese centers with rolled rail bolted on arms, the centers being cast in the shortest possible lengths with wing extensions ground to fit the various sections of rail on one side with a standard angle bar on the other. This construction has been used by the American Railways for some years for certain locations,

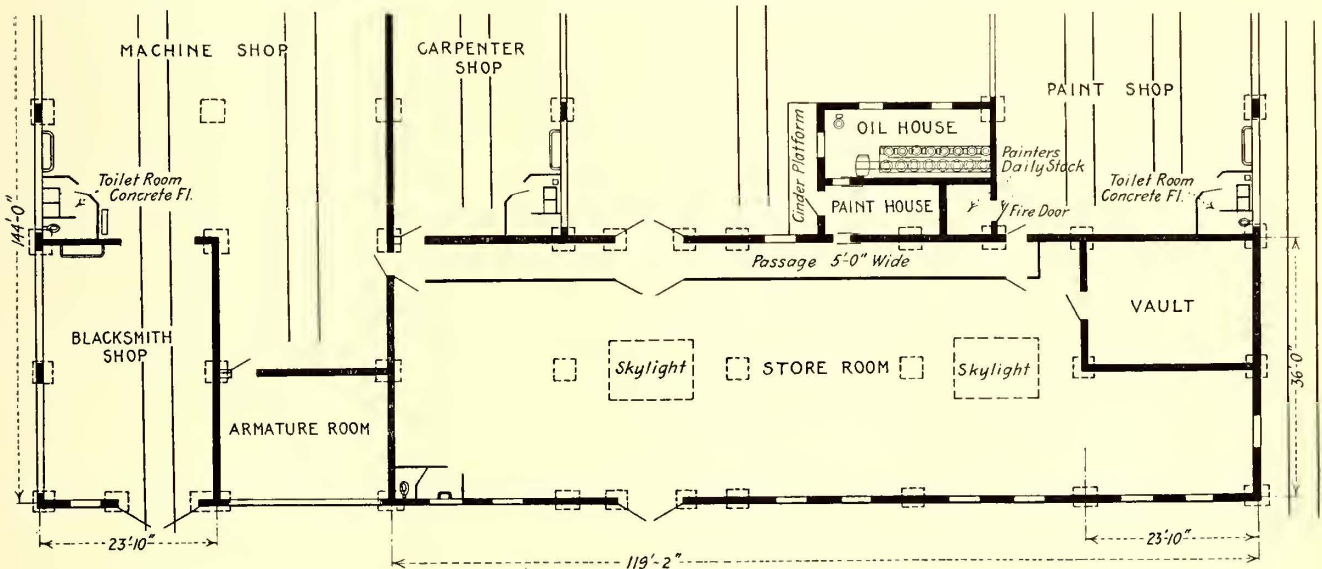
A spur track leads directly over this pocket. Another rectangular well alongside the boiler room foundation walls houses an ash conveyor and a bucket elevator, which takes the ashes from a pit in one corner of the boiler room floor and discharges them into an elevated spout.

The heating equipment consists of two 100-hp "Economy" boilers, which supply low-pressure steam to the shop buildings for direct radiation and to the carhouse heater, which is for indirect heating.

An indirect radiation heating system supplies heat to the carhouse. The air is forced through concrete ducts



SPRINGFIELD SHOPS—VERTICAL SECTION OF OIL ROOM



SPRINGFIELD SHOPS—PLAN OF STOREROOM AND IMMEDIATE VICINITY

particularly around carhouses. It insures long wear life and, being of standard T-rail construction, is not extremely expensive. The special work was furnished by the Indianapolis Switch & Frog Company, Springfield, Ohio.

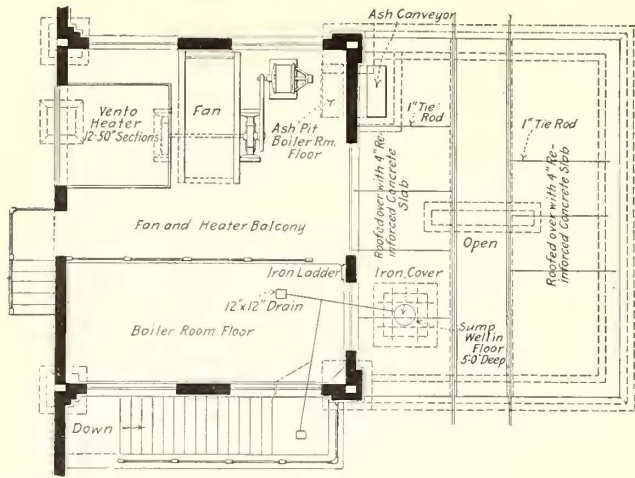
The trolley wire construction over this special work is supported from cross cables to provide a completely clear entrance way. These cables are carried on very heavy tubular steel poles and span the entire twelve tracks. The overhead construction is rendered adjustable by a liberal use of turnbuckles.

HEATING AND VENTILATING PLANT

The boiler plant has been designed with special reference to convenience in handling fuel and ashes. It is located in a 20-ft. x 23-ft. building and the boiler floor is 12 ft. below the carhouse floor level. Adjacent to it is a coal storage pocket with its top on ground level.

located on the pit floor under the runways and provided with side openings at frequent intervals. The warm air is thus uniformly distributed over the pit floor, rising through the pit openings. Beyond the pit section the ducts terminate in large wall openings a short distance above the floor.

The fan, of the B. F. Sturtevant No. 12 multivane type, is located on a balcony in the boiler house which adjoins the carhouse on the south. It is driven by a 15-hp d.c. motor, is 58 1/4 in. x 30 13/16 in. in size and its speed is 168 r.p.m. These data indicate a delivery capacity of 32,000 cu. ft. per minute against a 1-in. head. Air is drawn from the carhouse through a 7-ft. x 9-ft. screened opening in the south wall and through a "Vento" heater containing 2430 sq. ft. of heating surface. The heater is supplied with low-pressure steam from the boilers. The fan discharges vertically downward into the main duct.



SPRINGFIELD SHOPS—PLAN OF BOILER ROOM AND COAL STORAGE

The heating system furnishes excellent ventilation, which is supplemented by means of 12-in. Kernchen ventilators mounted on the Anti-Pluvius skylights and placed 50 ft. apart.

CARHOUSE, SHOP AND YARD LIGHTING

There are no wall openings admitting light to the carhouse, but a good distribution of skylights provides ample natural illumination. These are arranged in five rows, one over each pair of tracks. The rows extend over the entire length of the pits and partly over the washing floor. The latter is also partly lighted from glazed panels in the north-end doors.

The artificial lighting of the carhouse, as well as the shops, is provided entirely by incandescent lamps operating in series groups of the 550-volt railway circuit. These groups contain either five or twenty lamps each. The general lighting of the buildings requires seven circuits of 80-watt, 28.6-volt Mazda lamps, twenty in series on each, with film cut-out sockets to cut out and short-circuit burnt-out lamps. These lamps are kept burning all night.

The auxiliary lighting, which includes pits, offices, toilet rooms, individual machines, etc., is from series circuits of five 40-watt Mazda lamps each. The pit lighting is arranged so that by using a three-point switch and a plug receptacle one lamp may be cut out and a lamp on an extension-cord connected in its place for use in inspecting cars, trucks, motors, etc.

All circuits are controlled from a switchboard located in the foreman's office, which is separated from the shops by fire doors and has an outside exit. On this board are the usual circuit breakers, switches, meters,

etc. All wiring is in conduit, and lamps are protected with guards.

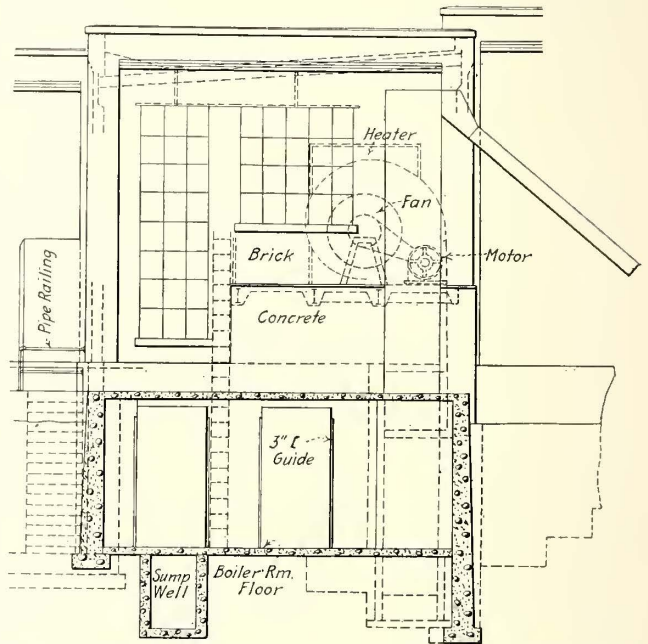
The lighting of the yards and around the buildings is included in the general scheme with twenty 80-watt lamps in series on each circuit. All fixtures are permanently fastened either to steel poles or to the buildings, out of reach of trolley poles.

FIRE PROTECTION

An 8-in. fire line connects with a 6-in. main on Clifton Street and runs nearly to the back of the lot, where a 50,000-gal. storage tank is located. From the main line 6-in. branches cover the property thoroughly, with outside hose houses and inside outlets.

In addition, the carhouse is provided for by means of a sprinkler system comprising rows of roof sprinklers over all tracks and a row under each curtain fire screen. A limited number of sprinklers are also distributed in the shops and storeroom.

As stated earlier, the Springfield Railway, of which

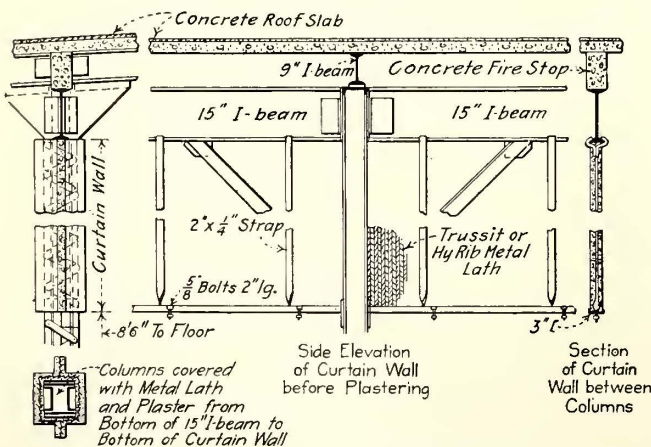


SPRINGFIELD SHOPS—VERTICAL SECTION OF BOILER ROOM

George C. Towle is general manager, is a subsidiary of the American Railways. Mr. Towle is located at Dayton. The designs for the new plant were made in the offices of the latter company in Philadelphia, Pa., under the direction of C. G. Keen, engineer of maintenance of way. The superintendent of construction in charge of erection was Andrew Schmittauer.

Collect Fares on Former Free Service Line

After twenty-two years of free service, the Louisville (Ky.) Railway has begun to collect fares on what is known as its "Goss Avenue loop," which has been maintained as a feeder for the Shelby Street line. Four cars have been operated on it. Several reasons prompted the company to change the status of the loop line. Though service was free, the cars were used more or less as a convenience by the people of the section and in a number of cases those who suffered accidents brought suits for damages against the company. Lastly the "jitney" has been meeting the loop cars and getting many of the passengers they discharged at the end of the Shelby Street line. The "jitney" is not responsible for the change, but was one of the circumstances considered in making it.



SPRINGFIELD SHOPS—DETAILS OF CURTAIN WALL

# SIGNAL MAINTENANCE METHODS

On the New York, Westchester & Boston Railway Ten Men Maintain Four  
Interlocking Plants and 110 Semaphore Signals at an  
Efficiency of 99.995 Per Cent

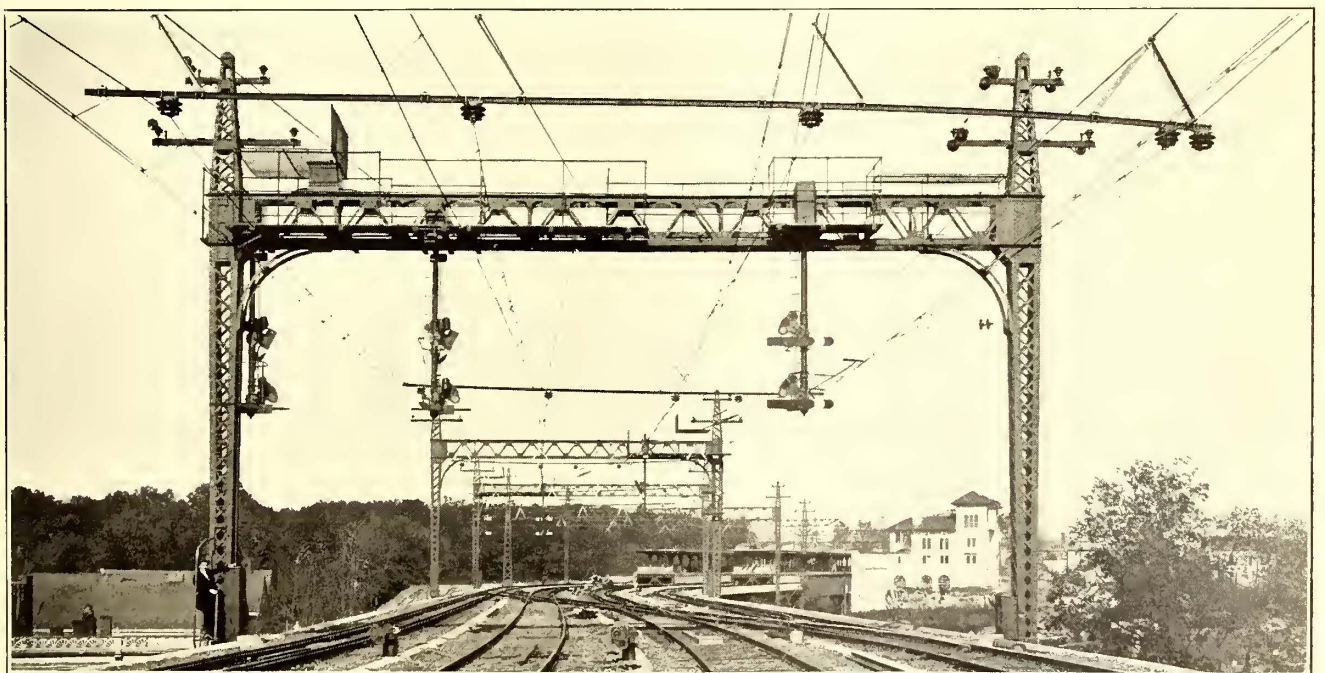
THE operating records of the signals of the New York, Westchester & Boston Railway show results that are typical for a high-speed suburban railway with moderately dense traffic. For the past year the record has been of the high order of 20,000 movements per failure. In the following paragraphs the maintenance methods are outlined, together with the scheme of organization, cost of maintenance and causes of signal failures.

The line, which has been described in previous issues of the *ELECTRIC RAILWAY JOURNAL* in considerable detail, has four tracks that extend between West Farms junction on the New York, New Haven & Hartford Railroad, to Columbus Avenue in Mount Vernon, a distance of about 7 miles. At Columbus Avenue a two-track line extends eastward to North Avenue in New Rochelle and another two-track line extends northward to White Plains, the two branches having respective lengths of approximately  $2\frac{1}{4}$  miles and 9 miles. At 180th Street, about 1 mile north of West Farms, is a thirty-five-lever interlocking plant with twenty-one working levers, from which are operated double cross-overs that serve the main car storage yard and the repair shop. At Columbus Avenue there is a twenty-nine-lever interlocking plant with twenty-two working levers serving the two branches, and the end of each one of the branches is an interlocking plant to provide for switching movements of cars at the terminal. The plant at New Rochelle has a seventeen-lever machine with eleven working levers and that at White Plains has a twenty-nine-lever machine with twenty working levers. All interlocking plants are operated by power and have electrically-operated dwarf signals and semaphore signals. The latter are controlled by the track circuits in advance as well

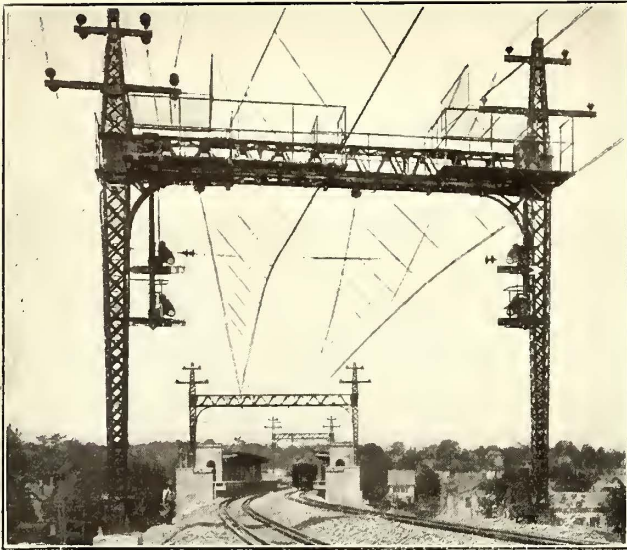
as by the interlocking levers, so that when the main-line switches are lined up the main-line signals within the limits of the interlocking operate semi-automatically, or, in other words, the signals are cleared by the lever and return to horizontal automatically after the train has passed.

The road is divided into blocks approximately 4000 ft. long, and practically every one of the signal mechanisms has two blades, one of which serves as the distant indication for the block in advance, and the other as the home indication. Sixty-cycle current is used owing to the fact that the propulsion current is of twenty-five-cycle frequency. The apparatus throughout is of the Union Switch & Signal Company's make. Two-position semaphores are used in all cases (except for four light signals in a short tunnel) and most of them are suspended from the catenary bridges. The semaphore arms are center-pivoted, and are counter-weighted to return by gravity to horizontal, each having a movement of 60 deg. from this position. The semaphore signal mechanisms are of the Union Switch & Signal Company's "Style B," the two arms on each mast being operated by the same motor and transformer that actuate two slot-arms, giving independent operation for each blade. The dwarf signals which govern slow-speed and reverse movements in the interlockings are of the simple solenoid type and require very little attention.

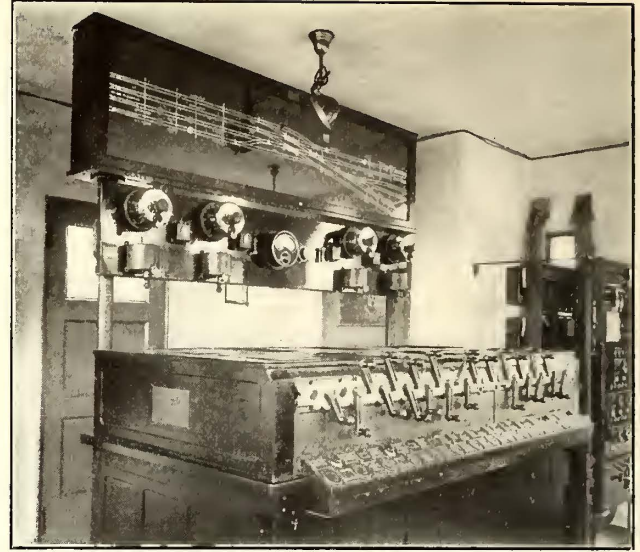
Power for operating the signals, switches and track circuits is obtained from the main feeders carrying 11,000-volt current. The signal current, which is delivered at 2200 volts, sixty cycles, single phase, has its change in frequency effected in a substation located at Columbus Avenue which contains two frequency chang-



WESTCHESTER SIGNALS—AUTOMATIC AND INTERLOCKED SIGNALS AT CROSS-OVER SOUTH OF 180TH STREET  
INTERLOCKING PLANT



WESTCHESTER SIGNALS—TYPICAL SEMAPHORE SIGNALS ON CATENARY BRIDGE FOR DOUBLE TRACK



WESTCHESTER SIGNALS—ELECTRIC INTERLOCKING MACHINE FOR SWITCHES AT COLUMBUS AVENUE JUNCTION

ers, each consisting of a 37-kw single-phase generator, mounted on the same shaft and driven by a three-phase induction motor.

#### ORGANIZATION

Altogether there are 110 semaphore signals on the line and these, together with the four interlocking plants that are in continuous operation, are kept up by a force of ten maintainers. The signal organization is headed by F. Zogbaum, engineer of maintenance New York, Westchester & Boston Railway, who has general supervision of the track overhead lines, buildings and other permanent equipment of the company, and to him the general foreman of signals, C. E. Arnold, reports direct. Under the general foreman of signals are nine maintainers, one maintainer's helper, and one substation foreman. Of the maintainers, eight are assigned to definite sections of the road, while one is called a "relief man" who works at any point on the line where his services are required and who takes the place of any maintainer that is laying off. The helper works under the orders of the relief man.

Six of the signal maintainers work twelve-hour shifts, one day man and one night man being assigned to each of three sections into which the road is divided. One of these sections includes the interlocking at 180th Street station and all signal apparatus between 180th Street and the West Farms junction, giving a total of eighteen high signals and 0.80 mile of four-track route in addition to the interlocking plant and dwarf signals. The second section includes the North Avenue Tower in New Rochelle and all signal apparatus on the New Rochelle branch as well as the signal apparatus south of the Columbus Avenue interlocking plant as far as the territory covered by the previously described section. This gives forty-six high signals and 7.63 miles of route to be maintained in addition to the small interlocking plant at New Rochelle.

The third section includes the White Plains interlocking plant and the signal apparatus on the White Plains branch which is maintained as follows: The day maintainer covers from White Plains to a station 6.64 miles south and has twenty-six high signals to inspect. In addition to his regular work of inspection and repair,



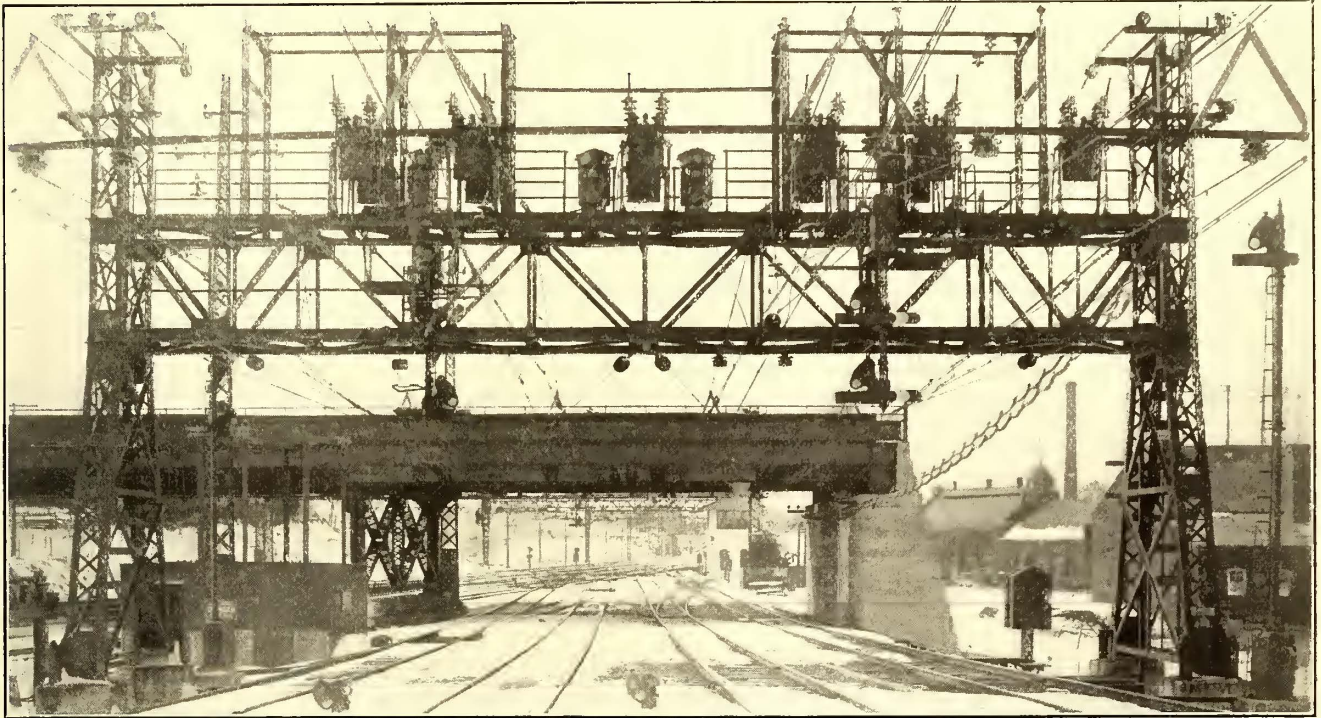
WESTCHESTER SIGNALS—CROSS-OVERS AND STORAGE YARD SIDING NORTH OF 180TH STREET INTERLOCKING PLANT



this maintainer answers calls in case of trouble between the south end of this section and the limits of Columbus Avenue interlocking, 2.28 miles further south, including eight additional high signals. The night maintainer covers the entire section from White Plains to the limits of Columbus Avenue interlocking and thus is responsible for a route of 8.82 miles and thirty-four high signals. The above-mentioned section of 2.28 miles of route and eight high signals is normally maintained by the day maintainer at the Columbus Avenue interlocking plant.

These three sections include the entire road with the exception of the interlocking at Columbus Avenue, and this plant is maintained by three men who act also as substation operators, one of them being the previously-mentioned substation foreman. These men work ten-hour shifts, and there is an overlap of four hours be-

train dispatcher's wire runs to each tower and, in addition, connects into outlying phones located at station platforms and on catenary bridges between stations where the distance warrants it. The telephone system is of the Western Electric inter-calling type and is arranged with a number of selector relays. Twelve per cent of the telephone line mileage consists of seven-pair, No. 19 gage cable; 33 per cent, fifteen-pair, No. 10 gage cable; 46 per cent, twelve-pair, No. 10 gage cable, and 9 per cent, ten-pair, No. 10 gage cable. There are twenty-five P. B. X. phones, seventy jack-box phones, which include stations, towers and outlying telephones, and twelve magneto phones, making a total of 107 phones of all types. The power used for the telephone system is obtained from a central storage battery which is charged by the same motor generator that is



WESTCHESTER SIGNALS—VIEW OF JUNCTION WITH NEW HAVEN TRACKS SHOWING SIGNALS MOUNTED ON SECTIONALIZING BRIDGE AND ON INDEPENDENT MASTS

tween 1 p. m. and 5 p. m. when two men are on duty at this point. This overlap provides an opportunity for the maintainer to inspect and repair the automatic signals within the previously-mentioned section, 2.28 miles north. This man, however, is not subject to calls from this territory, as the emergencies are cared for by calls upon the maintainers at White Plains.

The work of the signal maintainers listed above is confined generally to inspection and the lightest kind of repairs. Heavy repairs are done in all cases by the relief man and his helper. The latter work includes all replacements and any work which requires the removal of apparatus to the maintainer's shop which is located at the 180th Street station.

A telephone system has been installed on the railway company's line in underground ducts, and the repairs on this are kept up by one man who is separate from the signal maintenance department and who reports direct to the engineer of maintenance. This telephone repairman does all the repairs to wiring and apparatus, very little material being sent to the manufacturer for overhauling. In case of heavy cable work, the repairman is assisted by electricians from the line department, as such work is only occasional in character.

This telephone system is used for train dispatching as well as intercommunication between stations. The

used for charging the signal batteries, the motor generator receiving power from the signal mains.

#### INSPECTION METHODS

As mentioned above, the work of the maintainers who are assigned to certain districts is confined to inspection, and it is the rule of the road to examine everything once each month, although the electric locks on the interlocking machines are tested once each week. In making inspections the maintainers travel over their district on the regular trains, which are operated on a very short headway. No gasoline speeders are used because of the short distances to be covered. The night men who work between the hours of 1 a. m. and 5 a. m., when no trains are run, are assigned each day to work that will keep them in one locality, so that there is no necessity for their moving about when the trains are not running.

Whenever failures occur they are reported at the end of the run by the motorman to the dispatcher, who communicates with the proper maintainer and has the signal repaired at once. It is the endeavor, however, to make the inspection sufficiently thorough so that failures may be anticipated, and in the regular routine the relays are tested by tilting them over to see if they move freely, the impedance bonds are examined for heat-

ing and the transformers are opened to see how much oil they hold and whether taps are in good condition.

As an aid to the maintainers the maintenance department has recently published a book of permanent instructions for the proper maintenance of switch and signal apparatus. This book contains such items as the following: "The signal apparatus should be carefully inspected and cleaned, especially movable parts of the mechanism, care being taken to see that these do not get tight from lack of lubrication or gummed from the use of too much oil. The bearings should be oiled at least once a month, the oil should not be applied too lavishly and any surplus must be wiped off. Wire connections on binding posts should be examined to insure that the wires are not ruptured, and it should be observed that all connections to moving parts have proper freedom and do not have sharp ends that are likely to catch in other parts of the mechanism. Slot contacts and the roller should be wiped once a month with a piece of cloth or chamois skin. Relays that are found to be working improperly should be removed for test and inspection. When a relay is turned partly over all the contacts should make simultaneously and when energized with the normal operating current, as shown on the label, there should be about 1/32-in. slide in the contact points. The springs of the contact fingers may lose tension and cause the contact to get out of alignment. The armature should have about 1/64-in. end-play on the trunnions. Efforts to adjust a relay should not be made under any circumstances."

Unbalancing is treated as follows: "With a.c. track relays unbalancing of the track circuit above a certain amount is liable to cause the relay to open or to prevent it from making up. This may be caused by a defective power return, such as defective bond or broken rail. It will generally be manifested by excessive heating of the relay and track transformer. Unbalancing is liable to cause warping of the relay frame, owing to the excessive heat of long duration. The power return should be looked after where there is any indication of unbalancing."

A general rule book of the maintenance department is also published. This includes rules for the guidance of the signal foreman and for the signal maintainers with regard to traffic, such as that signals must be kept in a horizontal position while repairs are being made; that during severe storms of sleet or snow signal maintainers are required to assist in keeping switches, signals and interlockings in proper working order; that when trackmen are laying new rail or making changes in the track that affects track-circuit or interlocking connections the maintainer must be present to see that the rails are properly bonded and that the interlocking connections are restored; and the like.

#### REPAIR METHODS

As mentioned before all repairs aside from inspection and such work as making wiring connections, cleaning and oiling apparatus and similar operations are done by one maintainer, called the relief man, and one helper. The relief man is located in a small shop at the 180th Street station, where the more delicate pieces of signal apparatus are repaired. The heavier parts of the mechanism which involve machine or blacksmith's work are repaired in the near-by car-repair shop.

All of this repair work is done by the railroad company's forces and none is sent out to the manufacturer with the exception of the manufacture of such small special parts as detector locks for the interlocking, slot-arm latches, etc., whenever these are needed for replacement. In general, all repairs are effected by replacing the defective parts with others in good condition, the piece requiring repairs being removed and brought to

the shops. In this connection it is interesting to note that the installation is of such high grade and the maintenance methods so thorough that no apparatus has been in need of anything more than really minor repairs during the three years that it has been in operation. No relays have required complete rewinding, nor have there been any serious failures resulting in extended damage to signal mechanisms, motors or transformers. Even the blades for the semaphore arms, which are made of wood and covered with enamel paint, have not yet required repainting.

The relief man and his helper, in addition to making repairs and relieving maintainers who may be off duty, are assigned to all construction work that is done on the line. Since the road was constructed two spur sidings have been installed and equipped with switch indicators. These switch indicators, together with the electric locks and other accessories, were supplied by the Union Switch & Signal Company, but the scheme was laid out by the railway company, and since the installation of this system for outlying switches the operation has given satisfaction in every respect.

Repair material is kept in the general storehouse of the railway company at 180th Street, rather than in the signal maintainer's repair shop. The material on hand

N. Y. W. & B. RY. CO.		
MAINTENANCE OF WAY DEPARTMENT		
		Date _____ 191__
LOCATION	Hours	LABOR PERFORMED
To be filled out daily and forwarded to Engineer of Maintenance Office		(Sign) _____

WESTCHESTER SIGNALS—DAILY WORK REPORT MADE BY MAINTAINERS

consists of one complete signal mechanism for a two-blade signal and one for a single-blade signal. There is also one of each of the two styles of switch movement that are installed in the interlockings. For the automatic signal equipment there are four double-rail transformers, one single-rail transformer, two line transformers and two track circuit transformers. There are six line relays, ten track relays, and eight d.c. relays for the interlocking plants, together with four impedance bonds. This equipment has been found to be more than necessary for making prompt repairs, although there are 483 relays in operation on the line.

The signal maintainers are required to make out daily and forward to the engineer of maintenance statements of the work that they have done during the day. These statements are made out on the form reproduced in the accompanying illustration. In addition each signal maintainer turns in a report of the regular monthly inspection which he is required to make. This is also shown in one of the accompanying cuts. The general signal foreman is required to make a thorough inspection of the line in general every two months. This report provides for a division of the 18 miles of line into six sections, and for each section the following items are covered: Signal ladders, signal platforms, signal-platform trap doors, sectionalizing boxes for interlockings, locks on transformer housing, feeder protection screens, danger signs at substations and danger signs at tower transformer locations. As shown by the list of items, this report is largely for the purpose of

safety to the employees and to the public. The results of the weekly inspection of the interlockings by the maintainers are shown on cards which are turned into the office of the engineer of maintenance and filed in a card index.

**MAINTENANCE RECORDS AND COSTS**

As before mentioned, when failures occur they are, as a rule, first discovered by the motormen, who report

New York, Westchester and Boston Railway Co.	
MAINTENANCE OF WAY DEPARTMENT	
FAILURE REPORT	
Date, _____ 191	Signal, _____
Reported by _____ Time _____	Switch, _____
Time Arrived at Apparatus, _____	Telephone, _____
Time Failure Report received, _____	Electric Light, _____
Time Failure Repaired, _____	Electric Elevator, _____
Time Reported to Superior Officer, _____	Location, _____
Cause of Failure: _____	Repaired by _____

**WESTCHESTER SIGNALS—FAILURE REPORT FORM MADE OUT BY SIGNAL MAINTAINERS**

them to the dispatcher at the end of the trip. The dispatcher communicates with the proper maintainer, who proceeds at once to the defective signal and remedies the difficulty. As soon as the failure is overcome the maintainer fills out a form in duplicate, as shown in the accompanying illustration, the original being sent to the office of the engineer of maintenance. The carbon is sent to the general foreman of signals, who makes a further investigation in case this appears to be necessary. These failure reports are checked against the train detention reports which are made up by the transportation department and they serve as a basis for the daily report which is made by the engineer of maintenance to the president of the road with regard to the operation of all of the apparatus covered by his several departments.

Table I shows the causes of signal failures occurring during the last three months on record. In this a failure is considered to be any improper operation of a signal, but is considered independently of the number of trains that are stopped by the defective signals.

**TABLE I—CLASSIFIED SIGNAL FAILURES ON NEW YORK, WESTCHESTER & BOSTON RAILWAY**

	Nov.	Dec.	Jan.
Fuses blown	4	1	1
Power off and low voltage	4	1	1
Relay contact not making	2	2	1
Friction clutches on switches	2	1	1
Broken wires	2	1	1
Creeping switch points	2	1	1
Brakes on signal motors	6	1	1
Slot armatures	6	1	2
Lights burned out	1	1	2
Resistance coils burned out	8	5	5
Unknown and other causes	1	3	1
Motor contacts	1	3	2
Grounded wires	1	3	1
Car derailments	1	3	1
Snow	1	1	1
High-tension fuses	1	1	1
Resistance tube in track circuit	1	1	1
<b>Totals</b>	<b>26</b>	<b>15</b>	<b>16</b>

**TABLE II.—TRAIN DELAYS CAUSED BY SIGNALS, NEW YORK, WESTCHESTER & BOSTON RAILWAY**

	Failures	Delays	Minutes
March, 1914	15	0	0
April, 1914	20	20	89
May, 1914	19	27	125
June, 1914	10	1	8
July, 1914	11	34	114
August, 1914	27	102	309
September, 1914	21	23	48
October, 1914	10	1	3
November, 1914	26	2	8
December, 1914	15	10	71
January, 1915	16	1	3
February, 1915	14	1	2
<b>Total for year</b>	<b>204</b>	<b>222</b>	<b>780</b>

The record of trains stopped appears in the detention report of the transportation department, the signal department being concerned only with the operation of the signal as a piece of mechanism. No false-clear condition has occurred on the road since it began operation three years ago.

Table II shows the number of signal failures by months occurring during the current year, as well as the train delays that were caused by the signals. In this table the large number of delays that appear in May were due to grounded signal feeders and therefore were not all directly chargeable to signal mechanism. The large number of delays appearing in August were also due to grounded signal feeders as well as to high-tension fuse boxes and therefore were not chargeable to signal mechanism, although technically they had to be so charged.

All told, during the year 1914 there were 204 failures and 4,200,000 signal movements, corresponding to a

New York, Westchester and Boston Railway Co.	
MONTHLY INSPECTION	
OF ALL SIGNAL, SWITCH AND TOWER APPARATUS	
to be forwarded to Engineer of Maintenance Office	
not later than 7th day of each month	
I have made a thorough inspection of all Signal, Switch, and Tower apparatus on my territory and find it to be in condition as follows:	
CONDITION	REMARKS
Machine, and Spring Combination	
Moveable Frog Points	Details and Switch Points
Lock Rods and Locks	
Switch Movements	
Friction Clutches	
Signals and Signal Mechanisms	
Switch Indication Locks	
Signal Indication Locks	
Time Releases	
Emergency Releases	
Relays, Wires and Terminals	
Boat Legs and Connections	
Impedance Bonds	
Track Transformers	
Lane Transformers	
Master Controllers	
Circuit Breakers	
Storage Batteries	
Signal Lamps	
External Resistances	
Month _____ date _____ year _____	Signature _____

**WESTCHESTER SIGNALS—MAINTAINERS' MONTHLY INSPECTION REPORT**

figure of one failure to 20,700 movements, or an efficiency of 99.995 per cent. This applies to all semaphore signals whether within limits of interlockings or otherwise but does not consider dwarf signals. The number of signal movements as stated for one year's operation includes the number of complete operations of each of the blades of each two-blade signal. The costs of maintenance for the signal department are subdivided between interlocking plants and two-blade automatic signals that are outside of the limits of interlockings, these being \$1.95 per two-blade automatic signal per month, and \$5.01 per interlocking function per month. The latter figure covers the whole function, consisting of the lever, the interlocking, the switch, the switch operating mechanism and the governing signal complete. The costs of supervision as well as labor and material are included in both figures. The total cost of maintenance per track mile is \$23.67 per month, and the cost per function (either automatic signal or interlocking) is \$3.32 per month, including all functions of the signal substation.

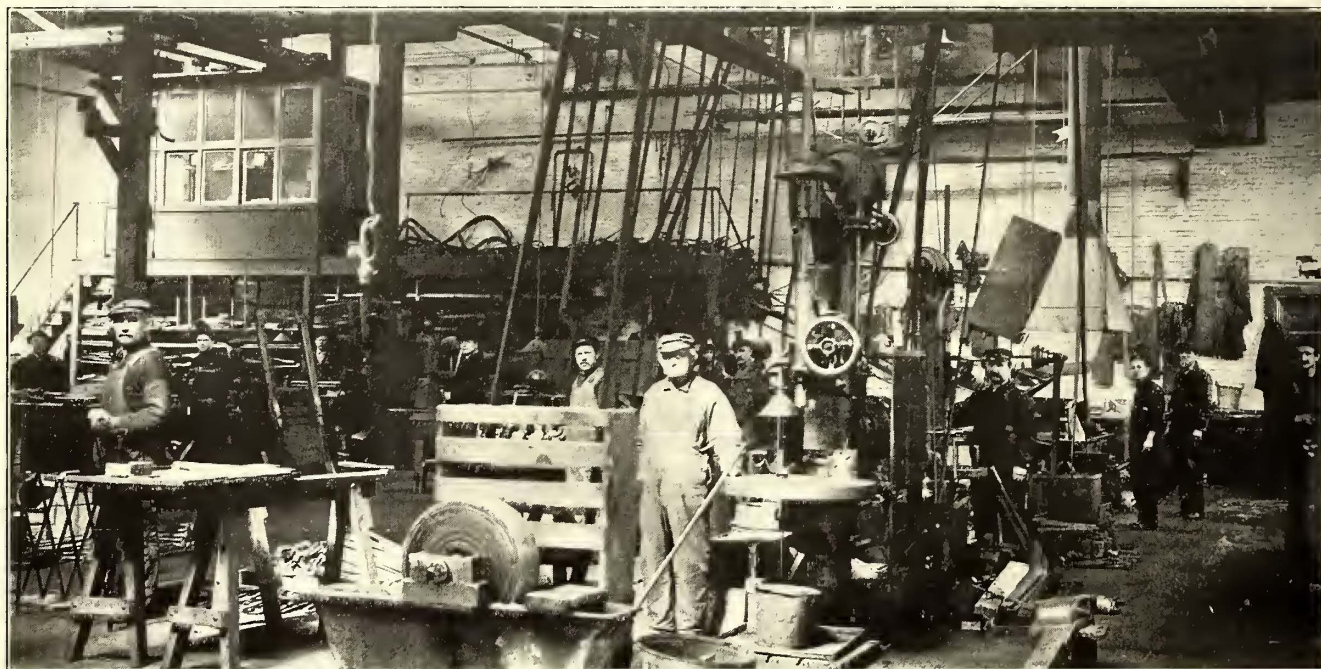
# STEEL CARS ON THE LONG ISLAND

Ten Years' Experience with All-Steel Construction Has Shown That  
Deterioration Is Practically Negligible and That Routine  
Repairs Are Minor in Character

STEEL cars have been in service on the Long Island Railroad since operation of the electric zone began on July 26, 1905, and, owing to the ten years of service that the original cars have undergone, they afford an excellent example of the lasting qualities of steel construction. In so far as the framework of the car bodies is concerned, the steel cars generally have required less repair work than the wooden cars on the same line. All of the cars are in first-class condition, and it is the expectation of the management that they will last much longer than wooden ones, although the life of a wooden passenger car on the same road is between twenty and thirty years. Summed up, the experience of the Long

purchased during 1909 and 1910, together with some baggage cars, but because of differences in coupler and platform heights they could not be operated in trains with the original 41-ft. cars, nor with the wooden trailers, and they have been used separately in all-motor-car trains.

The later type of car is equipped with two 225-hp motors mounted on one truck, and these give an acceleration of 1 m.p.h.s. with a maximum speed of approximately 54.5 m.p.h., the gear ratio being 25:48. The motors of the original cars are of 200 hp. with a gear ratio of 25:58, as the cars are designed to haul trailers. These motors give the same acceleration as in



LONG ISLAND STEEL CARS—VIEW IN SHEET-IRON SHOP SHOWING POWER-DRIVEN MACHINE TOOLS

Island Railroad in maintaining steel cars has been very satisfactory, and an account of the nature of the repair work that has been found to be necessary and of the methods followed for its accomplishment should be of interest to those considering the purchase of steel cars for heavy interurban service.

## CHARACTER OF THE STEEL EQUIPMENT

The 134 cars that were originally placed in service on the Long Island Railroad's electric zone were described in the *ELECTRIC RAILWAY JOURNAL* for Aug. 11, 1906. They were of the side-girder type of construction with composition floors and roofs, having a length of 41 ft. over corner posts, a total weight of 82,000 lb. and a seating capacity of fifty-two. These cars were operated in trains with wooden trailers.

In 1909 a new type of steel motor car was introduced, this being 54 ft. 6 in. over corner posts and having 5-ft. vestibules, measured over the couplers, the doors being 3 ft. wide. These cars weighed 107,000 lb. each, seating seventy-two passengers. Two hundred of them were

the case of the larger cars but the maximum speed is approximately 47.5 m.p.h.

The electric zone on the Long Island Railroad constitutes but a part of the total mileage, although the maintenance of all of the equipment of steam locomotives, coaches, rapid transit cars and trolley cars comes under a single department that is headed by G. C. Bishop, superintendent of motive power. On the lines at the east end of Long Island, which are operated altogether by steam, the passenger-coach equipment is originally of wood, although steel construction is displacing this rapidly at the present time. Both the steel and the wooden cars are repaired in the same shop, and this affords an excellent opportunity for comparing the work required for the different types.

## ORGANIZATION AND EQUIPMENT FOR STEEL CAR REPAIRS

When the electric zone began operations in 1905 the car repair shop had been in operation for some time. The road, therefore, was prepared to handle wooden car equipment, and the organization for this purpose was

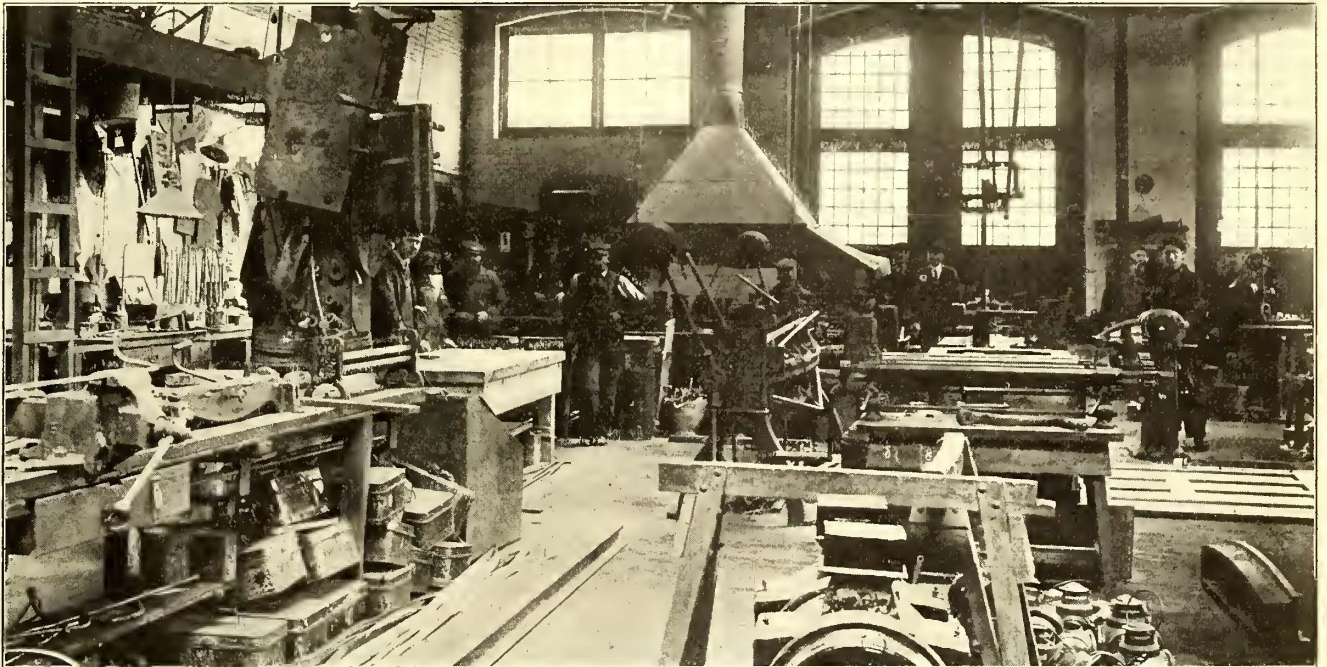
complete. But with the introduction of the large number of steel cars required for the electric zone it became necessary to provide a new class of workmen to make repairs that were peculiar to steel construction.

These steel-car repairers were put on about one year after the receipt of the steel cars. The original gang consisted of two structural iron workers and their helpers, experienced men being employed because they were familiar with the ordinary operations involved in riveting and in working structural shapes and plates. The helpers, however, were recruited from the existing shop force, and it was found that after these men had worked under the direction of the experienced gang leaders for a comparatively short time they acquired a considerable degree of proficiency in the use of the steel-worker's tools. Later on, as the original leaders drifted away, they were replaced by car repairers who had become experienced in handling steel. At the present time the force is composed of three workmen and their helpers, of whom all were broken in to the work in the railway repair shops.

These men are classed as iron workers and they are included as part of the tin-, pipe- and sheet-iron-shop

riveting is done pneumatically and drilling is done either by compressed air or by electric drill. Since the new forms of welding apparatus have been available the electric welder has been used to some extent, and the oxy-acetylene flame also is used extensively both for cutting and for welding on account of its convenience in handling. In general, however, riveting is used for all heavy repair work in preference to the weld on account of its greater reliability. A certain amount of soldering is done on the light-steel sheets of which the interior finish and the doors are made up, although this is being gradually discontinued because it does not hold well, the weld being preferred for all except temporary work. The fuel-oil torch also is used for emergency repairs and where bending of heavy members has taken place. There have been several cases of distortion of the center sills, to which, on the Long Island's steel car, the center plates are attached, there being no real body bolsters. Under these circumstances it has been found possible to heat the sills in place, and either jack them or hammer them into alignment.

The sand blast is used to a limited extent, but whenever rusting of any part of the framework of the car



LONG ISLAND STEEL CARS—VIEW SHOWING END OF SHEET-IRON SHOP ASSIGNED TO TINSMITHS' WORK

force that makes repairs upon the steam locomotives, passenger coaches and electric cars that are served by the general repair shop. This force, it may be said, is drawn upon as necessity arises for repair work on the steel car bodies, so that these six men do not cover all of the work that is needed but represent only the specially trained men that have had to be developed with the introduction of the steel car. At the present time approximately 600 steel cars are cared for at the repair shop and of these about two-thirds are used in the electric zone service.

Generally speaking, the steel car on the Long Island Railroad has involved the use of a number of new hand tools but practically no new machine tools, a large cornice-brake being the only one of the latter that was needed. This was purchased for the purpose of making up sections of the thin steel, about 1/32 in. thick, that is used for the door sheathing and for the interior finish of the car.

In all cases it has been found economical to use power-driven hand tools wherever they can be operated. All

has taken place the blast is applied only locally to clean off the surface and leave it in suitable condition for inspection and repainting of the metal underneath.

#### CHARACTER OF ROUTINE REPAIR WORK

Aside from painting, which it may be said costs about the same for wood as for steel on the Long Island Railroad, the routine repairs for the framework of the steel car bodies are almost negligible. This, however, is not intended to include that which may be classed as car-body equipment, such as doors, door-operating mechanisms, windows, interior trim and the like. In general the actual cost of any job, such as reflooring platforms or renewing doors, is cheaper with wood than in steel, but heavy repairs are required more often on the wooden cars, and this offsets the cheaper repairs.

The repairs to some types of the steel doors constitute a very material item of the routine repair expense, as it has been found that rainwater works down between the glass and the beading at the lower edge of the door sash and is trapped in the space between the

two thin sheets forming the door stiles and door rails. The result is that rusting occurs from the inside of the door outward, appearing at joints or at the edges of the panels or other places where the metal is subject to distortion or vibration. Approximately speaking, twenty-five doors have to be rebuilt by being equipped with new stiles and bottom rails in the course of a year, owing to deterioration from this cause.

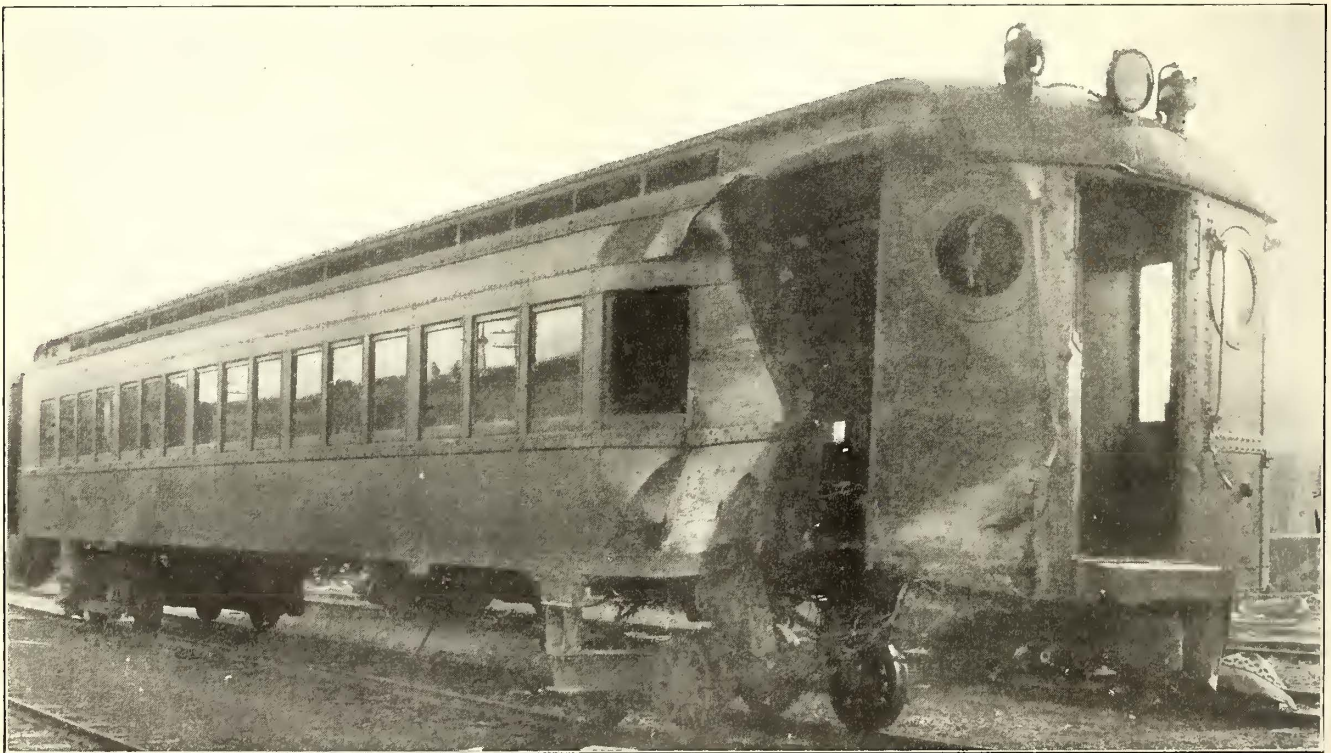
A certain amount of work also is done on the steps, which are subject to damage owing to occasional contact with obstructions inside of clearance lines. The steps, including the treads, are made up by hand in the sheet-iron shop, the frames being flanged as required over a form. About fifteen step replacements are required during the course of a year, and about two dozen new step-treads also are required.

Very little heavy repair work is required in the course of the routine repair work. Side sheets, however, are occasionally damaged by contact with obstructions, about two such repair jobs being required in twelve months. These repairs are made by cutting off the rivet heads and punching out the rivets that hold the dam-

door vestibules in which the trap doors are down for the greater part of the time, so that corner posts are subject to the above-mentioned action of salty water during the winter to about the same extent as the vestibule center posts. The same cause has produced extended rusting of the platform sheathing and platform sills of the earlier cars, but this does not appear on the later cars which have heavier platform members.

The trap doors for one of the several orders of steel cars were made up of flanged steel plates filled with monolith cement, this being covered with a rubber tread, and it has been found that the cement, when in contact with water, produced a salt which caused rapid deterioration of the steel frame. In consequence, the railway company is making a regular practice of replacing all of these trap doors with new ones that are made from diamond tread steel plate and that have no filling of any kind, the edges of the plate being bent over on a form to provide additional stiffness. At present, in fact, two men are working steadily upon the manufacture and installation of the new trap doors.

The floors of the Long Island cars, it may be said, are



LONG ISLAND STEEL CARS—PASSENGER CAR CORNERED BY FREIGHT TRAIN WITHOUT HAVING GLASS BROKEN EXCEPT AT POINT OF IMPACT

aged section of side sheathing to the posts, sills and belt rail and riveting on a new sheet in its place. Three or four cases of leaking roofs also occur during the course of a year and these are repaired by oxy-acetylene welding after determining the location of the leak by removing the headlining. Fifty of the earlier cars have the roof joints riveted and soldered, and in these each joint was provided with a cover piece in the form of a U-shaped strip of metal to provide for expansion and contraction of the roof. These joints have not given any trouble, but all later car roofs have welded joints.

A certain amount of deterioration of the sheathing of the vestibule corner and end posts occurs through rusting at the floor line. Rusting is accelerated at this point because of the salt solution that is tracked onto the platform by passengers during the winter owing to the use of rock salt for melting ice on station platforms and steps. It should be noted that the cars have trap-

made up of ferro-inclave plates of Toncan metal that is also covered with monolith cement, and it is known that the same rusting is taking place on the floors as on the trap doors. The action, however, is not so rapid in this case and it is expected that the floors will last as they are for some time to come.

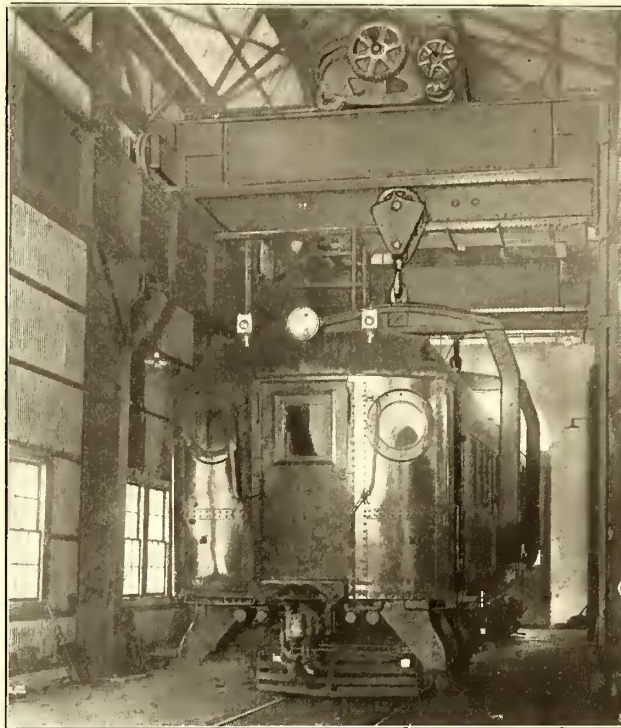
In painting the steel cars about the same process is followed as with the wooden ones. Somewhat less work is required for the filler coats of the former, in fact, because of the smoother and more regular surface upon which the paint coating is spread. Until some two years ago, however, the interior painting of the steel cars displayed a marked tendency toward the development of numerous fine cracks which detracted materially from the appearance of the surface. This was traced to the practice that had been developed in wooden-car painting wherein a hard, quick-drying varnish was used for interior work. The hard varnish was insufficiently

elastic to meet the exaggerated expansion and contraction that was inevitable with steel sheathing on railroad cars owing to their exposure to sudden and extreme temperature changes, and the result was a checking of the film of paint.

For this reason the Long Island Railroad has used "Valspar" varnish on its newer coaches, both inside and out, because of its extremely high elasticity. The cars that have been varnished with the new material have been in service for about eight months, and as no sign of checking has occurred, notwithstanding the fact that the service has extended over one winter, it is believed that this has solved the difficulty.

#### UNUSUAL REPAIRS

Owing to the high degree of efficiency under which operation is conducted on the Long Island Railroad, as well as to the sufficiency of the steel car equipment, the matter of unusual repairs, as distinguished from the routine involved by normal wear and tear, comes up but seldom, and very little experience has been attained along these lines. The engraving on page 568, however, shows the result of a steel passenger train running into the side of a stationary freight train at a speed of about 15 m.p.h. This crushed in the corner of the first car of the passenger train and slightly damaged the platform of the next car. The leading truck of the first car, however, was pushed under the car, breaking off all of the electrical equipment mounted on the underframe, and at the same time the truck itself was damaged to such an extent that it had to be replaced. Including all of this the cost of the repairs amounted only to about \$3,600. The time that elapsed until the repairs were completed was just two months, and this included some five weeks' delay waiting for new pressed-steel pieces to be furnished by the manufacturer, the actual work of replacement taking less than three weeks. These parts, it may be said, could have been made by the railroad company, if necessary, although at a considerable expense because of the fact that they would have had to be formed by hand instead of being pressed. Equipment for pressing out parts, such as installed by



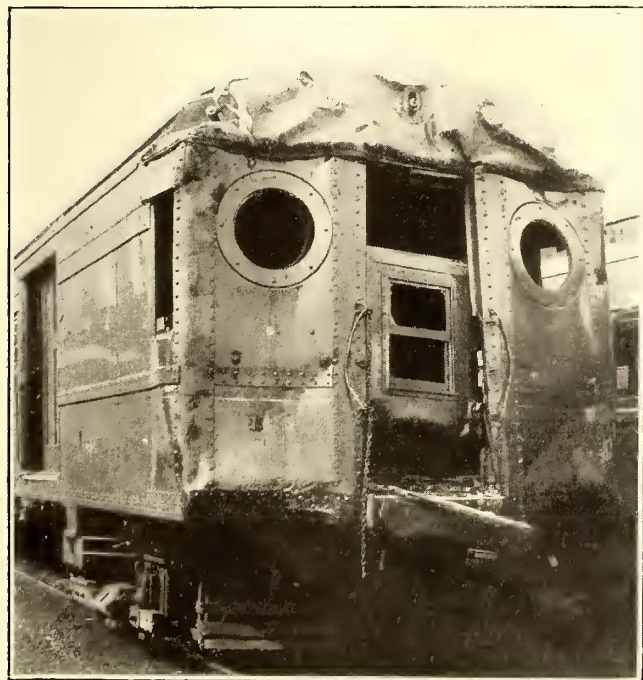
LONG ISLAND STEEL CARS—PAIR OF 40-TON ELECTRIC CAR HOISTS INSTALLED FOR DISMANTLING STEEL CARS

the manufacturer, manifestly would be unprofitable for the railroad company to install owing to the extremely infrequent use for it.

The conclusion drawn from this collision was that the body end-sheet, which had been expected to tie the roof and the floor of the car together, tore loose and permitted the corner of the car to be crumpled up. The main point of weakness, of course, is the pocket for the side door of the vestibule, these doors sliding back and forth in the manner customary with rapid-transit equipment and not swinging in accordance with steam road practice. In consequence, the company decided to rivet the body end-sheet more securely on later cars and to provide additional vertical reinforcement at the vestibule ends. In this particular case the repairs were effected by cutting out the damaged side sheets at the first joint back of the crumpled portion, and by replacing the sheet together with the cast-steel end sill, the vestibule corner post, the body corner post and the roof sheets over the vestibule.

As a consequence of the above-mentioned decision the more recent steel cars purchased by the company were built with 9-in. channels flanking the vestibule end posts. As yet there has been little definite experience with the strength of the reinforced design because of the general absence of collisions. However, in the one case in which the new design has been tested it gave striking evidences of strength. This is shown by the accompanying engraving, which gives a front view of a car with the heavy vestibule posts after it had hit a car of the original design. The impact was between a two-car train moving at about 30 m.p.h. and a five-car train moving at about 20 m.p.h. Considerable damage was done to the car with the lighter end construction, and it had to be repaired by having the end cut off and having a new end built on in its place. The side sheets were cut at the joints nearest to the line where the car was undamaged, and the center sills, side sills and belt rails were spliced with riveted joint plates.

It should be noted that the car that received the least damage was a combination baggage car without a plat-



LONG ISLAND STEEL CARS—RESULT OF USE OF REINFORCED VESTIBULE POSTS, THIS CAR WITHSTANDING DIRECT IMPACT AT 50 M.P.H.

form at the end where the impact took place. In consequence, the corners were supported directly by the side sheathing as there was no drop step between the body and the end sill, such as was the case in the opposing car. It is an interesting fact that the center sill of the opposing car was not crumpled, but was bent up slightly instead. This sill was projected into the baggage compartment of the car with the heavy end construction, between the vestibule centerposts. These stripped the end sill and other projecting members from the center sill, indicating that the columnar strength of the center sill exceeded the strength of attachment of the transverse members connected to it. The center sills are built up of two 9-in. 15-lb. channels spaced 16 $\frac{3}{4}$  in. apart, with a top plate  $\frac{1}{4}$  in. x 26 in. and two bottom plates  $\frac{3}{8}$  in. by 24 in. For 26 ft. at the middle of the car only one bottom plate is used.

This great strength of center sill is largely due to the previously mentioned fact that the Long Island Railroad steel cars are constructed without body bolsters. Instead, there is the box-girder center sill which is framed into the body end sill and which extends beyond it to support the platform. The center sill is also framed into a crossing, called a cantilever, that is located several feet back of the position normally assumed by the body bolster. The center plate is fastened to the center sill midway between the body end sill and the cantilever, and, therefore, the center sill acts as a beam extending between the cantilever and the body end sill. The primary object sought by this construction is the rigid support of the overhanging platform and draft gear, and, judging by above-mentioned experience, this object has been fully attained.

### CONVENTION OF THE A. R. E. A.

At the Chicago Meeting of the American Railway Engineering Association There Were Presented Committee Reports on Electricity, Ties, Wood Preservation, Fences and Other Subjects

Those reports of particular interest to electric railways which were presented at the sixteenth annual convention of the American Railway Engineering Association, have been abstracted and are published herewith. The convention was held at the Congress Hotel, Chicago, March 16-18, 1915, and, as has been the custom, the National Railway Appliances Association held its exhibition in the Chicago Coliseum and Armory during the same week.

#### ROADWAY, TRACK AND TIES

The committees on roadway and track reported progress, the latter stating that a sub-committee had held a joint meeting with the standardization committees of the Manganese Track Society and the Manganese Steel Foundry Society and had adopted their recommendations for special work specifications. In order that the costs of treated and untreated ties could be compared on the same basis, the committee on ties recommended several formulas for adoption and publication in the manual. These included a method of calculating the total annual cost of any tie when the following factors were known:

$C$  = first cost of tie in place;  
 $R$  = rate of interest;  
 $n$  = life of tie in years.

$$\text{Total annual cost} = \frac{CR(1+R)^n}{(1+R)^n - 1}$$

#### WOOD PRESERVATION

The use of coal tar in creosote was considered by the wood preservation committee to be desirable. Commercial and economic conditions made advisable the

conservation of the creosote supply, and one of the most feasible means of augmenting the available output of domestic creosote was by the proper addition of refined coal tar. Solutions of refined coal tar and creosote properly mixed and filtered were superior to ordinary mixtures of refined coal tar and distillate oil, and did not reduce the depth of penetration.

Allowable limits of water in creosote were also investigated by this committee, and as a result it recommended the adoption of specifications stating that the use in treatments of creosote containing up to 3 per cent water was permissible. Where the quantity exceeded 3 per cent, proper allowance should be made, and under no circumstances should timbers be treated with oils having more than 6 per cent water.

The report of the committee on buildings included recommendations regarding the best uses for various kinds of roofing materials and sketches of typical floor constructions for shops. Under the subject of roof materials, it was stated that the built-up roof was especially valuable for flat surfaces and could be made as heavy as desired. Regarding ready-made roofing, the report stated this has a better value for steeper roofs than for those of small pitch. It averaged much cheaper than the built-up type and most of those now in use required occasional recoating to obtain a fair life. Slate made a good roof if properly watched but it could not be walked upon without danger to the slate. Tile of good quality gave equally good results and had not the disadvantage of breaking so easily under foot. Its principal value, however, was from an architectural standpoint and when properly protected and fastened could be recommended for roofs with pitches of 6 in. to 1 ft. or more. Asbestos shingles were also recommended for railroad structures. Large cement tile, reinforced and laid without sheathing directly on the roof purlins, was regarded as a good roof for shops and freight houses. Owing to the high cost of maintenance, the average metallic roof coating was not recommended on permanent buildings.

#### FENCES AND CROSSINGS

The committee on signs, fences and crossings presented data on the economy of concrete and metal as compared with wood for fence posts, which had been collected from seventy-two roads, and it was concluded that their use had not yet passed the experimental stage so far as life was concerned. General results, however, had been sufficiently satisfactory to cause a number of railroad companies and private concerns to construct plants for the manufacture of concrete posts on a large scale. Where suitable timber was plentiful and cheap there was no economy in the use of concrete unless its life was much longer than is now estimated.

This committee's report also contained the following statements regarding galvanized wire fencing: The rapid deterioration of modern woven galvanized fence wire is caused by the coating of zinc being too thin and of an uneven thickness. A second coating of zinc should be applied to electrically welded fencing after it is manufactured. For right-of-way fences a hinged metal gate is recommended. The width of farm gates should not be less than 12 ft., depending upon the size of agricultural machinery in use in the vicinity, or as required by the laws of the states through which the railroad operates. The minimum height of farm gates should be 4 ft. 6 in. from the surface of the roadway. Farm gates should be hung so as to open away from the track, and, if hinged, should swing shut by gravity.

Concrete for fence posts was stated to be a practical, economical and a suitable substitute for wood. Reinforcements for them should be placed as near the surface as possible,  $\frac{1}{2}$  in. from the surface being the best location. Posts should taper from base to top and should not be less than 5 $\frac{1}{2}$  in. at base and 4 in. at top.



Concrete should consist of one part cement and four parts of run of pit gravel; or one part cement, two parts sand and four parts crushed stone of low absorption, or screened gravel. Gravel or crushed stone should not be less than  $\frac{1}{4}$  in. or more than  $\frac{1}{2}$  in. in size. Concrete should be of a quaking consistency. Molds should have a jogger or vibratory motion, while the concrete is being placed to compact it and smooth up the surface of the post.

Concrete posts should not be made outdoors in freezing weather. They should not be exposed to the sun, and, to aid curing, should be sprinkled with water the first eight or ten days after being made. Molds should be carefully oiled or soaped to prevent concrete sticking to them. Posts should be cured for not less than ninety days, when cured naturally, before being set or shipped and should be carefully handled and packed in straw, sawdust or other suitable material for shipment.

This committee's report also contained the following recommendations regarding track construction and flangeway at paved street crossings and in paved streets. (1) Treated ties should be used, laid on a bed of crushed rock, gravel or other suitable material, not less than 8 in. in depth, placed in about 3-in. layers, each to be thoroughly rammed to compact it. (2) Vitri-fied tile drains not less than 6 in. in diameter, with open joints, leading to nearest point from which efficient drainage may be obtained, or with sufficient outlets to reach sewers or drainage basins, should be laid on either side of and between tracks, parallel with ballast line and outside of ties. (3) Girder rail of 141-lb. weight and 9-in. depth or similar section, with suitable tie-plates and screw-spikes, should be used. Tracks should be filled in with crushed rock, gravel or other suitable material, allowing for 2-in. cushion of sand under finished pavement. (4) Ballast should be thoroughly rammed as it is installed to prevent settlement of paving foundations. Two inches of good, sharp sand should be placed on top of ballast. (5) Paving must conform to municipal requirements, granite or trap rock blocks preferred. Hot tar and gravel should be poured into the joints as a binder.

#### GRADING OF LUMBER

The committee on grading of lumber found that the rules which were adopted several years ago for Northern pins and hemlock were no longer standard. It had been found wholly impracticable to purchase lumber under the rules at present printed in the manual, and the committee unanimously recommended that they be rescinded. With the co-operation of the Northern Hemlock & Hardwood Manufacturers' Association, a new set of rules were drawn up for hemlock and were presented as information. The committee also stated that the grading rules for Southern yellow pine did not sufficiently define the quality of the wood, and that there was no practical means for definitely distinguishing between long-leaf pine, short-leaf pine and loblolly pine after timbers had once been manufactured from the trees. It was recognized, however, that it made little practical difference from what species of pine a structural timber was cut, so long as certain density requirements were met. In view of these considerations it had been proposed that the rules for the grading of yellow pine timber be revised. This work had been undertaken by the committee on grading of timbers of the American Society for Testing Materials, which was working jointly with the various manufacturing organizations interested.

#### REPORT ON ELECTRICITY

The work of the committee on electricity was largely that of reconciling the differences between this associa-

tion and other associations interested in the subject of clearances, standard specifications for overhead transmission line crossings and the study of electrolysis. During the year the committee investigated the question of modifying the limiting clearance line for rolling equipment so as to give additional space for automatic train stops or other permanent way structures. Out of a total of 196 replies to inquiries, 140 showed no encroachment on the proposed clearance diagram, and the information covering the encroachments reported had been included in the diagram. This information, together with the proposed clearance diagram, has been laid before the American Railway Association and the American Electric Railway Engineering Association and will come up for adoption at their next meetings. The diagram in question was shown in the *ELECTRIC RAILWAY JOURNAL* for Oct. 12, 1912, on page 857. The committee asked for the adoption of the diagram as recommended clearance lines for equipment and permanent way structures adjacent to third-rails and for third-rail structures. It also recommended the adoption of specifications for crossings of wires and cables of telegraph, telephone, signal and other circuits of similar character over steam railroad rights-of-way. The committee also recommended the adoption of the revised edition of the specification for overhead crossings of electric light and power lines, with the understanding that the national joint committee would take up the question of additions or changes in this specification previously suggested by this association at its 1912 convention.

The committee on ballast recommended a ballast section with 24-ft. roadbed for single track on tangents. Slopes should be sodded up to the top, but not beyond. Regarding the proper depth of ballast of various kinds to insure uniform distribution of loads on the roadway, the committee again unanimously recommended the test outlined in the 1913 and 1914 committee report.

#### Carbon Brush Troubles

At the Cleveland A. I. E. E. meeting which closed yesterday E. H. Martindale, engineer National Carbon Company, discussed the subject of commutation with particular reference to the brushes of stationary machines. He suggested the use of lead pencils from 2B to 8H for testing brush hardness, stating that a pencil softer than the brush will mark it, while one harder will scratch it. He did not specify the hardness suitable for each class of service. He recommended for railway motors brush pressures of from 4 to 8 lb. per square inch and one-half these values for stationary machines.

Mr. Martindale divided the causes of brush trouble into five classes, thus: Field; armature; commutator, including brush rigging; external electrical, and external mechanical. He listed the evidences of trouble in each case as a means of diagnosis and suggested the corresponding remedies. In connection with commutator slotting he advocated undercutting the mica about  $\frac{3}{64}$  in., cautioning against leaving strips or particles of mica flush with the commutator. On slotted commutators brushes with no abrasive action may be used and their use will result in long life of the commutator and brushes. A non-abrasive brush is not necessarily a soft brush, as one of the hardest brushes made in this country is rapidly becoming standard.

Interstate Commerce Commissioner C. C. McChord is authority for the statement that in twenty years the trespassers killed on railways in the United States totaled 86,733 and the injured 94,646, or 181,379 casualties in all, equal to the entire population of the city of Columbus, Ohio.

# COASTING RECORDERS IN NEW YORK

The Number of Kilowatt-Hours Required for Standard Cars on the Third Avenue Railway Has Been Reduced for One Month as Much as 10 Per Cent—Accidents Also Show Big Decrease

EARLY in 1911 the Third Avenue Railway System, New York, installed 100 coasting recorders on its Broadway line, choosing that route in order to try out this device under the most unfavorable conditions. As the sequel shows, the company was right in its preliminary analysis, for to-day, with all the Manhattan lines of the Third Avenue Railway equipped with coasting recorders, the pioneer line does not show as good coasting performances as the others.

Nevertheless, the tests on the Broadway line proved so satisfactory compared with the preceding conditions that following an experience of two and one-half years the company decided during the year 1914 to equip all of its Third Avenue, Union and Westchester lines, city and suburban, with Rico coasting recorders. The sole exception is in the case of the storage-battery cars. The entire order amounted to 1100 recorders costing \$110,000.

Comparative records of coasting ability were begun

represented solely by the efficiency department, which consists of the head of the department, his assistant and seven clerks for a total of 1100 recorders. The cost of keeping the records is about 1.1 cents a day per motorman.

The recorders are of the Railway Improvement Company's standard type except that they were altered slightly to permit installation upside down for the convenience of the motorman in making the registration and getting his record slip. The recorder is mounted on the archway left after the removal of the bulkheads. As it is energized only by current from the propulsion motors acting as generators during coasting periods, the possibility of false records is practically eliminated.

## MANNER OF MAKING AND KEEPING RECORDS

Besides operating these recorders the Third Avenue Railway System uses the terminal clocks of the same maker. Therefore, the first duty of the motorman is to



SCIENTIFIC CAR OPERATION—OFFICE OF THE EFFICIENCY DEPARTMENT WHERE ALL COASTING RECORDS ARE KEPT AND CALCULATED

systematically on May 1, 1914, with the organization of the efficiency department for that object. The Broadway-Kingsbridge and 125th Street lines were first taken over, and others were added from month to month as their recorders were installed. In fact, the last suburban lines are just being added to the record system.

While it would have been possible to equip the entire system in less than the nine months actually required since the main order was placed, it was considered more economical to do it gradually and in synchronism with other car changes. During this period, in fact, the open-vestibuled cars were converted to the fully-vestibuled non-bulkhead type. Thus, the wiring for the coasting clock was installed at the same time as the circuits for the McWhirter door closing and car starting mechanism.

No additional men are required at the carhouses or shops on account of these recorders. The extra staff is

record his departure from the terminal by inserting his running-time envelope in the terminal timeclock. The envelope, as reproduced, shows the division, line, run number, date, motorman's name and recorder key number. It also shows the order of the trips.

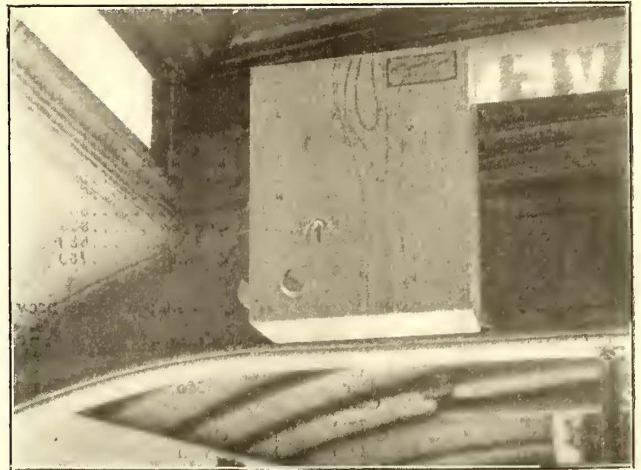
After registering his time the motorman inserts his key in the coaster. This second registration shows his badge number, card number and the "minute" position of the recording wheel. Since the total number of minutes shown does not exceed sixty, the motorman must register in at the end of every half trip, otherwise only the coasting time in excess of sixty minutes would be shown. The registration every half trip also is intentional as this forcibly reminds the motorman of the need for economical operation.

On leaving the car the motorman removes the record tape for the run and also inserts his running-time envelope in the terminal timeclock. Thus his envelope



SCIENTIFIC CAR OPERATION—RINGING IN AT THE TERMINAL CLOCK; TWO TAPE RECORDS OF A DAY'S WORK

2-4-15 Car 1019 Run 135 McLaughlin B. 528	2-4-15 Car 1019 Run 135 McLaughlin B. 528
Hours	Min.
9	49
Cash	511
Transfers	126
637	
A 10 40 →	57 8
A 10 44 →	57 8
A 10 54 →	57 8
A 10 05 →	57 8
A 10 14 →	57 8
A 10 22 →	57 8
A 10 30 →	57 8
A 10 38 →	57 8
A 10 46 →	57 8
A 10 56 →	57 8
A 10 05 →	57 8
A 10 15 →	57 8
A 10 23 →	57 8
A 10 33 →	57 8
A 10 46 →	57 8
A 10 56 →	57 8
A 10 06 →	57 8
A 10 17 →	57 8



SCIENTIFIC CAR OPERATION—POSITION OF COASTING RECORDER ON BULKHEAD ARCH

for the day bears a complete record of his running times while the tape shows the corresponding coasting times. The tape is placed in the envelope and handed to the depot receivers, who in turn forward the data to the efficiency department.

The motormen soon learn to read the tape intelligently. Their interest in the records is particularly manifest when they get a lower reading than usual. In such cases their opinion about the car is expressed by notes written on the tape in succinct if not always elegant language. On the other hand, exceptionally good records are accompanied by a phrase like "This car is a hummer." All complaints are referred to the superintendent of equipment as possibly worth special attention at the next inspection of the car.

The original tapes are filed in the daily envelope, the unstamped side of which carries the separate and totaled number of run and coasting minutes. These first ad-

ditions are the only ones made without a machine. At the end of the week both sets of figures are integrated in a Burroughs machine and the percentage of coasting time is computed. The weekly record reproduced shows the motorman's badge number in the upper right-hand corner, the run-minutes in the left-hand column and the coasting minutes in the right-hand column. Both columns are added simultaneously. For the convenience of the reader the day corresponding to each performance has been added. The monthly record is similar, showing the record for each of the four weeks and the fraction remaining. The percentage of coasting time is calculated with a slide rule.

The object in making weekly records is to give both the men and the management the chance to see the effects of weather and traffic conditions while the memory of such conditions is fresh in the minds of all. Again, the daily and even the weekly records show big fluctuations in the runs of the same man, but when compared by months the order of merit changes little so far as the regulars are concerned.

At the end of each week the records for the motormen of each line are made up in the order of merit as expressed in percentage of coasting time. The record pertaining to a given division is posted only in the depots of that division but a set of records covering every division is forwarded to the department head, the chief instructor and other executive officers interested in the effect of coasting on power, equipment, and traffic. The road instructor for each division also gets a record covering his men. This record is his guide for the investigation of operating characteristics of motor-

THIRD AVENUE RAILWAY CO. SYSTEM			
RUNNING TIME CARD			
THIRD AVE.	Division	Run No.	
125th ST CROSSTOWN		135	
Date	JAN - 1 1915		
Name	McLaughlin		
	Key No. 528		
Arrive	1	20	6 22
Leave	1	20	6 10
Arrive	2	19	6 59
Leave	2	19	6 59
Arrive	3	18	7 30
Leave	3	18	7 30
Arrive	4	17	8 14
Leave	4	17	8 14
Arrive	5	16	8 59
Leave	5	16	8 59
Arrive	6	15	9 35
Leave	6	15	9 35
Arrive	7	14	10 14
Leave	7	14	10 14
Arrive	8	13	10 59
Leave	8	13	10 59
Arrive	9	12	11 42
Leave	9	12	11 42
Arrive	10	11	
Leave	10	11	

339	157
259	112
59	269

SCIENTIFIC CAR OPERATION—FRONT AND BACK OF RUNNING TIME ENVELOPE; THE BACK SHOWS THE RUN, COASTING AND TOTAL MINUTES

WEEK ENDING JAN. 7			
	Running Time	Coasting Time	Badge Number
Jan. 1	591	26	52
Jan. 2	599	27	
Jan. 3	633	24	
Jan. 4	578	25	
Jan. 5	585	24	
Jan. 6	600	26	
Jan. 7	562	27	
Total for week	4,148	183	Per Cent Coasting 44.2

SCIENTIFIC CAR OPERATION—RECORD DAY BY DAY			
MONTH OF JANUARY			
	Running Time	Coasting Time	Badge Number
Total for			52
Week ending Jan. 7	4,148	183	
Week ending Jan. 14	3,061	151	
Week ending Jan. 21	3,016	166	
Week ending Jan. 28	2,415	115	
Three days ending Jan. 31	1,722	86	
Total for month	14,362	703	Per Cent Coasting 49.0

SCIENTIFIC CAR OPERATION—ONE MONTH'S RECORD, WEEK BY WEEK, OF RUN AND COASTING MINUTES

COASTING RECORD 125TH STREET CROSSTOWN LINE, WEEK ENDING JAN. 7, 1915.

Table with columns: Date, Motor-man, Minutes, Per Cent, Date, Motor-man, Minutes, Per Cent. Lists names like McLaughlin, McDermott, Lynch, Keegan, McCourt, Mullins, Melia, Murray, Jessup, Ryan, Creggan, Gillespie.

Average, 37.8; previous week's average, 38.6; highest previous average, 38.6. Highest week's record to date: McLaughlin, 528, 47.2 per cent, week of June 14, 1914.

Relief Runs

Table with columns: Date, Motor-man, Minutes, Per Cent, Date, Motor-man, Minutes, Per Cent. Lists names like Reddy, Quinn, O'Neill, Howe, Lombard, Flaherty, Donohue, Brown, McCourt, Smith, Stevenson, Allen, Creggan, Hogan.

Average, 37.0; previous week's average, 36.3; highest previous average, 36.7. Highest week's record to date: Howe, 829, 45 per cent, week of Dec. 7, 1914.

Night Runs

Table with columns: Date, Motor-man, Minutes, Per Cent, Date, Motor-man, Minutes, Per Cent. Lists names like Quinn, Hlousek.

Average, 41.2; previous week's average, 43.8; highest previous average, 46. Highest week's record to date: Hlousek, 784, 50.6 per cent, week of Dec. 14, 1914.

Average all classes, 37.5; previous week's average all classes, 37.9; highest previous average all classes, 37.9.

men with supernormal or subnormal records. Formerly these instructors coached only the new men.

That the men may be compared on a fair basis the runs are classified into day, relief and night runs. In examining the weekly record it will be seen that the night runs of the 125th Street line show the highest percentages of coasting, 41.2 per cent, as might be anticipated from non-congested track. The senior motormen with day runs averaged 37.8 per cent during the same week, with the leader reaching a maximum of 44.2 per cent compared with 47.3 per cent by the best night man. The average of the relief men is 37 per cent, or only 1.8 per cent less than the day men, while the top man actually did 45.7 per cent, or 1.5 per cent more, coasting than the top day man. The weekly record also shows the premier performances of preceding weeks, the fall-back for the week of Jan. 7 being the effect of bad weather.

The monthly record which divides the men according to employment for more or less than twenty-one days per month, in addition to the classification as to runs, proves clearly enough that the ability to coast tends to improve as the motorman has more opportunities to get the "feel" of the run. Thus, despite some exceptions to the rule, it will be seen that the day men who worked more than twenty-one days in January did 3.1 per cent more coasting. The relief men of more than twenty-one days' service also did 2.7 per cent more coasting than the relief men of less than twenty-one days' service, while the night men oftener employed did 2.2 per cent more coasting.

Aside from the records already described weekly summaries with comparisons for other weeks are prepared to show the average coasting performances for each class of run on each of the five divisions. The proportion of men who have attained various percentages is also shown for each class of run and each division. A similar record is made up for the month. From this

last record a summary is prepared to compare the average coasting ability of all men under each of the five superintendents, together with comparisons with other months. Thus, not only the motormen but also the superintendents are trying to improve their records. In fact, the order of merit by divisions has changed several times. At the present time Mr. Carrigan is superintendent of the West Farms lines, Mr. Murphy of the Third Avenue, 125th Street and Kingsbridge lines, Mr. Reynolds of the Kingsbridge division, Mr. McDonald of the Manhattan lines not under Mr. Murphy, and Mr. Wheeler of the Westchester division.

REDUCED ENERGY CONSUMPTION

The value of the coasting recorder is shown by the reduction in energy consumption for the last six months of 1914. It is true that during practically the same period many of the cars were changed from carbon to tungsten lighting and that about 200 cars were equipped with Perkins roller bearings. There is no question, however, that the major portion of the saving is due to the coasting recorder. Compared with the same

125TH STREET CROSSTOWN LINE—MONTH OF JANUARY, 1915. Day Runs—Men Working Twenty-one Days and Over

Table with columns: Date, Motor-man, Minutes, Per Cent, Date, Motor-man, Minutes, Per Cent. Lists names like McLaughlin, Skinner, Keegan, Conroy, Martin, Gillespie.

Average, 39.6.

Men Working Less Than Twenty-one Days

Table with columns: Date, Motor-man, Minutes, Per Cent, Date, Motor-man, Minutes, Per Cent. Lists names like McNerney, Farrell, Lynch, McCue, Mulcahy, O'Neill, Olsen, Reddy, Melia, O'Hara, O'Connell, Lyons.

Average, 37.6; average for class, 39.1; previous month's average for class, 37.1; highest previous average for class, 37.1. Highest month's record to date: McLaughlin, 528, 49 per cent for this month.

Relief Runs—Men Working Twenty-one Days and Over

Table with columns: Date, Motor-man, Minutes, Per Cent, Date, Motor-man, Minutes, Per Cent. Lists names like Howe, Brown, Donohue, Williams, Allen.

Average, 37.6.

Relief Runs—Men Working Less Than Twenty-one Days

Table with columns: Date, Motor-man, Minutes, Per Cent, Date, Motor-man, Minutes, Per Cent. Lists names like McDermott, Stevenson, Istvanko, Keegan, Elder, O'Neill, McDonald, Beagon, McGuire, Scanlon, Halloran, Sullivan, Spellman.

Average, 34.9.

Average for class, 37; previous month's average for class, 36.3; highest previous average for class, 36.3. Highest month's record to date: Howe, 829, 43 per cent for this month.

Night Runs—Men Working Twenty-one Days and Over

Table with columns: Date, Motor-man, Minutes, Per Cent, Date, Motor-man, Minutes, Per Cent. Lists names like Hlousek, Audette.

Average, 36.8.

Men Working Less Than Twenty-one Days

Table with columns: Date, Motor-man, Minutes, Per Cent, Date, Motor-man, Minutes, Per Cent. Lists names like McCourt, McDermott, Mulhern.

Average, 36.6.

Average for class, 36.7; previous month's average for class, 44.3; highest previous average for class, 44.3. Highest month's record to date: Hlousek, 784, 49 per cent for October, 1914. Average all classes, 38.1; previous month's average all classes, 37.4; highest previous average all classes, 37.4.

WEEKLY AVERAGES

	Week Ending		Highest Previous	Increase (+) Decrease (-) as Compared with Previous Highest	
	Jan. 7	Dec. 28		Previous Week	Highest Previous
The averages were:					
Third and Amsterdam Avenues:					
Day runs	32.3	33.3	34.9	-1.0	-2.6
Harlem tripper	31.6	31.8	33.3	-0.2	-1.7
Relief runs	30.9	31.8	33.9	-0.9	-3.0
Night runs	33.4	35.0	37.5	-0.6	-4.1
All runs	31.9	33.0	34.9	-1.1	-3.0
125th Street Crosstown:					
Day runs	37.8	38.6	38.6	-0.8	-0.8
Relief runs	37.0	36.3	36.7	+0.7	+0.3
Night runs	41.2	43.8	46.0	-2.6	-4.8
All runs	37.5	37.9	37.9	-0.4	-0.4
Broadway-Kingsbridge:					
Day runs	35.8	35.5	36.6	+0.3	-0.8
Relief runs	35.5	35.2	36.8	+0.3	-1.3
Night runs	31.1	33.7	37.5	-2.6	-6.4
All runs	35.4	35.0	36.6	+0.4	-1.2
All lines	33.0	33.7	35.3	-0.7	-2.3

The following shows the proportion of men attaining various percentages in coasting:

	Over 40 per cent	Bet. 30 and 40 per cent	Under 30 per cent
Third and Amsterdam Avenues:			
Day runs	2	74	24
Harlem tripper runs	0	55	45
Relief runs	0	61	39
Night runs	7	67	24
All runs	2	67	31
125th Street Crosstown:			
Day runs	9	82	9
Relief runs	18	82	0
Night runs	25	75	0
All runs	14	82	4
Broadway-Kingsbridge:			
Day runs	7	78	15
Relief runs	11	74	15
Night runs	0	100	0
All runs	9	76	15
All lines	6	69	25

MONTHLY COMPARISONS BY DIVISIONS

	Month of		Highest <sup>a</sup> Previous	Increase (+) Decrease (-) as Compared with Previous Highest	
	Janu- (1915)	Decem- (1914)		Previous Month	Highest Previous
	ary	ber			
Mr. Carrigan	35.0	33.6	33.6	+1.4	+1.4
Mr. Murphy	34.1	34.2	34.2	-0.1	-0.1
Mr. Reynolds	33.9	32.0	32.0	+1.9	+1.9
Mr. McDonald	30.2	31.7	31.7	-1.5	-1.5
Mr. Wheeler	29.5	33.2	33.2	-3.7	-3.7
System average	32.7	33.1	33.1	-0.4	-0.4

The following shows the proportion of men attaining various percentages in coasting:

	Over 40 per Cent		Between 40 and 30 per Cent		Under 30 per Cent	
	Jan.	Dec. Prev.	Highest		Jan.	Dec. Prev.
			Jan.	Dec.		
Mr. Carrigan	6	7	51	52	38	42
Mr. Murphy	8	8	75	79	15	13
Mr. Reynolds	6	4	52	45	40	49
Mr. McDonald	4	5	29	49	67	43
Mr. Wheeler	22	22	30	28	59	50
System per cent	8	8	50	58	42	43

months of 1913, the successive monthly decreases in kilowatt-hours per car-mile on the Manhattan lines are 5.5 in July, 5.3 in August, 7.7 in September, 10.0 in October and 9.8 in November. In July only 74 per cent of the system was equipped with recorders, which accounts largely for the smaller savings first shown. By December, 1914, 83 per cent of all cars covered in these power statistics were equipped with recorders.

EFFECT ON ACCIDENTS AND EQUIPMENT

No consideration of car recorders would be complete without a determination of the effect of increased coasting on front-end collisions and on the electrical and braking equipment. The reductions due to the coasting campaign alone cannot be segregated, partly because during the last half of 1914 the near-side stop was adopted and the cars were fitted with automatic starting equipment. However, for the months of September, October and November, 1914, the numbers of vehicle collisions and knock-downs on the Manhattan

MONTHLY AVERAGES

	Month of		Highest Previous	Increase (+) Decrease (-) as Compared with Previous Highest	
	Janu- ary	Decem- ber		Previous Month	Highest Previous
The averages were:					
Third and Amsterdam Avenues:					
Day runs	33.4	33.9	33.9	-0.5	-0.5
Harlem tripper	32.3	32.6	32.6	-0.3	-0.3
Relief runs	32.7	32.8	32.8	-0.1	-0.1
Night runs	34.3	36.2	36.2	-1.9	-1.9
All runs	33.3	33.7	33.7	-0.4	-0.4
125th Street Crosstown:					
Day runs	39.1	37.1	37.1	+2.0	+2.0
Relief runs	37.0	36.3	36.3	+0.7	+0.7
Night runs	36.7	44.3	44.3	-7.6	-7.6
All runs	38.1	37.4	37.4	+0.7	+0.7
Broadway-Kingsbridge:					
Day runs	36.4	36.0	36.0	+0.4	+0.4
Relief runs	36.3	36.0	36.0	+0.3	+0.3
Night runs	33.3	33.0	35.1	+0.3	-1.8
All runs	36.2	35.9	35.9	+0.3	+0.3
All lines	34.1	34.2	34.2	-0.1	-0.1

The following shows the proportion of men attaining various percentages in coasting:

	Over 40 per cent	Bet. 30 and 40 per cent	Under 30 per cent
Third and Amsterdam Avenues:			
Day runs	4	86	10
Harlem tripper runs	0	78	22
Relief runs	4	76	20
Night runs	7	70	23
All runs	4	79	17
125th Street Crosstown:			
Day runs	32	62	6
Relief runs	26	63	11
Night runs	25	63	12
All runs	29	62	9
Broadway-Kingsbridge:			
Day runs	14	70	16
Relief runs	13	75	12
Night runs	50	50	0
All runs	15	72	13
All lines	10	75	15

ENERGY USED FOR TRACTION THIRD AVENUE RAILWAY LINES IN MANHATTAN, EXCLUSIVE OF STORAGE-BATTERY CARS

Year	Kilowatt- hours	Miles	Kilowatt- hours per Car-Mile July	Per Cent Reduction	Per Cent Coasting Mileage	Per Cent Indicated Saving
1913	3,961,610	1,154,009	3.43			
1914	3,750,273	1,157,223	3.24	5.5	74	7.4
1913	3,799,051	1,116,294	3.41			
1914	3,676,392	1,139,035	3.23	5.3	77	5.9
1913	3,699,858	1,057,012	3.50			
1914	3,571,930	1,103,653	3.23	7.7	76	10.1
1913	3,897,706	1,084,328	3.60			
1914	3,691,178	1,138,459	3.24	10.0	83	12.0
1913	3,787,303	1,065,569	3.76			
1914	3,603,024	1,061,651	3.39	9.8*	83	11.8
1913	4,164,633	1,116,650	3.73			
1914	4,085,015	1,087,478	3.75	0.5*	83	...

\*The decreased saving and seeming loss are due to greater heat requirements, although the percentage of coasting improved. The average mean temperature for November, 1914, was 44 deg. Fahr. or 3 deg. less than November, 1913; that for December, 1914, however, was 32 deg. Fahr. or fully 7 deg. less than for December, 1913. The heavy drop to such a low temperature, of course, demanded the maximum heater output. Further, the precipitation for December, 1914, was 4.01 in. compared with 2.40 in. in December, 1913.

The foregoing figures are gross outputs of energy measured at the d.c. busbars of the substation.

lines were 885 and 176 respectively, compared with 1092 and 214 for the same months of 1913—a reduction of 20 per cent.

So far as car equipment is concerned, the figures for the coasting recorder installation period also show a decrease in the cost of maintenance. For motor and control maintenance alone, including, however, the mileage of the Union Railway cars, the figures per 1000 car-miles are as follows:

	MOTOR AND CONTROL MAINTENANCE COST PER 1000 CAR-MILES	
	1913	1914
July	\$1.131	\$1.324
August	1.733	1.360
September	1.631	1.607
October	2.370	1.527
November	1.700	0.985
December	1.214	1.805

# MANGANESE STEEL SPECIAL WORK

Experience of Several Companies on the Pacific Coast with Solid Manganese  
and Insert Manganese Steel Special Work

**A**LTHOUGH this paper has published several articles on the experience of electric railways with solid manganese and insert special work most of the information has been based on returns from roads east of the Rocky Mountains. These data can now be supplemented by information in regard to the Pacific Coast states, obtained by this paper through its San Francisco office, and while the returns from the canvass have not been as complete as could be desired, such information of interest as could be collected is presented below.

Manganese steel has been used in track special work on the Pacific Coast under widely divergent conditions and in conformity with varied construction standards. Naturally, both satisfactory and unsatisfactory results are reported in different quarters, but as more careful observations are made and more data become available as to the effect of heavy traffic on the different types of construction, certain general conclusions have been reached, and many of the street railways are adopting certain construction standards based on their experience with solid manganese and insert special work.

## EXPERIENCE IN VANCOUVER

In Vancouver, B. C., both solid manganese and insert special work have been used by the British Columbia Electric Railway, with the result that in 1911, after nine years' experience with insert special work and five years' experience with solid manganese, the decision was reached to abandon insert work altogether in favor of solid manganese. This was decided after repeated difficulties with loose plates, with arms breaking off, with chipping at point of intersection and cupping where the open-hearth rail joined the insert, while on the other hand very little difficulty and long life attended the use of solid manganese crossings in the same service.

As typical of results with insert special work manufactured by different companies, it may be cited that a certain iron-bound insert type junction was installed in 1904 under traffic amounting to 800 tons per rail per hour (eighteen-hour day). This was in bad condition six years later and should have been replaced then but was kept in service two years longer. At the end of this time it was entirely worn out and literally ready to fall to pieces under normal traffic. Between 1902 and 1909 eight junctions and fourteen cross-overs of the insert type were installed, and all showed the several types of failures already mentioned to greater or lesser degree.

In solid manganese this company has installed some fifty-three layouts of all sizes since 1906 and twelve cross-overs using solid manganese switches, mates and frogs. The traffic over these installations varies from 200 to 1550 tons per rail per hour (eighteen-hour day) and to date not a single solid manganese piece in any one of these has had to be renewed, nor is there prospect of renewal being required soon. The only solid manganese renewals which this company has ever had to make were in two steam over-electric crossings, not included in those mentioned above, where the traffic was very heavy, being 2500 tons per rail per hour (eighteen-hour day). Of the eight cross-overs in each of these two installations, which were placed in 1906, the

first renewal was made in 1912, and to date a total of five pieces have been renewed in the one installation and four in the other. The points of intersection have not yet broken in these heavy traffic cross-overs, and the breaking of the casting arms which required the renewals mentioned is considered to be due to poor foundation which extends to a considerable depth and could not be improved.

The success with solid manganese work which this company has had is attributed largely to the care taken to secure solid foundations under the crossings. This work is carried out as follows: The special work is laid on ties spaced 3 ft. center to center and blocked up to grade to admit 8 in. of concrete under the ties. The concrete is mixed in the proportion of one to seven and is tamped under the ties and up to 2 in. below the base of the rail. At the same time a wood block is embedded in the soft concrete between each two ties, under the rail, with the top of the block also 2 in. below the base of the rail and flush with the top of the concrete.

This concrete is permitted to set from six to ten days, according to weather, and then the rail support is shifted to the wood block which was set in the concrete, by means of wedges driven between the block and the rail. These wedges are then bored with an auger and the rails spiked down to them and the block beneath them. This takes the weight of the rail off the ties. The spikes in the ties are then slightly drawn and the ties pounded down to the concrete bed, as the traffic will probably have caused slight vertical movement of the tie in the soft concrete while it was setting. The rails are then shimmed up on the ties with tie plates of the required thickness and then spiked in place. This method eliminates any movement as the result of installation under traffic and supports the rail on the tie and block alternately every 18 in. The remaining concrete is then placed and brought up to the required paving level.

An electric welder has been in use for about a year on the Vancouver system and has repaired insert special work with moderate success. It has been very useful where cupping in the rail head has occurred but cannot be used to repair loose arms. Points of intersection in the solid manganese crossings have not failed frequently, but in those cases where failure did occur it is reported that the welder effected a satisfactory repair.

In summing up experience with the two types of special work, the British Columbia Electric Railway has concluded that the best practice is to use solid manganese switches, mates, frogs, crossings and connecting rails for the heaviest traffic. For moderate traffic the specification should be for solid manganese switches, mates, frogs and crossings with open-hearth connecting rails, while, for light traffic, the desirable construction is regular hard cast-steel switches, mates, frogs and crossings and open-hearth rails, or built-up work of open-hearth rails.

In this summary it is also pointed out that seven separate pieces are necessary in making up a manganese insert frog of iron-bound construction and that at least four different metals are involved. Moreover, although the purpose of the insert is to eliminate wear at points of intersection, its presence really creates uneven wear

at the four points where the manganese joins the open-hearth steel because the latter wears more than fifty times faster than the former.

#### PUGET SOUND CITIES

In both Seattle and Tacoma the Puget Sound Traction, Light & Power Company is using for the greater portion of its special work, cast-bound manganese center construction with bolted-down, splattered-in inserts. In Seattle there are a few solid manganese crossings, chiefly at intersections with cable lines, and some standard built-up work using T-rails, the latter being the standard for steam over electric crossings. This company also uses an electric welder for building up broken off intersections and reports that it has obtained fairly successful results.

In general the insert work has proved satisfactory, but there has been some trouble with inserts coming loose, and the company would prefer solid manganese construction at the same price as insert work.

#### EXPERIENCE AT PORTLAND

At Portland much the same conditions obtain as at Seattle, except that the Portland Railway Light & Power Company uses solid manganese for steam-over-electric crossings and at certain intersections where the street railway traffic is particularly heavy. In general, good success is reported with solid manganese special work with a few exceptions where crossings of improper design were installed and which were later overcome by a redesign prepared by the manufacturer. For example, the crossings with the Southern Pacific Railroad at one point developed cracks in the groove at the point of the frog. These appeared soon after the crossings were installed, and some of the cracks grew to a length of 8 in. under service of less than four weeks. After two and one-half years, when the cracks had reached a length of 14 in. to 18 in., the crossing was pronounced unsafe and was replaced. On one of these castings about 4 in. of the end of one arm had broken off and, altogether, the crossings were admitted to be defective by the manufacturers and a proper allowance for this was made.

Sixteen standard solid manganese crossings were put in service by the Portland Railway, Light & Power Company at steam-and-electric intersections. Experience with these indicated that the points of the frog should have had more reinforcing metal to take the hammer blows, for six of the sixteen broke all the way through at the point of the frog when the other parts of the crossing indicated that possibly two years more wear could have been expected. It was noted in these and in other crossings that both in solid manganese and insert work the wear for the first month was greater than for the entire year following, from which it was inferred that the castings were not as hard at the surface as underneath.

A rigid concrete foundation is not considered successful under manganese crossings for heavy steam traffic, this company reports, because it has been found that the concrete may break under one part of the crossing and remain rigid under another part. In one case, this kind of a foundation failure caused an arm of the crossing to break off at the end of the casting, a break which was practically impossible to repair. Concrete foundations might be successful, it was thought, if the concrete was allowed to set for two or three weeks before operating over it, but no opportunity was found for experimenting with this theory. The most successful foundation for heavy service crossings was found to be not less than 2 ft. of well-drained crushed rock under well-seasoned 10-in. x 10-in. ties with tie plates large

enough to drill and spike through, and the whole surfaced with 5-in. crossing plank shaped to fit the crossing.

Electric welding on solid manganese has not been considered a success by the Portland Railway, Light & Power Company, and this is attributed to the difficulty of getting a flux bar with enough manganese in it to obtain a proper fusion with the broken or worn parts. Arrangements are being made to use flux bars of manganese steel, with which better success is expected. However, by the use of a steel containing a small percentage of manganese, two apparently successful welds were made in solid manganese frogs which had been badly chipped at the points. Three pounds of metal were required to make the repair on each of these, and after being in service for ten months the welds were in fair shape. These crossings were on electric lines only. The usual difficulty with electrically welded solid manganese crossings has been that the metal usually parts along the line of the weld, lasting only long enough to be badly battered.

#### SAN FRANCISCO AND BAY CITIES

The greater portion of special work used by the United Railroads in San Francisco is of insert construction with keyed-in inserts on splatter base. Solid manganese is specified for replacements under the heaviest traffic, and for lighter service the removable centers are considered most economical. Although no fixed rule is observed in determining which type is to be specified, it may be said of their practice that where 25-ton cars pass more often than on an average of two-minute intervals, solid manganese is specified, and where the traffic is lighter than this the insert work is considered suitable.

The United Railroads have had some insert special work in service for six years which, their engineers state, gives every indication of having a total life of fifteen years. Eight years is regarded as about the minimum reasonable life for insert work. Sixty manganese insert special work pieces that failed only three years after laying were replaced by the steel company. The United Railroads have had some trouble with inserts coming loose. An electric welder is used for repairing breaks at intersections and for building up cupped-out places.

The San Francisco Municipal Railway uses solid manganese special work throughout its system, a 105-lb. rail being standard. Considerable unusually heavy construction has been put down, but most of this has been in service such a short time that conclusions as to service cannot yet be drawn.

In Oakland three types of special work are used by the San Francisco-Oakland Terminal Railways; built up T-rail construction, manganese inserts, and a few solid manganese crossings. Occasional loose plates in the insert special work are reported, and there has been some chipping off at intersections, the latter being repaired successfully with an electric welder.

#### SOUTHERN CALIFORNIA

For the downtown districts of Los Angeles, about 90 per cent of the special work layouts on the system of the Los Angeles Railway are of solid manganese. This company has prepared standard designs for the special work on its entire system, and double-web sections are specified on all solid manganese work, thus involving about 40 per cent more steel than would be required by manganese insert work of single-web construction. For light traffic and in outlying districts insert construction is used.

Solid manganese has been laid where the Los Angeles Railway intersects the Pacific Electric system or steam

railroads. On steam road intersections, however, there has been considerable difficulty on account of corners breaking off, and the use of solid manganese special work is being discontinued, in replacements, in favor of built-up standard T-rail crossings with a structural steel foundation set in concrete. On parts of its system, where traffic is comparatively light, this company is now specifying cast-steel body manganese inserts. Solid manganese is used, however, for most crossings, frogs, switches and mates to obviate trouble with insert plates coming loose.

The Pacific Electric Railway has prepared a standard double-web design for solid manganese crossings which is given a specially strong reinforcement. It claims that not a single failure of these crossings has occurred. On crossings of less than 40 deg. it uses the built-up type of anvil face crossings, that is, manganese inserts which are the full depth of the rail and are bound all around by rolled rail. It uses no shallow or splattered-in inserts whatsoever on account of their coming loose, and it has never been able to keep them tight for more than two or three years. All switches, mates, frogs and crossings of solid manganese under the heaviest kind of traffic have given good service when they have been reinforced in accordance with this company's standard method. The average car weighs 35 tons and in some places these are run on a half-minute service. These cars are all equipped with M.C.B. standard wheels and no risers are used in the special work flangeways. In addition to the solid manganese design this company also uses special work built up of standard rolled T-rails. Both the Los Angeles companies use an electric welder in repairing broken-off intersections with success.

The San Diego Electric Railway uses 7-in. single web solid manganese special work for heaviest street railway traffic, with frogs, switches and mates also of solid manganese. For steam-over-electric crossings it uses double-web solid manganese specials of built-up, standard T-rail construction. This company claims to have obviated trouble with the breaking off of intersections by specifying unusually high risers in the flange grooves of all crossings so as to lift the wheel treads off the rail head at these points. These risers are cast integral with the crossings and are not renewable. Their life varies with the traffic, but when they wear down the crossing does not necessarily have to be renewed.

#### GENERAL SUMMARY

An analysis of the trouble which Pacific Coast companies have experienced with solid manganese and insert special work might be summed up as follows:

Most of the difficulty with solid manganese special work would be eliminated if proper foundry methods were always used and the crossings were properly reinforced. Formerly a common complaint was that castings were not properly tempered and the corners were too brittle, also where foundry work has been carelessly done, segregated metal sometimes collected at the intersections, thus weakening these points, or cracks occur in the flangeways. Recent experience would indicate, however, that the foundries are overcoming these defects almost entirely.

Insert special work seems to be very often liable to difficulty with loose plates, and engineers agree that it is usually impossible to renew a manganese plate on a splter bearing in the field so that it will stay tight permanently. There is also the liability of arms breaking off which does not occur in solid manganese castings. The corners of intersections seem to chip off under about the same conditions in both solid and insert special work, but as the electric welder is generally reported to repair both satisfactorily, this is not so serious a difficulty as are the other two. Solid manganese and

insert special work layouts are expected to have about the same life, so far as wear is concerned, when the plates remain tight.

Finally it might be said that in addition to obviating trouble with loose plates and broken arms, the solid manganese special work has the advantage that long tapering risers in the flange grooves can raise the wheels so that they roll on the flanges at the intersections, reducing the noise and lengthening the life by lessening intersection failures. With market conditions as they have been recently, the cost of standard single-web design solid manganese special work has been almost the same as for insert work where the single-web design is used, and under these conditions the preference is generally for the solid manganese castings.

#### Harder Rails Suggested as Preventative of Corrugation

In a paper on "Rail Corrugation and Its Causes," presented Feb. 24 before the Institution of Civil Engineers, London, England, S. P. W. D'A. Sellon reviewed different theories and investigations on the subject. In his opinion the evidence seemed to show that a comparatively small increase in the compressive strength of the steel will prevent corrugation, which he defined as the failure of the rail table under the stresses imposed upon it. The only remedy, of course, was a harder steel. The current British standard specification for tramway rails prescribed the proportion of carbon in the steel as 0.40 to 0.55 per cent, a rather wide range, of which the upper point only just encroached on the hard side for steel made by the Bessemer process, while for open-hearth material this percentage gave a comparatively soft steel.

The cold flowing of the rail surface, detruding into the groove, or to the outside of the railhead, was a general concomitant of corrugation and had been noticed as a frequent precursor of this trouble. It seemed desirable, therefore, that the rail steel should not have a high degree of ductility. It appeared that rails which conform to the British standard specification might have too low an elastic limit and too high a measure of ductility. The essential points to be specified were mechanical properties corresponding with the working stresses imposed upon the rails.

The first point was compressive strength. The British standard specification prescribes an ultimate tensile strength of not less than 40 tons per square inch, and as tensile strength and compressive strength were generally about equal in mild steel, this might be taken as the intention of the specification in respect of compressive strength. Probably steel with an ultimate tensile strength of 50 tons to 60 tons per square inch would be found hard enough to resist the destructive stresses. Neither flowing nor crushing should occur at less than 60 tons per square inch, although no figures should be fixed until proved by experiment to be adequate.

It was obvious that in obtaining the desired mechanical qualities it was necessary to avoid brittleness, to keep the metal sufficiently tough to enable rails to be curved by the usual methods and to use metal capable of being drilled. However, some additional cost of labor to secure more careful bending, and perhaps more expensive drills of special steel, could well be afforded if corrugation and excessive rates of wear could be avoided. It was probable that the tup test would have to be modified to suit steel with the desired properties, but rail breakage was so rare on street railways with a continuous concrete substructure that there was evidently a large margin of safety in that respect. Therefore, a less severe tup test should suffice. In any case, the tup test represented nothing to which the street rail was exposed in the course of its work.



# ELECTRIFICATION DISCUSSED

At Meeting of Western Society of Engineers on March 16, Papers on Electric Operation of Steam Railroads Were Presented by C. A. Goodnow, W. S. Murray, George Gibbs and E. B. Katté

AT a meeting of the Western Society of Engineers held at its club rooms in Chicago, March 16, papers discussing the operating results of electrification of steam railroads were presented by W. F. Murray, consulting engineer New York, New Haven & Hartford Railroad; Edwin B. Katté, chief engineer Electric Traction, New York Central Railroad; C. A. Goodnow, assistant to president Chicago, Milwaukee & St. Paul Railway, and George Gibbs, consulting engineer for the Pennsylvania and Norfolk & Western Railways. Messrs. Murray and Goodnow were unable to attend the meeting in person, Mr. Goodnow's paper being read by E. H. Lee, vice-president Chicago & Western Indiana Railroad, and Mr. Murray's paper by E. T. Howson, engineering editor *Railway Age Gazette*. The papers by Messrs. Gibbs and Katté are abstracted on another page of this issue.

Since the electrification of the Chicago, Milwaukee & St. Paul Railway was merely under construction, Mr. Goodnow's paper was devoted largely to a description of the character of the work undertaken, all of which has appeared from time to time in these columns. He expected that the Milwaukee electrification would result in important economies not only because an entire engine division was to be electrified for the first time, but also because it would become possible to abandon the intermediate engine terminals and yards within the electric zone which had been required under steam operation. The saving in fuel was also an important factor.

In Mr. Murray's paper it was stated that more than 40,000,000 ton-miles trailing load were handled during the month of January, 1915, by the New Haven electric locomotives, this total tonnage being made up of fast, slow and local freight movements. Records of the wattmeters on the locomotives indicate that for fast freight the kilowatt-hours per 1000 ton-miles of trailing load are on the order of 30; for slow freight, 30; and for local freight, 85. These show that an electrical ton-mile requires half as much fuel as a steam ton-mile.

With regard to the handling of classification and switching yards by electric motive power, Mr. Murray said that in 1,000,000 electric switch-engine-miles there had been but one failure. The introduction of the electric engine had increased the speed of the switching yards very greatly, and this increase of speed had been secured with a ratio of electric engines to replaced steam engines varying from 4:6 to 6:10.

With reference to the mercury-arc rectifier, Mr. Murray stated that the car which was in commercial operation on the New Haven Railroad had been giving most successful service and that it had solved the problem of the production and maintenance of the vacuum tube, both commercially and electrically. The possibilities accruing from such a result could be epitomized in the statement that while the economies of transmission by the single-phase system justified the utilization of a heavier and less efficient motive power, the rectifier to-day permitted railways not only to secure the economies gained in this transmission but to operate beneath the contact wires of such a

system the more efficient and lighter d.c. apparatus. As a concrete and practical application of this result, the a.c. motive power now in use on the New Haven would be increased 25 per cent by the application of the rectifier.

With regard to administration, he said that past experience on the New Haven Railroad had shown the necessity for a complete understanding of the difference between the operation of a steam and an electric property. There was no necessity for any general change in an existing steam-operated organization, but the methods pursued in producing a ton-mile of any character upon a steam basis must be abandoned when the drawbar pull comes from electricity. The error of holding a steam master mechanic responsible for an electric engine-mile of any character is patent, and equally patent is the error of holding a steam railroad shopman responsible for the maintenance and repairs of electric engines.

## DISCUSSION

In the discussion which followed the reading of the papers it appeared to be the general belief that electrification could be brought about only by proving the economy of its adoption over steam operation on a given line. Density of traffic was the main factor that had accounted for the present development of the art, and if a traffic density sufficient to warrant electrification did not obtain, it would be folly to consider it. Regarding the electrification of the Norfolk & Western, C. S. Churchhill, chief engineer of that road, stated that the economies of electrification had been first considered in 1905. At that time electrical engineers were unable to show any other saving than that of reducing the number of men necessary to operate the trains. After a month's operation on the present electrified division it had been found that the number of men could not be reduced, but that the remarkable development in the efficiency of the electrical generating units and distribution system had made possible other savings which had been far greater and had made electrification of the Norfolk & Western particularly economical. In order to check the economy of electric over steam operation a log of steam-engine train costs for the electrified engine division had been kept, and consequently the Norfolk & Western had figures with which it might definitely calculate results of electrification.

W. F. M. Goss also took part in the discussion and stated that although he was unable to give out any information regarding the Chicago terminal electrification, he wanted to leave the thought with the members and guests of the society that the proposed electrified zone would include more track than the total miles of electrified steam roads now in existence in the rest of the world. He ventured the statement that if the Chicago terminals were electrified more electric locomotives than there were now in existence would be required.

Bion J. Arnold spoke of the remarkable development in the efficiency of the steam locomotive during recent years. The problem of electrification now resolves it-

self into one of relative efficiency of operating units or trains rather than the relative efficiency of the two types of locomotives, since they were about at par at the present time. Regarding Mr. Katté's paper and particularly referring to the operating costs, Mr. Arnold predicted that if the electrified zone of the New York Central was extended, the costs would be greatly reduced and the whole electrification would prove to be economical. He stated that the extension of the New Haven electrification had made possible greater economies. He also predicted that good results would be obtained from the electrification of the Chicago, Milwaukee & St. Paul Railway. Regarding the Chicago terminals, Mr. Arnold stated that, although he doubted the practicability of electrifying the existing terminals as an economical proposition, he did believe that if they were rearranged, systematized and grouped so that the unified property could be utilized to its fullest capacity, there would be a complete change in the aspect as regards electrification.

Others taking part in the discussion included J. C. Mock, signal engineer Michigan Central Railroad, and E. W. Herr, vice-president Westinghouse Electric & Manufacturing Company.

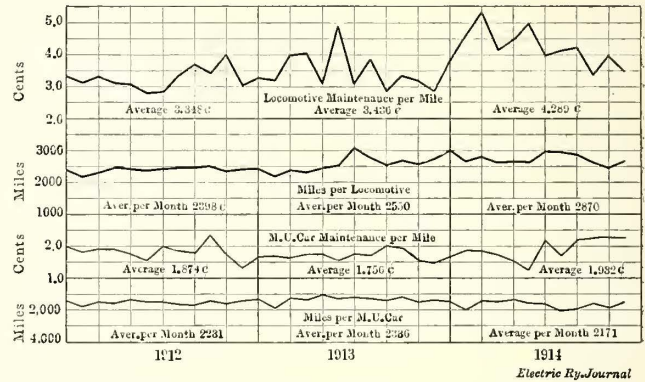
### MAINTENANCE COSTS ON THE NEW YORK CENTRAL

BY E. B. KATTÉ, CHIEF ENGINEER ELECTRIC TRACTION NEW YORK CENTRAL RAILROAD

The electric locomotive service of the New York Central Railroad in New York includes switching in yards and terminals, hauling shop trains for a distance of about 6 miles, and a main line express and local service on one 34-mile division and on another 24-mile division. The average cost for locomotive maintenance, including inspection, repairs, renewals, cleaning and painting varies from month to month, but the average cost, covering a period of eight years, is not far from 3½ cents per mile. The maintenance during the past year has been about 4 1/3 cents per mile, the increase being caused by the renewal of driving-wheel tires on the first thirty-five locomotives that were purchased.

The suburban service in the vicinity of New York City is handled by multiple-unit trains consisting of from two to eleven cars. Maintenance, including mechanical and electrical repairs, inspection, renewals, painting, etc., excluding only sweeping and window cleaning, has averaged somewhat less than 2 cents per car-mile. The cars are all-steel, 60 ft. long. They seat sixty-four passengers and weigh 57 tons. There is one motor truck under each car that is equipped with two 200-hp motors, giving a maximum speed of 54 m.p.h.

The New York Central Railroad Company has a special type of under-running third-rail, which is believed to afford greater protection from accidental contact than any other type. Its chief characteristics are, first, a wooden sheath inclosing the live third-rail, except on the bottom or contact surface, and, second, an insulated support so hung as to afford flexibility to prevent strains due to the up and down movement of the supporting ties under traffic. The cost of maintaining this protected third-rail is higher than for the usual type of third-rail, and the large amount of construction work in progress adjacent to the third-rail has increased the maintenance cost above normal. The average cost has been about \$26 per mile per month on the main line and \$40 for yards and terminals, including track bonding and cable connections, both positive and negative. As a general statement, it may be said that the cost of maintaining the three-phase, high-tension, overhead and under-



### NEW YORK CENTRAL EQUIPMENT—MAINTENANCE COSTS OF ELECTRIC LOCOMOTIVES AND MOTOR CARS

ground lines is about \$8 per circuit-mile per month, and the d.c. cables cost about \$13 per cable-mile.

The price paid for coal in New York averages from \$2.50 to \$3 per short ton, and power stations in this vicinity are operated on three eight-hour shifts, in place of the more common twelve-hour shifts. Under these conditions, 11,000-volt, three-phase, twenty-five cycle current measured at the busbars of the Port Morris Power Station averages between 0.45 cent and 0.50 cent per kilowatt-hour for operating, labor and materials. When fixed charges are added, the cost averages about 0.75 cent. The transmission and transformation losses, together with all fixed charges, will bring the average total cost of current, delivered to the third-rail shoes, to about 1.75 cents per kilowatt-hour.

As a measure of the reliability of electric equipment, it may be said that during the year 1914 the average

Month	ELECTRIC ZONE TRAIN DETENTION RECORD FOR 1914. NEW YORK CENTRAL RAILROAD																																
	TRAIN MINUTE DETENTION										MILEAGE																						
	Electric Power Trouble—Trans. Line					Electric Locomotives					Multiple Unit Cars					Locos. — M. U. Cars					Av. Miles per Min. Det. — M. U. Cars												
Power Station Substation	11000 Volts	600 Volts	Third Rail	22.20-Volt Signal Line	Total	Fuses	Contactors	Reversers	Misc. Elec.	Brakes	Misc. Mech.	Total	Fuses	Contactors	Relays	Control Jumpers	Misc. Elec.	Brakes	Hot Boxes	Misc. Mech.	Total	Total for All Causes	Total	Electric Zone	Total	Total	Elec. Delays	Mech. Delays	Total for All Causes				
January	11	5	16	36	18	86	5	124	269	13	27	21	5	43	109	394	188,314	459,989	475,607	700	11,500	6,893	1,685										
February	157	35½	192½	21	4	22	60	8	193	308	2	7	5	76	26½	35½	152	652½	166,740	409,701	423,680	541	4,552	6,834	905								
March	47	3½	50½	9	24	9	4	65	111	12	7½	41	22	40	112½	274	175,555	459,250	474,219	1581	48,342	4,604	2,371										
April																																	
May	3	133	25	14	175	4	60	4	19	87	5	4																					
June	260	6½	12	278½	10	65	14	89	2	32	95	3	132	499½	165,851	449,854	461,564	2579	21,045	15,916	1,970												
July	12	194½	206½	5	32	9	7	19	72	3	18	16	13	50	328½	185,656	441,956	461,564	2579	21,045	15,916	1,970											
August																																	
September																																	
October																																	
November																																	
December																																	
Total	26	597	48½	463½	1135	71	172	128	570½	59	475	1475½	45	18	14	11	184½	237	178½	189	877	3487½	2,066,253	5,302,952	5,496,603	1400	19,457	9,093	2,169				

Note:—Locomotives—Number of Detentions, 94; Miles per Detention, 21,981.  
M. U. Cars—Number of Detentions, 108; Miles per Detention, 50,894.

mileage per locomotive per detention was 22,000, while the multiple-unit cars averaged 51,000 miles per detention. The train detentions due to electric power troubles totaled 840 minutes for the year. To this aerial lines contributed most largely, with 535 train-minutes; the third-rail caused 244 minutes' delay, and sub-stations twenty-five minutes. The power stations have never caused a minute's delay during their eight years of operation.

Mr. Katté also presented the accompanying chart and table on costs, shown on page 580, and presented views of the equipment.

## ELECTRIFICATION ON THE NORFOLK & WESTERN RAILWAY

BY GEORGE GIBBS, CONSULTING ENGINEER

The Norfolk & Western Railway, an important trunk line with a large business in coal, has electrified a section of line that is known as the Elkhorn grade in the Pocahontas coal region. The tonnage on the road is very heavy, and this produces a favorable condition for electric traction. The electrified section includes about 30 miles of heavy grade along the western slope of the Allegheny Mountains and covers practically the entire gathering division for that particular coal-field.

The coal trains over these heavy grades are hauled by Mallet engines which operate only on the gathering division, three engines being required to haul the train at a speed of 7 m.p.h. or 8 m.p.h. In a tunnel on the division this speed is reduced to about 6 m.p.h., the tunnel being of limited cross-section so that difficulties with smoke have been intensified. The line is a very crooked one throughout the division. While the scheduled weight of the trains is 3250 tons now, with Mallet service, this is cut down in winter time to 2900 tons in order to get the trains over the division.

When electrification was first considered it was apparent that the use of a third-rail was impossible. That narrowed the problem to a consideration of high voltage systems, and an analysis of the cost and expense of operation resulted in the adoption of the single-phase system. On account of the enormous amounts of power which had to be applied to each train it was desirable to keep the amount of current as low as possible by adopting the highest possible voltage.

The single-phase power is converted on the locomotive into three-phase power and is used with three-phase motors. By this arrangement there is obtained the advantage of a rugged electrical machine together with a single overhead conductor, the latter being important in complicated yards and on crooked lines. The three-phase motor is not adapted to other classes of railway service, as it is essentially a one- or two-speed motor. It is not suitable for main line service requiring speed, but it is eminently satisfactory for tonnage work on heavy grades on account of its rugged characteristics.

With this system the speed of the train will be maintained irrespective of the load and the grade at any speed at which the motors are set. If the speed is exceeded by coasting down grade, with the train pushing the locomotive, the motors automatically return the current to the line at normal voltage and this power may be used in propelling trains up grade.

For this service there are provided twelve locomotives. Each is equipped with eight three-phase motors, arranged with eight-pole and four-pole combinations to produce 14 m.p.h. and 28 m.p.h. respectively. The total length of the locomotive is 105 ft. over all and the diameter of the driving wheels 62 in. The

weight is 270 tons, with 220 tons on the drivers. The drawbar-pull varies from 114,000 lb. during acceleration at the 14-mile speed, to 86,000 lb. when operating at this speed uniformly on a one per cent grade, but on a recent test a locomotive developed a tractive effort in excess of 170,000 lb., indicating, however, a coefficient of adhesion which cannot be assumed in practice. The maximum guaranteed accelerating tractive effort for a locomotive is 133,000 lb.

At the present time about half of this section of the road, including the entire heavy grade division, has been operating for about a month, and the experience thus far encountered indicates that the anticipations are to be realized in obtaining a remarkably successful installation. The trains accelerate promptly and without jerking on the heavy grades. On a 2.5 per cent down grade the trains are held at a speed not to exceed 14 m.p.h. As soon as the speed exceeds the 14-mile limit the current drops to zero, then mounts up in the opposite direction and there is returned automatically to the line an amount of power probably in excess of 2000 kw.

The acceleration of these heavy trains, as regards the amount of power required, is impressive. Preliminary tests indicate a development of 11,000 hp on one train during the acceleration period and 8000 hp when running at uniform speed. These figures are probably in excess of any amount of power delivered on a single train anywhere in the world.

Mr. Gibbs' paper concluded with a brief account of the electrification of the Pennsylvania main line between Broad Street Station, Philadelphia, and Paoli, a distance of 20 miles. This installation was described in the *ELECTRIC RAILWAY JOURNAL* for April 18, 1914.

## Electrolytic Corrosion Discussed at British I. C. E. Meeting

At a recent meeting of the Institution of Civil Engineers H. E. Gerbury outlined the general principles of pipe corrosion, with and without railway stray currents, quoting conditions in Sheffield by way of illustration. He stated that, as current density and current duration are the most important factors, potential readings are somewhat misleading. Where a comparatively high difference of potential exists there is, as a rule, less injurious current passing. This is largely due to the counter-emf of polarization. In Sheffield, when the tramway system and generation station have been shut down, differences of potential up to 0.66 volt have been observed on pipes. Incrustation in the bore of pipes is often caused by local electrolytic action. This growth might be started as a speck of rust, thus forming with the iron a galvanic couple, the oxide being electronegative to iron. The electrolyte might be created by the secretions of animalculæ or other acids. This nucleus would then establish a closed circuit, and the growth would continue by the increased bulk of oxide acting as a shell to retain the electrolyte.

## Ferro-manganese and the European War

Ferro-manganese, which has come to play an important part in street and electric railway special work, frogs and crossings, is sold under severe conditions by England during the present war. English producers require that American buyers must obligate themselves not to ship steel to Germany, Austria or Turkey, or even to countries contiguous thereto except through London. It is said that some buyers have declined to agree to these stipulations, while others, because of the large amount of business on hand, have been forced to do so in order to keep their plants in operation.

## RAILWAY SIGNAL ASSOCIATION MEETS

### Requisites Which Were Presented for Automatic Block on Single Track Were Considered Ample for Train Operation by Signal Indications Alone

At the winter meeting of the Railway Signal Association, which was held at the Auditorium Hotel, Chicago, on March 15, reports were presented by the standing committees on mechanical interlocking, power interlocking, automatic blocks, standard designs, electric railway and a.c. signaling, and storage-battery and charging equipment. Special committees on lightning protection and contract forms also made reports.

The committee on electric railway and alternating current signaling presented a report of progress only, stating that it was bringing up to date a series of descriptions of new and extended installations. The report added that alternating current signals were increasing in number greatly and that it would be doubtful whether the committee could present descriptions of all existing installations at the annual convention next fall. Specifications were being prepared for impedance coils, and an investigation was being conducted upon the subject of inductive effect between signal circuits and adjacent electric circuits, as well as upon the hazards due to the paralleling of high-tension and low-tension lines.

The committee on automatic block included in its report a statement of circuit requisites for single-track, "traffic direction," automatic block signaling. These proposed that the control of signals should be such as to provide: (1) That stop, caution or proceed indications should be given for following movements as on double track; (2) that two trains meeting at a passing siding should first receive caution indications before reaching stop signals; (3) that protection for switches and switching movements should be given as on double track; (4) that neither a single cross nor any combination of grounds or breaks should cause the energization of the controlling or signal-operating devices; (5) that two opposing signals governing into the same block should not display proceed indications simultaneously authorizing trains to move opposing each other; (6) that two opposing signals should not display the proceed indication simultaneously authorizing two trains to move from meeting points opposing each other where operating conditions would permit.

The committee reported that it had agreed on the above requisite as a whole, but that there was, however, a difference of opinion as to the scope of the requisites. The sub-committee handling this work was of the opinion that one set of requisites should cover all single-track signaling, while a majority of the whole committee favored the application of these requisites to "traffic direction" signaling only, with another set of requisites to cover each of the automatic signal systems now in general use and known to be giving satisfactory operation. No further circuit plans had been prepared since the convention in September, as the committee considered it advisable to wait until a definite expression of opinions had been obtained from the association concerning the proposed requisites.

The chairman of the sub-committee in charge of the work offered the following additional requisite for the consideration of the association: "That the giving of a proceed signal at the entrance to a block should be dependent upon the signal governing the same block in the opposing direction indicating stop."

### DISCUSSION

During the discussion each of the above-mentioned requisites was read and discussed at length, tentative

circuit plans having been presented which fulfilled their requirements. Exception was taken to requisite No. 2 because it was believed that it did not necessarily provide for a caution indication for a train at a stop at a station when an opposing train had started from a siding in advance. In response to this criticism G. H. Dryden, Baltimore & Ohio Railroad, advised that this requisite was covered in the circuits presented, which provided that when trains were actually running toward each other they first received a caution indication before a final stop signal. Mr. Dryden explained requisite No. 3 by stating that a train which was doing switching should be protected by stop and caution signals in the rear. In all cases an opposing train or a following train, as well as a train that might be using the switch, should receive correct indications by which to stop.

Requisite No. 4 was made the subject of considerable discussion and was characterized by President T. S. Stevens as the most important requisite presented. Objection to this was made on the ground that some combinations of grounds might result in a false indication under the present method of signal-line construction which provides for one common return. This point brought out the fact that the requisite provided for metallic circuits for the control of each relay. Objection was made to this because of the increased expense entailed. Some of the members were not at all sure but that a combination of grounds might result in a signal giving the wrong proceed indication even if metallic circuits were used. In explanation one of the members of the committee stated that the tentative plan designed to meet this requisite required only four line wires to be used between passing sidings, while with the present methods of signaling five are generally used. Upon this basis the expense entailed to meet this requisite was believed to be less than that required under the present method of installing signal line wires. The committee was not unanimously agreed on this clause, some believing that the requisite could not be met under all conditions. The committee as a whole, however, had approved the requisite because it wanted a scheme of single-track signaling which would be as safe as it could be made. In answer to a criticism regarding the wording of the requisite a member of the committee advised that it had been so constructed as to leave an opening for invention.

Discussion of requisite No. 5 was brief, but the consideration of requisite No. 6 brought out a number of interesting points. The first one raised was that this clause provided for a preliminary or traffic-direction feature which would mean that the first train arriving at a station would hold a train at an adjacent station irrespective of its class. This criticism, a member of committee stated, was covered by the last five words of the clause which qualified it to the extent of stating that "where operating conditions will permit." W. H. Elliott, New York Central Railroad, objected further to this requisite because he believed that signal systems should be so constructed as to permit trains to enter a block without traffic-direction control by circuits. He considered it would be better practice to leave this feature for the operating department, which could establish such regulations as it might require. Another objection to this requisite was that it might prevent the use of tracks to their fullest capacity and thus add to the expense of operation.

In response to these criticisms Mr. Dryden advised that the Baltimore & Ohio Railroad had 130 miles of single-track automatic block signaling where the siding overlap was in use. The division superintendent of the section so signaled had stated that he had experienced no more difficulty in the operation of his trains with the siding overlap after the trainmen and dispatchers had

been properly educated than if it had not been provided. This scheme was deemed desirable because it assured that trains would meet only at sidings if the trainmen disregarded orders or rules and operated only on signal indications. At this point Mr. Dryden went on record with the interesting statement that, with minor improvements, an installation such as provided by the tentative plans might be operated by signal indications alone. He believed that trains could be safely handled by the signals over single-track railroads when telegraph and telephone communication had failed. In fact, that was one of the conditions toward which the committee was proceeding.

In response to this statement it was remarked that the members of the association agreed that railroads could be operated safely with signals alone, but it was believed that this was aside from the work of the committee, which should confine its efforts to the recording of commonly accepted and known practice. One member stated that he had made a close study of the subject of siding overlaps and had decided that it could not be used except in very exceptional places without detriment to the operation of some trains. Another member stated that the recommendations presented by the committee were so far-reaching that it seemed advisable for the board of direction to pass upon them before the committee proceeded further with its work. In response to this Mr. Dryden, chairman of the sub-committee which prepared and presented the requisites, stated that he had received instructions to prepare typical circuits for single-track blocking, but in pursuance of this work had found that the method of operating single-track signaling was so different on various railroads that it was practically impossible to co-ordinate them. Upon motion at this point the association decided that the committee should proceed further along the lines set out in the requisites, but should confine itself to the work of standardizing common practice. Before closing the discussion of this subject a second motion was presented and carried which directed the committee to confine its efforts to accepted and general practice and not to delve into the realms of invention.

### “ELECTRIC RAILWAY HANDBOOK”

**Professor Richey's Book Has Just Been Published—Embraces Every Branch of Electric Railway Engineering**

A tremendous mass of electric railway engineering data has been intelligently selected and co-ordinated in Professor Richey's "Electric Railway Handbook," just issued by the McGraw-Hill Book Company, New York. Within one pocket volume of 832 pages there has been compressed the gist of thousands of articles and papers hitherto scattered in past issues of technical periodicals and association proceedings. It would be a mistake, however, to look upon this handbook as a mere historical digest. A conscientious effort has been made to bring the facts down to date wherever possible, and in many cases the matter is absolutely new. For example, the cost data on electric shovels were supplied to the author directly by the users. Another departure from many other handbooks is that labor-saving tools and other maintenance practices have been included wherever practicable.

The scope of the book embraces every branch of electric railway engineering, except a detailed consideration of those power problems that are common to generating plants as a whole. On the other hand, adequate treatment is included of any questions that peculiarly affect railway power plants and distribution.

In the first chapter, that on roadbed and track, the

author does not give the detailed calculations found in books exclusively devoted to track, but does give in a readily understood form just the data that the electric railway track engineer most often requires. He also presents construction costs and many hints on the most economical ways of handling work. The standards of electric railway track construction in many different cities are conveniently summarized in tabulated form. Rail standards and composition, rail joints, special work, steam railroad crossings and automatic switches are also taken up.

The chapter on buildings deals with a peculiarly difficult subject since so many of the existing carhouses and shops were planned before the consolidation of the local properties. The varying degrees of home manufacture by different railways and their use of steel or wooden cars also make difficult any conclusive comparisons of relative areas and layouts. However, the plans reproduced are of value even if they do no more than attract attention to some points that might otherwise have been overlooked. Included in the construction data are a number of minor but useful points on the best location of certain facilities like oil rooms, construction of trolley troughs, etc.

The next chapter, that on train movement, is evidently written for the engineer rather than for the maker of time-tables, although the factors that make up a schedule and samples of graphic interurban schedules are presented in the introduction. As a matter of fact, the greater part of this section is devoted to speed and power considerations, including studies of train resistance.

In the fourth chapter, that on railway motors, methods for comparing and selecting motors are explained. The treatment of gear ratio is particularly timely in view of the fact that some companies have found it desirable to change their gear ratios on account of changes in operating conditions. This chapter includes a discussion of shop practices and testing. The following two chapters are devoted to controlling apparatus and current-collecting devices.

In the chapter on trucks the author has presented a number of diagrams of the principal types of trucks, specifications of the A. E. R. E. A., covering wheels and axles, etc. Journal boxes and lubrication are also treated, including a description of the semicircular journal brass for high-braking pressures. This chapter is followed by one on braking, which opens with considerations of shoe pressure, rate and time of stop, and then describes the principal types and comparisons of brakeshop designs, including standardization, comparisons of hand and air brakes and calculation of brake rigging.

Under "rolling stock" the author discusses the question of weights as affecting operating costs, and describes representative types of city, interurban and rapid transit cars. Train operation, heating, lighting and ventilation are also treated. No attempt is made to take up the design of cars from the structural engineer's standpoint. This chapter also has some comparative data on locomotive design and a brief reference to motor buses.

Under "transmission and distribution" the author has taken up all forms of overhead and underground construction, including standard specifications, construction costs and a treatment of electrolysis. The final chapter is on signals and communication. This subject is developed from the simplest types of trolley contact signals to the most elaborate type for high-speed, short-headway service. Automatic train stops, cab signals, crossing signals and the functions of the telephone are also included.

# PAINING CARS IN TWO DAYS

The Hudson & Manhattan Railroad Has Extended the Use of Baking Enamel to Exterior Painting by Developing a Portable Oven

BY P. V. SEE, SUPERINTENDENT OF CAR EQUIPMENT HUDSON & MANHATTAN RAILROAD

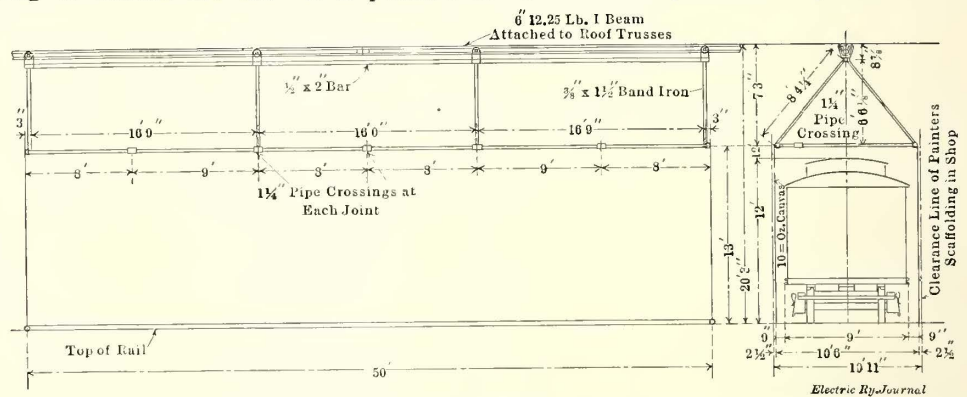
MORE than two years ago experiments were begun by the Hudson & Manhattan Railroad with a view toward determining the value of baking enamel for painting cars. These experiments resulted in the development of a method for painting car interiors that was described in the *ELECTRIC RAILWAY JOURNAL* for Jan. 25, 1913, the scheme in use at that time being to close the car completely and to raise the interior temperature by means of three extra equipments of electric car heaters hung inside of the car. This plan was, of course, available only for interior painting, but sixty cars were finished in this manner in white and green enamel, and after service of more than one year it was found that the baked enamel had maintained their color and luster in spite of frequent cleaning, the appearance being considered to be much better than that which could have been obtained under the air-drying system of painting.

In view of these results, it was decided at the beginning of last summer's painting to extend the use of baking enamel to the exteriors of the cars as well as to the interiors, and several of the leading varnish manufacturers were called upon to furnish baking enamel for this service. All of the manufacturers, it may be said, approved of the decision to use baking enamel exclusively, claiming that enamel could be made freer-running than paint, and that, owing to the fact that the material could be applied in a more liquid state, it provided a much smoother

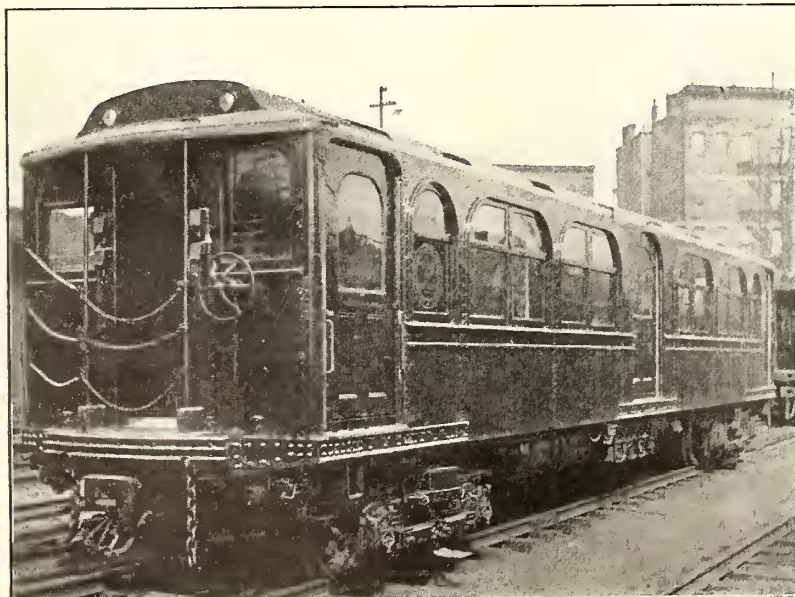
and tougher surface, when hard, than did the ordinary air-drying paint which the railroad formerly used.

## BAKED ENAMEL PAINTING

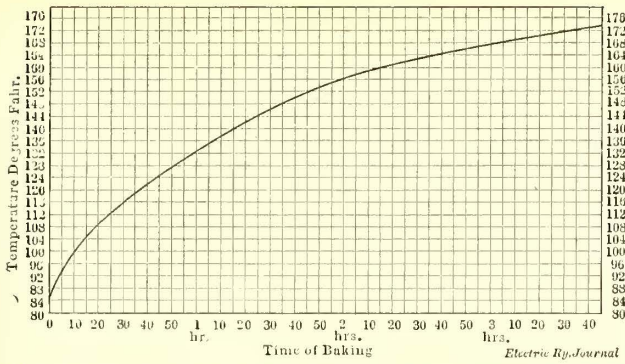
In order to apply the baking principle to the exteriors of the cars a 50-ft. portable canvas oven was designed to hang from an overhead framework, the latter being suspended on wheels from a 6-in. I-beam that was fastened to the roof girders. By the use of this canvas oven, which is heated by a battery of electric car heaters that are carried on low portable frames, a coat of enamel applied both to the interior and to the exterior of a car can be baked hard in about four hours. As the application of the coat requires about three hours, it is therefore possible for cars to be given two coats of enamel in one day, the nightwatchman at the shops having been trained to watch the temperature in the oven and to regulate the heat so that the oven can be operated after the painters leave. In consequence, it is possible for a car to be painted complete in two



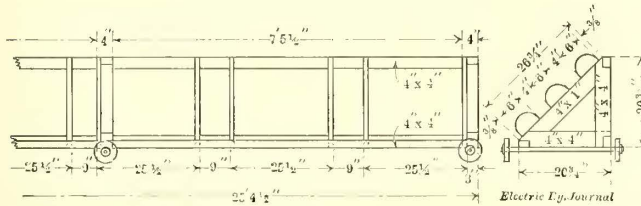
HUDSON & MANHATTAN PAINTING—DETAILS OF FRAME FOR CANVAS OVEN



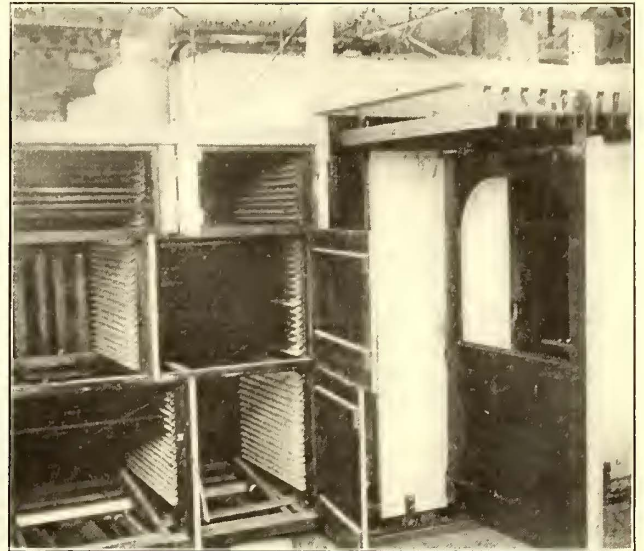
HUDSON & MANHATTAN PAINTING—VIEWS OF EXTERIOR AND INTERIOR OF CAR AFTER PAINTING WITH BAKING ENAMEL



HUDSON & MANHATTAN PAINTING—CURVE SHOWING TEMPERATURE RISE IN OVEN



HUDSON & MANHATTAN PAINTING—HEATER FRAME FOR CAR OVEN



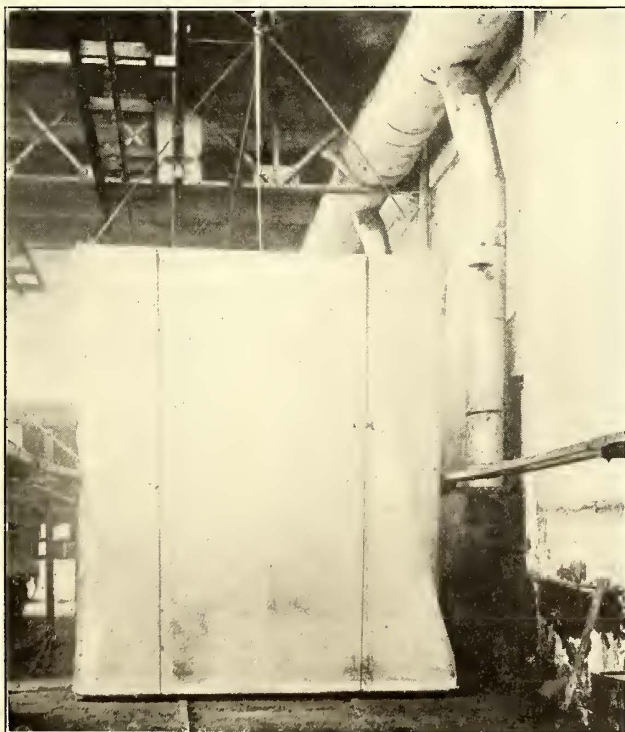
HUDSON & MANHATTAN PAINTING—SMALL BAKING OVENS FOR DOORS AND DASH

days, with the result that a large number of cars which would ordinarily be held for painting are made available for service. The cost of the oven and accessories was approximately \$300.

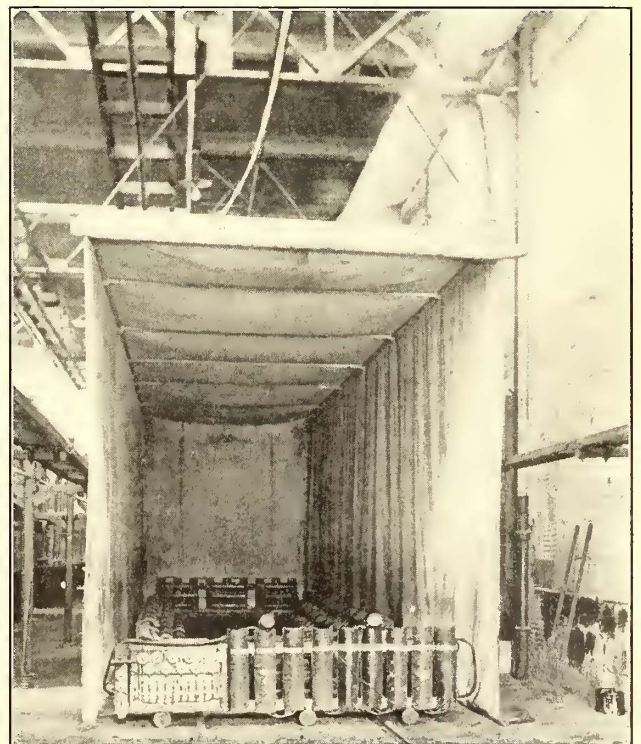
The use of baking enamel is limited to the car bodies and underframes, the trucks being painted only with such quality of paint as will serve to protect the metal against corrosion where it is not likely to be covered with oil or grease. To apply a coat of enamel over the inside and outside of a car takes approximately twenty-one man-hours. Four coats are given at each painting except for the roof, which has only three coats, and it has been found that about 1.2 gal. of enamel are required for each interior or exterior coat

on the sides, 1 gal. covering the roof and 1/2 gal. covering the ceiling. The quantity of material that is used varies, of course, in accordance with the character of the enamel and its location on the car, the roofs of the Hudson & Manhattan cars, for instance, being made of a lead-covered steel, so that a special lead primer has to be applied. The exteriors of the cars are painted a solid Pullman green and the interiors are painted green with white trimmings, the ceilings being solid white. The cost of the various enamels used averages \$3.50 per gallon, it being the belief of the management that high-priced paint is an economy in the end.

The temperature rise of the oven when it contains a car is shown in the accompanying curve. The readings for this were taken on a day when the tempera-



HUDSON & MANHATTAN PAINTING—VIEW OF BAKING OVEN WITH END-PIECE IN PLACE



HUDSON & MANHATTAN PAINTING—VIEW OF BAKING OVEN WITH END-PIECE ROLLED UP

ture was approximately 85 deg., and the upper part of the curve shows the extent of radiation from the sides and roof of the oven. Prior to applying the enamel, the cars thus far have been sandblasted owing to the fact that the old exterior paint has been seriously affected in spots by the salt-water drip from the tunnel in which the Hudson & Manhattan Railroad operates. The present results, therefore, apply to cars which are stripped clean of all protective covering.

#### DETAILS OF PROCESS

The process has been followed of preheating the car before the enamel is applied so that positive assurance exists that the metal of the car body is hotter than the surrounding air and no chance exists that any moisture can collect to set up corrosion underneath the first coat of enamel. The pre-heating temperature has been set at approximately 175 deg. After this temperature is reached the oven is moved away from the car, and by the time the temperature of the metal surface has fallen to 110 deg. or 115 deg. the painting is commenced. By the time the coat has been applied the temperature has fallen 25 deg. or 30 deg. further, so that the car has again reached the approximate atmospheric temperature.

As soon as the first coat of enamel has been applied the oven is moved back over the car and the temperature is raised to 160 deg. This rise in temperature requires about two hours and after the baking temperature is reached the heat is maintained constant for three hours longer. These periods are based upon the requirements of a four-hour baking period, the two-hour rise in temperature being considered as the equivalent of one-hour run at the high temperature.

At the completion of the baking of the first coat of enamel, the oven is removed and the temperature is allowed to fall again to about 115 deg., when the application of the second coat is begun. After this is applied the temperature is raised to 140 deg. and maintained at that point for the equivalent of the four-hour baking period. The same process is followed for the two additional coats, making a total of four applications for each car. In future paintings, of course, it is obvious that four coats will not be required, as new priming coats will not be necessary.

During the time that one car is being painted the oven is kept in use by baking the enamel on another car, this being possible because the time required to apply a coat of enamel is roughly equal to that required to bake it. The movement of the oven is facilitated by the fact that it is hung on rollers and the heaters with which it is equipped are mounted on frames with wheels, so that they can be rolled with facility across the concrete floor of the paint shop.

#### BAKING OVEN AND EQUIPMENT

The framework on which the oven is carried is made of 1½-in. pipe and ¼-in. x 1-in. strap iron, as shown in the accompanying cut. Over this frame is hung a 10-oz. canvas curtain made in a single piece 50 ft. long and 26 ft. wide, so that it extends from one side of the frame to the other. The end pieces are 13 ft. high and 10 ft. 6 in. wide, and they are sewed to the top of the main canvas covering. The end pieces are fitted with eyelets at 6-in. intervals along the edges, and the edges of the main curtain have corresponding buttons, so that the end pieces can be fastened in place while the baking is going on.

Heat is provided by seven and one-half equipments of car heaters, each equipment consisting of eighteen Consolidated car heaters. The connections are made of No. 10 wire with car-jumper plugs and sockets, so that they can be made and broken very quickly. Each

equipment is supplied through a snap switch so that the temperature may be readily adjusted by cutting out groups of heaters as required. The heaters are mounted in three horizontal rows on a long wooden framework that is supported on wheels. The frame is triangular in section, having three 4-in. x 4-in. stringers extending for the full length of 25 ft. and the heaters are attached to the diagonal pieces of 4-in. x 1-in. wood. An accompanying illustration shows the construction of the frames for the heaters at the sides of the car. The frames for the heaters at the ends are similar in construction but are, of course, only 10 ft. wide. In addition they carry heaters mounted vertically along the outside of the frame.

Before the car is painted the doors and sash are removed and cleaned, enamelled and then baked in small stationary ovens located in another part of the shop. These ovens have been made by inclosing the old sash and door racks originally used with the air-drying painting system and equipping them with electric heaters in sufficient number to raise the temperature to that required for baking. It will be seen from the accompanying illustration that the door rack is arranged with runways upon which the doors are hung, the doors being given a coat of enamel and then run into the oven without the loss of any appreciable amount of heat by leaving the doors open.

## COMMUNICATION

### The "Jitney" Bus and Syndicated News

GEORGIA RAILWAY & POWER COMPANY

ATLANTA, GA., March 15, 1915.

To the Editors:

I have read with much interest and appreciation the presentation in your issue of March 6 of the malicious activities of a newspaper syndicate bureau. Your positive treatment of this matter, both in the body of the paper and editorially, should be of benefit to the industry. I believe you have revealed much to street railway interests throughout the country.

The article on page 509 in your issue of March 13 shows that the syndicate's anti-railway campaign is still active and continuous.

There is no doubt that a great deal of good can be accomplished if railway men reply promptly and vigorously to erroneous and exaggerated statements which appear in the public press. You may be interested in an experience which I have had in so doing. A syndicated article on the "jitney" bus, written by Dr. Frank Crane, New York, recently was given wide publication. It included a quotation, made with seeming approval, of a newspaper editorial statement that "The 'jitneys' may even achieve the miracle of making traction magnates understand that there is a limit to the patience of the American people." It said also that the street railway and subway businesses have never been satisfactory; that the facilities for transportation supplied by them had always been inadequate and that people had submitted to being jammed and pushed in street cars and subways and elevated cars as if they were cattle.

I wrote to Dr. Crane, and in my letter to him I quoted these statements and then said:

President Wilson spoke recently of "the rules of the game" that must be observed by every business, big or little, wherein moves the spirit of true sportsmanship. He was addressing the mid-year meeting in Washington of the Electric Railway Association.

He spoke plain, common sense. There are rules; and if A is to observe them, B is playing an unfair game if for



his part he does not observe them. Either A's rules in the game must apply to B also, with suitable adaptation and handicap, or B's freedom from rules must be extended to A. Otherwise there can be no game, no fair play.

The game of city and suburban transportation is played by established business under the following rules:

1. The player shall take good with bad, skimmed milk with cream, misfortune with fortune. For the risk is his, as well as the reward.

2. Player shall move conveyances throughout the city. He cannot address his game to those sections where traffic is heavy and profitable without obligating himself to serve also those other sections where traffic is light and unprofitable.

3. Player shall move conveyances on fixed, regular and frequent schedules. These schedules must be followed all day and every day and most of every night, regardless of weather. This rule is inflexible, even when its observance means loss to the player.

4. Player shall furnish rides to all who apply, just when they apply. This rule shall be observed even when nobody applies.

5. Player shall exchange for one 5-cent piece a ride from any point to any other point in his field, either by direct route or by transfer.

6. Once a route is established, it shall remain thereafter forever a part of the game, and service upon it shall not be discontinued by any circumstance.

7. In exchange for the right to play the game on the city streets, player shall contribute a full proportion of the cost of public pavements in the streets, even though these streets are occupied by all others in common with him, and notwithstanding he imposes no wear upon said pavement.

8. Player shall pay to the public, the proprietor of the game, city and county and state taxes of generous figure, and also to the city a fixed portion of his gross earnings.

9. Player shall not be permitted to gain an unlimited profit. This limitation is impassable notwithstanding he is not guaranteed in any degree by anyone any profit at all.

10. Player shall furnish to his patrons at all seasons protection from the weather, in clean, sanitary, ventilated, comfortable cars.

11. Player shall qualify as financially responsible for any and all injuries or damages to person or property for which he may be adjudged legally responsible.

12. Player shall obey under penalty such regulations as are prescribed by the police. He shall stop but briefly his conveyances, and at certain points only, and never for the purpose of soliciting patrons. He shall keep his conveyances moving on schedules and routes predetermined.

In all matters not covered specifically by the foregoing rules, player shall be subject at all times to oversight and

regulation by the referees, who are the authorities named by the people.

If "jitney" buses are to enter the city and suburban transportation game, should not their play be adapted to these rules?

Nobody maintains that the alternative of declaring all rules "off" should be accepted. That would bring chaos in reality. But if no fair basis of competition is established, and the public wants "jitney" buses sufficiently to make them profitable on a permanent basis, would it not be reasonable for the established street car companies, the transportation specialists, to play the game with the "jitney" buses on their own ground and under their own rules?

I have continued sending to Dr. Crane other matter pretesting the company's viewpoint. You may be interested to learn that I have just received from him this letter:

The article "Look, Then Leap," which you sent me, strikes me as good advertising. While I don't think the "jitney" bus movement can be stopped, it certainly should be regulated. I would be pleased to see what further action you are taking in this matter. Cordially, Frank Crane.

W. T. WATERS, Advertising Manager.

## TERMINAL FACILITIES AT SAN DIEGO

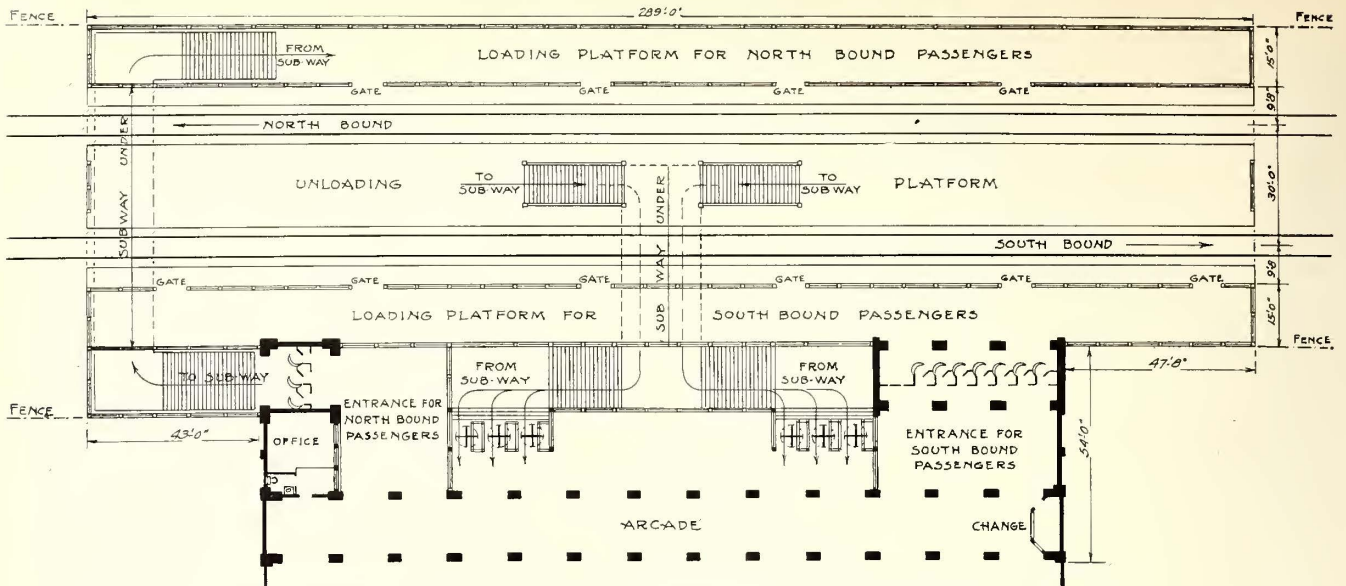
Provisions Made by San Diego Electric Railway for Handling Exposition Crowds

Many people probably do not realize that there are two large expositions in California this year, the Panama-Pacific Exposition at San Francisco and the Panama-California Exposition at San Diego. The former, being larger, is attracting more public attention than the exposition held at San Diego, but the promoters of the latter believe that there is opportunity for two large fairs of this kind in California this year. They think that few people will take the trip across the Continent to San Francisco without also visiting Southern California, and that the fair at San Diego will prove an added attraction for the trip.

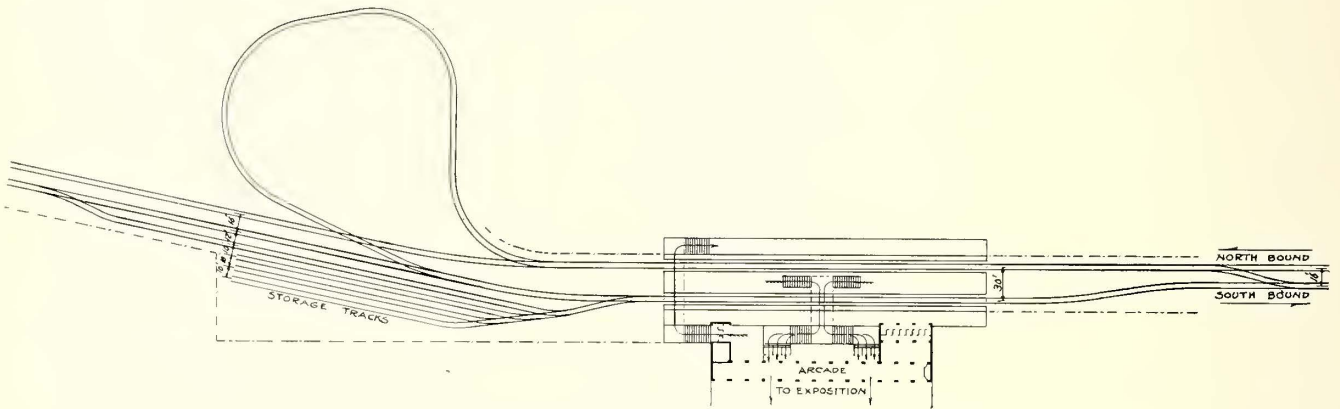
In location, the Exposition at San Diego is quite different from that at San Francisco. The latter is directly on the water. The San Diego Exposition is in Balboa Park—a large tract of land near the center of



SAN DIEGO TERMINAL—GENERAL VIEW OF PLATFORMS



SAN DIEGO TERMINAL—PLAN SHOWING LOADING AND UNLOADING PLATFORMS



SAN DIEGO TERMINAL—PLAN OF LOOP AND STORAGE TRACKS

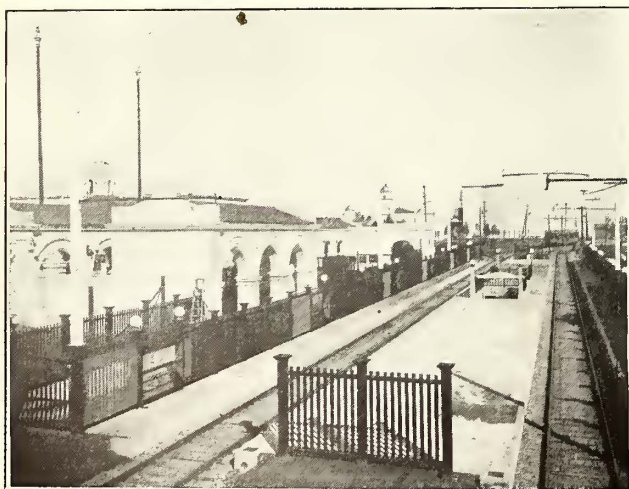
the city and at a considerable height above it. From the buildings can be obtained a beautiful view of San Diego Bay. The area covered by the Exposition is 618 acres. The general exhibit and main buildings occupy 100 acres, the state and foreign sections 100 acres, and the amusement features 25 acres, while 250 acres are devoted to landscape gardens and park. The buildings are in the Spanish Colonial style. The Exposition was opened on Jan. 1, and will continue for the entire year of 1915.

The electric railway system in San Diego is operated by the San Diego Electric Railway Company, which has recently completed at the main Exposition entrance an elaborate terminal with three platforms, two for loading and one for unloading. There are separate entrances or exits to each and subways so that passengers do not have to cross the tracks.

The track is constructed of 75-lb. T-rail. All of the platforms are of sufficient length to enable the company to discharge or load at least two-car trains at the same time. The company has 76 cars equipped with the General Electric system of control which enables the use of two or more cars per train. The train which has been found to be most convenient during the rush-hours is the two-car train, and this will probably be the standard unit for the exposition period at rush-hours. Passengers unloading from the cars pass down stairways to subways and then to the inside of the grounds, passing through turnstiles.

The inclosure on the loading platform has a capacity for 2000 people, so that in case of a blockade or any serious delay no difficulty will be experienced. Electric lights are installed to show intending passengers which way they are to go. These lights are under the control of the gateman. Ample storage capacity for cars is provided by the stub tracks and loop track. These enable the company to store a sufficiently large number of cars to enable it to take care of a crowd at closing time.

The cost of the construction of this terminal was nearly \$20,000 exclusive of track.



SAN DIEGO TERMINAL—VIEW SHOWING ENTRANCE TO EXPOSITION

# AMERICAN ASSOCIATION NEWS

Important Meetings of Rules, Block Signals and Motor Vehicles Committees  
Were Held This Week—Complete Sets of Proceedings Were Issued

## JOINT MEETING OF RULES AND BLOCK SIGNAL COMMITTEES

A joint meeting of the block signal committee and a sub-committee of the Transportation & Traffic Association rules committee was held at the Congress Hotel, Chicago, March 16 and 17, for the purpose of revising the rules pertaining to signals. This meeting was attended by L. H. Palmer, New York, N. Y.; C. E. Morgan, Jackson, Mich.; S. W. Greenland, Fort Wayne, Ind.; J. W. Brown, Newark, N. J.; John Leisenring, Peoria, Ill.; G. N. Brown, Syracuse, N. Y.; H. A. Nicholl, Anderson, Ind.; C. H. Morrison, New Haven, Conn.; G. N. Day, Syracuse, N. Y.; H. W. Griffin, New York, N. Y.; C. D. Emmons, South Bend, Ind.; W. J. Field, *Electric Traction*, and E. M. Haas, *ELECTRIC RAILWAY JOURNAL*. In the absence of J. M. Waldron, chairman of the joint committee on block signals, J. W. Brown, vice-chairman, presided.

The subject of the block signal rules was considered in detail, with a view to making such revisions of the definitions and rules as were deemed advisable. It was decided that Rule 10 relating to contactor signals should not be revised, but that an explanatory note should be added restricting its application to the non-registering type of signals. Since the registering type was believed to be special, no rule was recommended for it.

Rule 554, under automatic block signal rules for train and motor crews, which relates to the procedure at signals indicating "stop," a new rule, which was believed to cover the situation thoroughly, was discussed at length and approved. At the close of the discussion of block signal rules, Chairman J. W. Brown appointed C. D. Emmons and G. N. Brown as a sub-committee to work with the sub-committee of the Transportation & Traffic Association's committee on rules to complete the work of revision.

Immediately upon completion of the work of the joint committee on block signals and the sub-committee on rules of the Transportation & Traffic Association, the former committee went into session, taking up the subjects assigned directly to it. A tentative plan on clearance diagrams for semaphore signals was submitted, criticised and revised to meet the views of the committee as a whole, as well as those of the power distribution committee. On the subject of light signals for interurban railways it was decided that the recommendations made at the 1914 convention should remain unchanged, pending the adoption of definite standards.

On the subject of operating by signal indications only, the statement was made that data sheets had been sent out to a number of companies for information and their recommendations regarding this practice, and it was found that the concensus of opinion was against this method of operation, at least at this stage of the development of the art of block signaling. One of the points raised included the delay to superior trains by inferior trains and the possibility of a complete tie-up. A statement of the opinion of the committee regarding this method of operation is being preferred.

The committee accepted the A. I. E. E. standardization rules as far as they relate to signal work.

A complete report on the subject of highway crossings and protection was submitted and, after slight revisions, was approved for insertion in its final report.

## MEETING OF COMMITTEE ON OPERATION OF MOTOR VEHICLES

A meeting of the committee of the American Electric Railway Association on the operation of motor vehicles was held in New York on March 16. It was attended by all of the four members of the committee, Britton I. Budd, Chicago; Henry G. Bradlee, Boston; William A. House, Baltimore, and C. L. S. Tingley, Philadelphia. This is the second meeting of the committee, the former having been held in New York last month. The conclusions of the committee were summarized in a report to President Allen, which will doubtless be issued in the immediate future.

## ISSUE OF PROCEEDINGS

Bound volumes of the proceedings for the 1914 convention were distributed this week. As for last year, they consist of six volumes. Altogether there are 2130 pages, made up as follows: American Association, 314 pages; Engineering Association, 596 pages; Accountants Association, 200 pages; Traffic & Transportation Association, 464 pages; Claims Association, 216 pages; year book, 340 pages. Besides bringing the committees and other data in regard to the association up to date, the year book contains some twenty pages of tables compiled by the bureau of fare research, largely from the 1912 census report on electric railways.

## PUBLIC SERVICE COMPANY SECTION

The regular meeting of the section was held in Newark on March 18. The speaker advertised for the evening was Oscar T. Crosby, but a letter received from Mr. Crosby on Wednesday stated that he had accepted the direction of the Belgian relief work, necessitating his sailing on Saturday. A new program was immediately devised, consisting of talks by R. E. Danforth, general manager, on experiences with early railway motors and results achieved in reducing motor maintenance costs; by Alfred Green, Galena Signal Oil Company, on experiences with several types of early motors in Rochester, and by H. H. Norris, *ELECTRIC RAILWAY JOURNAL*, on energy requirements in starting electric cars and keeping them at speed.

This program while extempore, fitted in with the course on "Public Service Economics," and Mr. Danforth stated that the discussion of equipment maintenance cost reduction would be continued at a later meeting.

## ACCOUNTANTS' EDUCATIONAL COMMITTEE

A meeting of the committee on education of the American Electric Railway Accountants' Association is called for Monday, March 22, in New York. The members of this committee, whose names have not been previously announced in the *ELECTRIC RAILWAY JOURNAL*, are George C. Whitney, Washington Railway & Electric Company, Washington, D. C., chairman; F. J. Pryor, Jr., American Railways Company, Philadelphia, Pa.; F. D. Lasher, Republic Railway & Light Company, New York; N. E. Stubbs, United Railways & Electric Company, Baltimore, Md., and G. H. Caskey, Newport News & Hampton Railway, Gas & Electric Company, Hampton, Va.

# Equipment and Its Maintenance

Short Descriptions of Labor, Mechanical and Electrical Practices in Every Department of Electric Railroading

(Contributions from the Men in the Field Are Solicited and Will be Paid for at Special Rates.)

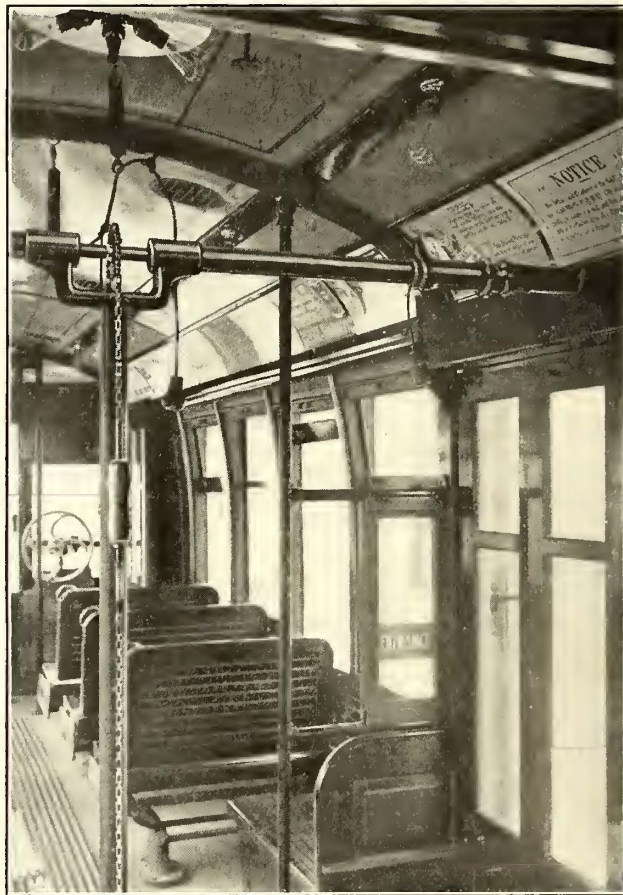
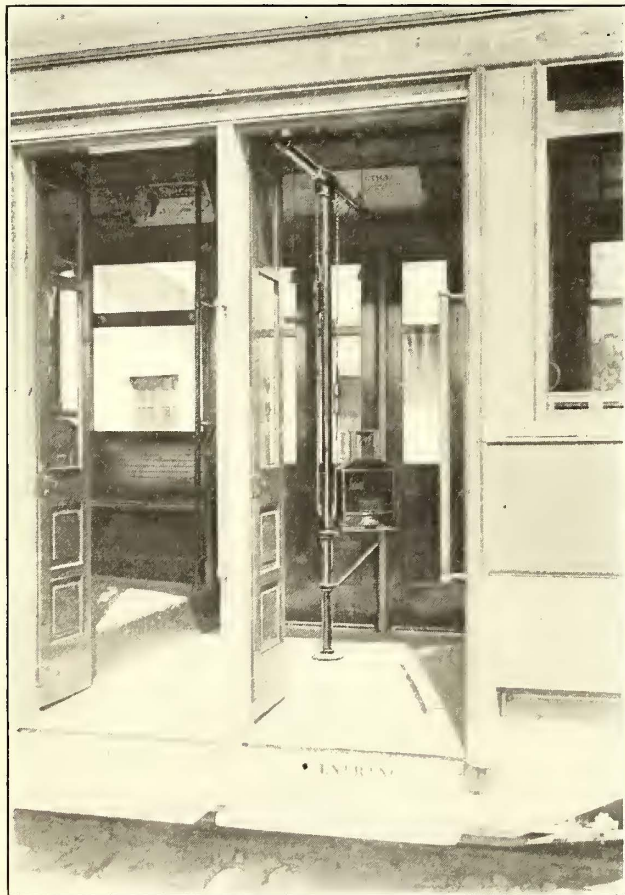
## Car-Door Operation with Sprocket Chain and Worm Shaft

BY J. N. LLOYD, MASTER MECHANIC SANTA BARBARA & SUBURBAN RAILWAY, SANTA BARBARA, CAL.

Our cars are of the center-entrance prepayment type. Originally they were equipped with wire doors but as these proved unsatisfactory the company decided to replace them with half-glazed wooden doors. For this change we designed and built in our own shops the door-operating mechanism hereinafter described. The first car, which was changed in July, 1914, gave such

In the center of the car is a 1½-in. pipe stanchion which has a cast fork at the top. A hollow tube runs from each side of the fork across the car to the post at the center of the entrance. Incased in these tubes is a continuous shaft which has bearings at each end of the tubes. The shaft has a right-hand worm screw on one end and a left-hand screw on the other. Each screw operates a wing nut which slides through two slots 8 in. long which are cut, one on each side of the tube, 14 in. from the door post.

Connected with each wing nut are two rods which in turn are connected to cranks, one on each center door



VIEW OF SANTA BARBARA CAR AT CENTER-ENTRANCE, SHOWING THE DOOR-OPERATING CHAIN WITH HAND-HOLD FOR CONDUCTOR, SPROCKET WHEEL AND TUBING FOR CONTINUOUS SHAFT; SHORT LEVER OVER SLOT IN HORIZONTAL TUBE LOCKS ONE DOOR MECHANISM WITHOUT AFFECTING THE OTHER

satisfaction that we have since converted the remaining cars in the same way.

There are four doors to each side of the car, two opening back to back at the center-entrance post and one at each side of the entrance bulkhead. The step works simultaneously with the doors. The doors are hinged on 1-in. door posts which have a bearing at the floor and just above the tops of the doors.

The two center-door posts extend through the floor and are equipped at the bottom with bevel gears which are in mesh with bevel gears on a jack shaft parallel with step shaft and operating step shaft by a lever.

post. From another crank on each center door post is a rod extending over and connecting with a crank on each side door post and causing them to operate simultaneously with the center doors.

The worm screw shaft extending across the car is fitted at the center with a sprocket which is caused to rotate by a continuous chain which runs over another sprocket fitted in the center stanchion 2 ft. from the floor.

The chain is fitted on each side of the stanchion with a wooden grip to enable the conductor to operate the doors by a downward pull.

To prevent the doors on both sides of the car from operating at the same time, two collars are fitted on each tube at the ends of the slots through which the wing nuts slide. Between the collars is a slotted sleeve which is caused to rotate by means of a short lever over the slot in the tube. This arrangement causes the wing nut to be locked in place when the doors are closed. To operate the doors on either side of the car, the wing nut on the opposite side is locked, and the shaft is rotated by means of the chain and sprocket. The shaft rotates through both the locked and the unlocked nuts, drawing the latter back through its slot toward the center of the car for the 4-in. of distance required to open the doors.

### Trailer Wagons with Automobile Steering Gear for Vienna Snow Cleaning—Car Scraper Practice

BY LUDWIG SPÄGLER, DIRECTOR VIENNA MUNICIPAL TRAMWAYS

For many years the Vienna Municipal Tramways has been obliged to remove all snow not only from between its rails but also for certain distances on each side of the rails and even to the curbs. This makes it necessary to have equipment which will take care of the entire width of the street. To attain this end we use a train made up of a motor service car and two pole-coupled wagons, both classes of vehicles being fitted with snow plows, as illustrated. The space between the rails is cleared by the motor car while the rest is cleared by the wagons which can be steered from side to side and around obstructions. This steering gear is of automobile type, and is manipulated by seated operators. The



MOTOR CAR WITH PLOW FOR TRACK CLEANING AND WAGON TRAILERS FOR REMOVING SNOW BETWEEN RAILS AND CURB

wagons have iron-tired wheels and are hauled at an average rate of 7.4 m.p.h., at which speed they do not make excessive noise in paved streets. Consequently they may be run in between the regular passenger cars. The trains are placed in service as soon as a storm begins and if the storm is a heavy one remain at work during its continuance.

For the more thorough removal of the snow at the rails patented Berbalk snow-scrapers for 200 to 300 motor cars are deposited at several points along the routes. As soon as snow begins to fall the cars stop at the supply depots where the scrapers are attached by their crews.

While the equipments described might prove insufficient for heavy snow conditions they are entirely satisfactory for the winters of Vienna.

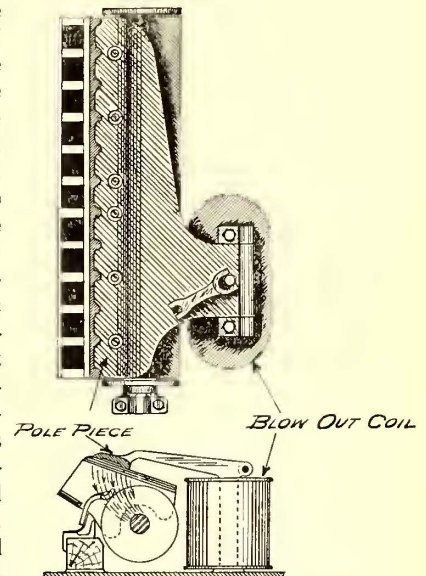
### Equipment Defects—Controller Blow-Out Coils—I

BY C. W. SQUIER, E. E.

It is necessary that all controllers handling large currents be provided with some means for successfully extinguishing the arc formed by the opening of the circuit at the contacts. At first mechanical devices were tried and the circuit was opened simultaneously at a number of points in series, but the great advance in extinguishing this arc came with the introduction of the magnetic blow-out. The principle of using a magnetic field to blow out an arc was first developed by Prof. Elihu Thomson. He found that an electric arc is urged out of a magnetic field and that when the circuit is broken in such a field the arc is blown out of line and is extinguished or cut in two.

The General Electric Company was the first to apply this principle to extinguishing the arcing in controllers. Its first type of controller blow-out is shown in an accompanying illustration. This consists of a blow-out coil connected in series with the main contacts and fitted with a cast-iron pole piece which extends over the main fingers and contacts, hinged to one end of the core of the coil. The path of the magnetic circuit is from the coil through the pole piece and down through the fingers and contacts to the controller shaft and frame and so back to the core of the blow-out coil. Thus a magnetic field is provided at the point where the

fingers bear on the contacts, by the passage of lines of force between the pole piece and the shaft. When the circuit is opened this magnetic field causes the arc to be blown sidewise and so aids in extinguishing it. To prevent this arc from short-circuiting to the adjacent fingers and contacts, molded insulating shields called arc deflectors are inserted between them. These are fastened to the pole pieces so that they can be easily swung out of the way to permit easy access and give an unimpeded view of the contacts for inspection.

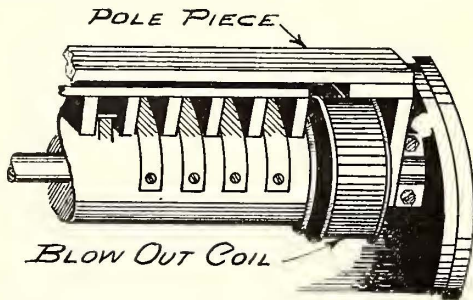


FIRST CONTROLLER BLOW-OUT

This pioneer magnetic blow-out has proved very successful for handling currents up to 75 amp, and most of the hand controllers now in service have this type in some modified form. Many other types and arrangements of controller blow-outs have since been developed, however, in an effort to provide a more efficient blow-out and to overcome some of the principal objections to the pioneer type, namely: The coil occupies much space at a point that could be utilized to advantage for connections or contacts; the stray fields are very large, so that a big portion of the lines of force is not available for blow-out purposes; the contacts most distant from the coil have a smaller magnetic field and consequently a weaker magnetic blow-out than the contacts nearer this coil; as the arc is blown sidewise against the arc deflectors it does not have sufficient space to expand properly, causing excessive burning of the arc deflector plates. Troubles with the coils themselves

have been very few and are confined chiefly to short-circuits which result from the burning of insulation, due to the floating back of the arc from the contacts or to the expansion of the coils when hot whereby the insulation is rubbed by the drum or some other moving part.

Troubles with the arc shield, which may be included as a part of the controller blow-out, are the following:



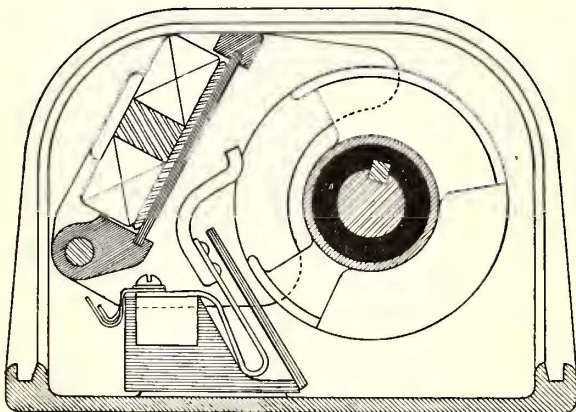
SHAFT TYPE OF CONTROLLER BLOW-OUT

Burned arc deflectors and broken or split deflectors. This splitting of the arc deflectors is due principally to the use of wood screws for fastening them together and to the pole piece.

Much attention has been given toward developing an insulating material which will withstand the severe arcing to which arc deflectors are subjected and also to permit fastening with wood screws to provide a solid support. So far, however, nothing entirely satisfactory has been produced.

SHAFT TYPE BLOW-OUT

The type of blow-out next developed may be properly termed the shaft type of blow-out. It is shown in a second illustration. In this type the blow-out coil is placed directly around the controller shaft, and a wrought-iron pole piece extends over the coil and contacts. This location of the blow-out coil at the bottom of the controller makes a very neat design and utilizes



POLE-PIECE TYPE OF CONTROLLER BLOW-OUT

the space to the best advantage. It is also remote from the arcing at the controller contacts so that trouble from burned insulation, due to this arcing, is overcome. This type, however, is still open to the criticism that the contacts at the top of the drum have less blow-out than those at the bottom and that the direction of the arc is still against the arc deflectors.

POLE-PIECE TYPE OF BLOW-OUT COIL

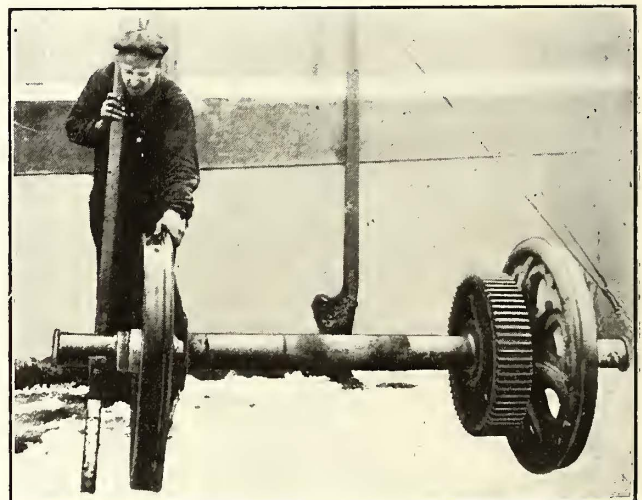
A third illustration shows the pole-piece type of blow-out coil which was the third design brought out. This consists of a long coil extending the entire length of

the controller and mounted directly over the points where the fingers rest on their contacts. The magnetic circuit for this blow-out is from the inside of the core of the blow-out coil across the contacts to the controller shaft and then to the cover and frame and so back to the outside of the blow-out core. This blow-out is used quite extensively as it provides a uniform field for all contacts and so overcomes the objection of having some contacts with less blow-out effect than others.

All three of the blow-outs so far illustrated have the lines of force of the magnetic field passing in a direction perpendicular to the controller shaft and the arc is blown sidewise. To provide space for the expansion of this arc some controllers have been built with a space between adjacent contacts and with holes through the arc deflectors at the contact points through which the arc is blown. However, this adds to the height of the controller and so requires a disadvantageous amount of room.

Notched Stick to Steer Wheel Sets

The notched stick well known to steam railroad men for lifting wheel sets from the rails is used in the Wolf Street shops of the New York State Railways, Syracuse Lines, for moving a wheel set across the floor and steering it to the wheel lathe. The stick, which is shown in use, is made of wood except that a reinforcing strip of



NOTCHED STICK FOR STEERING WHEEL SETS

strap iron is added to prevent splitting. To steer the set the operator inserts the notched portion under the axle, lifting it, say, only 1/8 in., but this is enough to permit him to steer the set by pulling toward him the wheel on his left.

Railless Traction in Shanghai, China

The railless street cars recently shipped from England for use in Shanghai have been temporarily abandoned because of the condition of the streets on which they were operated. It was found that the wheels of the new cars were pressing down the surface stones with which the roads are paved, and it seems that these roads will have to be gone over thoroughly before the operation of the railless cars can be undertaken successfully. Aside from the difficulty with the roadbeds, the cars are said to be eminently suited for use on the traffic-packed streets of Shanghai. In the period of thirteen days during which the cars were run 200,000 passengers were carried, the cars on the streets numbering about five each day.

**Ampere-hour Meters on Battery Cars**

The Third Avenue Railway System, New York, now operates a total of 160 storage-battery cars, of which about 140 are in daily use. In order to show the motormen how much energy they have left in the batteries, and also as an incentive to economical operation, each car is equipped with a Sangamo integrating ampere-hour meter. On a storage-battery car, of course, the meter which records charge and discharge is a necessity since the car carries but a limited supply which, if used too lavishly, will cause the motorman to lose a portion of his day's work. Thus, a storage-battery motorman has a strong and immediate incentive to operate with economy. Should he run short of power when operating a car taken over from a morning platform man, the latter is likely to hear something to his disadvantage the next time he meets his relief.

The average weight, unloaded, of a storage-battery car is 8.25 tons. The car seating capacity averages twenty-four and the standing load may increase the total passenger load to fifty or sixty. The capacity of the battery is 420-amp-hr. With careful operation this is ample for the twelve to fourteen-hour schedule, which means a daily run ranging from 69 to 98 car-miles. The average schedule speed is 6.5 to 7 m.p.h. on Manhattan lines, but the City Island cars (four in winter and twelve in summer) make 9 m.p.h. on account of long free runs through park territory. The energy consumption varies, of course, according to traffic conditions as well as to the skill of the motormen. Thus, with a battery potential of 113 volts the average ampere-hours per car-mile of the five Manhattan divisions shape up as follows: 5.20 amp-hr. on the West Belt line, 5.22 amp-hr. on the 110th Street line, 5.72 amp-hr. on the Twenty-eighth-Twenty-ninth Street Crosstown line, 5.82 amp-hr. on the Avenue B line and 5.87 amp-hr. on the East Belt line.

A copy of the ampere-hour records of all motormen and the corresponding car numbers is sent by the transportation department to the storage-battery foreman. The former, therefore, has a check on the motormen while the mechanical department has one on the cars. The ampere-hour meters have given an excellent account of themselves. Outside of occasional careless handling, due in no way to the type of meter, they require no other maintenance than an occasional cleansing of the mercury. Such a cleansing may be needed at intervals of six months to two and one-half years.

**Compact Wet Process Insulator**

A demand for small compact wet process insulators for sustaining heavy loads has led the Pittsburgh High Voltage Insulator Company, Derry, Pa., to place on the market the type of insulator shown in the accompanying illustration. The bearing surface of the insulator is 9 in. in diameter, and it stands 10 in. high. It is provided with petticoats or corrugations to increase the creepage distance under rainy or stormy conditions.

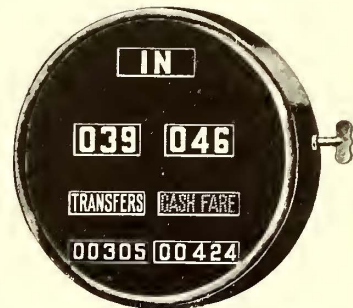


CORRUGATED WET PROCESS INSULATOR

It is supplied with a metal cap and base for attachment to the bottom of towers, the object being to provide an insulated base for support and insulation of heavy towers. The insulator shown in the illustration is designed to maintain a 500,000 lb. compression load, and to have an ultimate strength of 1,150,000 lbs.

**Double Fare Register Adapted for City and Zone Operation**

The New Haven Trolley Supply Company, New Haven, Conn., is just placing on the market a new Sterling double fare register which is particularly adapted for interurban service, where the zone system of fare collection is used, and also for city service. This machine obviates the need for two styles of register equipment where it is desirable to shift cars from city to interurban or from interurban to city service. In other words, this register gives one standard equipment for both interurban and city service. The machine visibly indicates the number of the zone, or trip, in which the fare is being collected. As the indicator is very prominent it greatly facilitates inspection, and serves as a reminder to the conductor not to "neglect" to reset his register at the end of each zone, or trip. The company has recently furnished a full equipment of these registers, and center-ringing device, to the Parkersburg, Marietta & Interurban Railway, Parkersburg, W. Va.

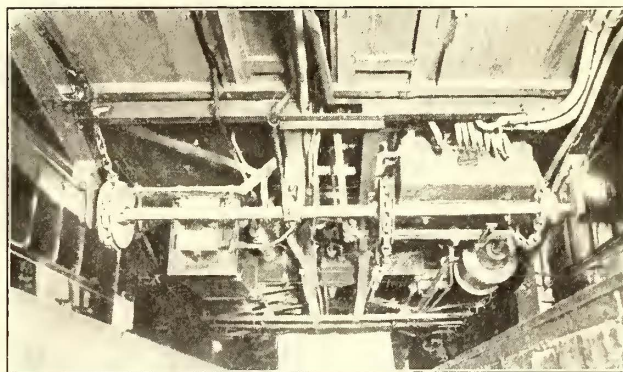


DOUBLE REGISTER ADAPTED FOR CITY AND ZONE OPERATION

**Light-Weight Electrical Equipment of Wilkes-Barre Center-Entrance Cars**

Supplementing the description of the Wilkes-Barre Railway's six center-entrance cars described in the ELECTRIC RAILWAY JOURNAL for March 13, the Westinghouse Electric & Manufacturing Company furnishes the following data on their light, compact electrical equipment.

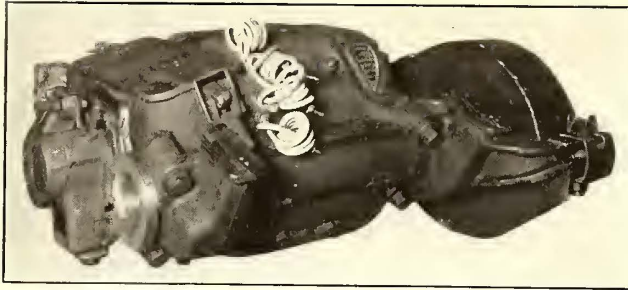
Each truck carries two Westinghouse No. 532-B motors. The No. 532-B is a self-ventilated motor of the box-frame type, and has a rating of 36 kw (48 hp)



UNDERFLOOR LAYOUT OF EQUIPMENT, WILKES-BARRE CENTER-ENTRANCE CAR

at 600 volts. This motor equipment is the most powerful to which the light-weight HL equipment has ever been applied. The floor of the cars at the center entrance is approximately 13 in. above the ground, whereas at the trucks clearance must be provided for the 30-in. wheels. Consequently there is but little space for the control and brake equipment beneath the car.

The switch group of this control weighs only 350 lb. Otherwise, a complete light-weight HL equipment is made up of the same number of parts as the regular



SELF-VENTILATED MOTOR OF 36 KW CAPACITY, INCLUDING GEAR CASE

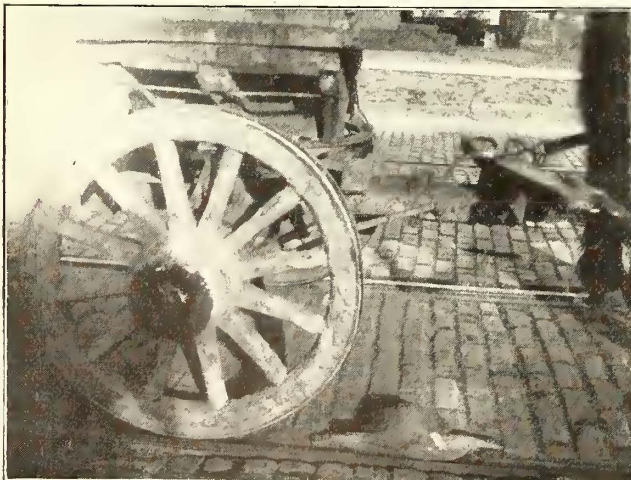
type HL. The switch group has an over-all height of only 17 in., thus being easily mounted under low-floor cars. The master controller used with the light-weight apparatus has an interesting feature in that it is provided with a slip ring which causes all the important circuit-breaking switches to open simultaneously whenever the master controller is "backed off" one notch from any position. This causes a division of the final break between several switches, eliminates all other current breaks when "backing off" and thereby greatly decreases the wear on switch contacts, arcing horns and arcing boxes.

The weight of the electrical equipment is 11,580 lb. Other weights are as follows: Car-body only, 22,000 lb.; each Brill 27 MCB-2X truck, 7200 lb.; Westinghouse semi-automatic air brakes and other equipment, 2000 lb.; total car complete, 49,980 lb.

### Tread-Pickup Rerailer for Cars Which Serves Also as Derailer for Vehicles

The accompanying illustrations show a radically new and improved rerailer made by the Sargent Company, Chicago, Ill. This rerailer is the result of several years of experimenting to obtain a final contour which will most readily serve to rerail wheels in track on paved streets. The principle used is asserted to be new in rerailing devices in that the wheel is picked up on its tread rather than on the flange. This method of rerailing requires much less elevation for the function of sliding the wheels to the rails. With other devices it is the practice to roll the wheels on their flanges over the rerailer and irrespective of the form of the flange. In such cases the car must be lifted from  $\frac{5}{8}$  in. to 1 in. higher before it is well mounted on the rerailing device.

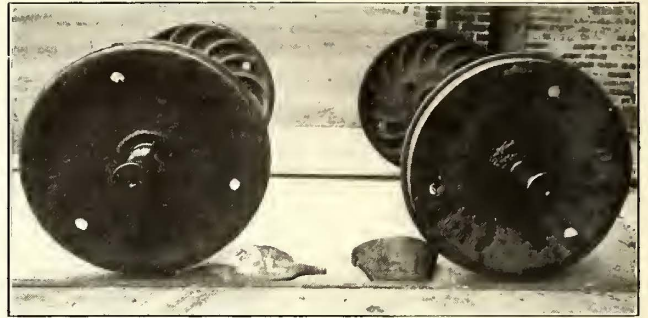
With the Sargent rerailer, projections are provided



RERAILER EMPLOYED AS A DERAILER TO GET A WEDGED WAGON WHEEL OFF THE RAILS

as a part of the main casting. These projections serve to put the full weight directly onto the tread and thus give good traction before the flange climbs onto the body of the rerailer and reaches the point where it will automatically slide onto the rail.

The accompanying halftones are from photographs made on the property of the Evanston (Ill.) Street Railway where these rerailers have been put to diversified use. They have been employed not only for rerailing cars, but also for derailing wagons and electric automobiles, which, under certain conditions of the



NEW RERAILER AT LEFT AND OLD-STYLE RERAILER AT RIGHT

pavement, get wedged between the gage lines of the running rails. One illustration shows the device in use for derailing a wagon. Another shows this device and the old style turtle-back rerailer. This view illustrates the difference in angle and vertical lift of the two devices and the consequent ease with which the new device operates.

### Motor Efficiency

R. E. Hellmund in the *Electric Journal* states that while a high efficiency in the railway motor is desirable, as in any motor, there are a number of reasons which make it inadvisable to give the question of efficiency too much weight. High efficiency means large and heavy motors and, in many cases, it might occur that the addition of a certain motor weight to make a small gain in efficiency would be bad engineering because the gain in motor efficiency might be more than outweighed by the power consumption necessary for hauling that an extra weight. It should further be considered that a reduction of efficiency caused by increased ohmic resistance in the motor does not mean very much, especially in city service, because there the motor is operated a large part of the time, and especially during the periods of large currents, with external resistance in circuit anyhow, and because the resistance losses in the motor itself are relatively small. It is somewhat different with the core losses of the motor which constitute a source of power consumption which can always be reduced by keeping the core losses of the motor low, as far as this can be done without materially increasing the weight and size of the motor.

The bureau of standards at Washington, D. C., is distributing upon request its publication entitled "The Testing of Materials." The publication is an eighty-nine-page pamphlet dealing with such subjects as metals and alloys, cements, clay products, lime, stone, paint materials, bituminous materials, inks, paper, textiles, rubber, leather, lubricating oils and greases, chemicals, and materials intended for technical use, such as electrical materials, optical materials, thermal materials, etc. The introduction gives briefly the theory upon which the testing of materials is based and outlines the purpose and ultimate aim of the bureau's work in this direction.



# News of Electric Railways

## CHARGES AGAINST COMMISSIONERS

### Four Members of New York Commission, First District, Served with Charges—Reply Required by March 23

Four members of the Public Service Commission for the First District of New York—Edward E. McCall, chairman; J. Sergeant Cram, George V. S. Williams and Robert Colgate Wood—received on March 13 from Governor Whitman letters containing charges against them. The fifth commissioner, Milo R. Maltbie, whose term expired on Feb. 1, and who is holding over temporarily, got no communication from Albany. March 23 has been fixed as the date on or before which the commissioners may answer publicly in person or by counsel. The charges against Chairman McCall follow:

1.—He has been inefficient and neglectful of his duty in failing to supervise the handling by the subordinates of the commission of complaints of citizens regarding service on street railroads, and in failing to give support to the efforts of said subordinates necessary to enable them to accomplish satisfactory results.

2.—He has been inefficient and neglectful of his duty in failing to inform himself of the outstanding orders of the commission regarding service on street railroads.

3.—He has been inefficient and neglectful of his duty in permitting street railroad companies to violate the orders of the commission and in failing to resort to the remedies provided by law to compel compliance with said orders.

4.—He has been inefficient and neglectful of his duty in failing to compel street railroad companies to furnish such service to the public as could reasonably have been required under existing conditions.

5.—He was inefficient and neglectful of his duty in failing to require the Bradley Construction Company to cease work on the Lexington Avenue route of the subway, after having been advised by the chief engineer of the commission that this work would be useless in the event that the dual subway system was adopted.

6.—He has been inefficient and neglectful of his duty in permitting unreasonable and unnecessary delays in the final determination of matters taken up by the commission in formal hearings.

7.—He was guilty of misconduct in office in devoting a considerable portion of his time to the private practice of law at a time when he should have been devoting all of his time to the business of the commission and acquainting himself with the duties of his office, the existing orders of the commission and the details of administration of the commission's affairs, and in absenting himself from the stated meetings of the commission, at which important business was transacted, in order to attend court on the same days in the interest of private clients.

8.—He was guilty of misconduct in office in using an automobile belonging to the commission for his own private purpose, and also in using the office of the chairman of the commission as a place for the taking of testimony in connection with his private practice.

The first five charges against Commissioner Cram were the same as the first, third, fourth, fifth, and sixth against Chairman McCall. Two others were individual to him. They were:

6.—He was guilty of misconduct in office in using an automobile belonging to the commission for his own private purposes, as more fully specified on pages 16 and 17 of said report.

7.—He has been inefficient and neglectful of his duty in failing to devote the time and attention necessary to the faithful and efficient performance of the duties of his office, as is more fully specified on pages 15 and 18 of said report.

Only six charges were made against Commissioner Williams. Of these four were the same as the first, third, fifth and sixth counts against Chairman McCall, and he

is also required to answer these special accusations:

3.—He has been inefficient and neglectful of his duty in failing to compel street railroad companies, and especially the street railroad companies in the Borough of Brooklyn, over which he had direct personal supervision, to furnish such service to the public as could reasonably have been required under existing conditions.

6.—He was guilty of misconduct in office, adjourning the hearing in Case No. 1436, involving the question of increasing the car equipment on the elevated lines in Brooklyn for a period of more than a year without disclosing to the public the fact that the commission had determined not to order additional elevated cars until final decision had been made as to the adoption of the dual subway contracts, and in neglecting to make an order in said proceedings requiring additional car equipment.

Against Commissioner Wood the same charges are brought as in the first, second, third, fourth and sixth specifications against Chairman McCall. The charges referring to him exclusively are:

6.—He has been inefficient and neglectful of his duty in failing to familiarize himself with the provisions of the Public Service Commission law.

7.—He was inefficient and neglectful of his duty and was guilty of misconduct in office in unnecessarily delaying the letting of a contract for the construction of a signal system in the Center Street loop.

## DETROIT TRAFFIC SURVEY

### Report by Barclay Parsons & Klapp Recommends Rerouting Loops and Two-Car Units—Cost of Downtown Subway \$2,500,000

Barclay Parsons & Klapp, New York, have presented their report on their traffic survey of Detroit to the Municipal Street Railway Commission. The report covers 298 printed pages and includes twenty-one maps and plans. Provision is made in the recommendations for both temporary immediate relief and for permanent readjustment of the car lines and routes. Referring to the rush-hour problem the report says:

"The Detroit street railway rush-hour problem is essentially a case of unusual traffic concentration, due to a system of converging car lines loading and unloading the bulk of their passengers in a very limited central delivery district. The permanent nature of this district and the distribution of the new population during the recent rapid growth of Detroit clearly indicates that the convenience of the traveling public will best be served by continuation of their present main lines of travel."

Speaking of the density of traffic in Detroit, the report says:

"In the period from 1904 to 1914 the total revenue passengers grew from 78,349,220 to a total of 219,606,056, an increase of 180 per cent. This latter figure gives a density of traffic per mile of main single track of 1,062,000 revenue passengers, which is about 40 per cent heavier than in Cleveland in 1913, and 44 per cent heavier than the density on the surface and elevated lines in Chicago in 1914."

Briefly stated, the report recommends as follows:

Entire rerouting of various lines entering the heart of the city by a system of loops to eliminate, as far as possible, the present crossing interference. This rerouting provides for the looping back of cars not required for the carrying of legitimate through traffic across the center of the city. Two-car units are suggested on Woodward Avenue, with larger car units on some of the lines now using old type cars, the extension of crosstown lines, a system of "skip stops" on the heavy traffic lines, street collectors at the front doors in the downtown district in the rush hour, special non-stop cars through the crowds of factory workers on some of the main lines to take care of

ordinary traffic, and suitable ordinances to encourage the use by automobiles of streets on which car lines do not operate.

The report sets forth that \$400,000 spent for track changes, repaving, curbing and other items involved in a complete rerouting plan, in addition to the operation of two-car units and a system of "skip stops," will increase the carrying capacity of the lines from 30 per cent to 50 per cent.

The immediate construction of a long subway on Woodward Avenue, the heaviest traffic artery, is not recommended. The estimated cost of a long subway, 6 miles, is placed at \$16,300,000, and even if a population of 1,000,000 is reached by 1920 the advisability of such a subway is questioned. The alternative of a short subway, that is, putting the street cars underground downtown, is discussed also. A tube of this kind, so built as to be available for a terminus of a complete subway system, would cost \$2,500,000.

#### PHILADELPHIA ELECTRIFICATION TRIALS

It was announced that a few minutes after midnight on March 18 the Philadelphia Electric Company would cut over service to the cables of the Pennsylvania Railroad leading to the Bryn Mawr substation and that trial runs would follow on the electrified line of the Pennsylvania Railroad between Philadelphia and Bryn Mawr, connection with Paoli being made later. It is expected that regular service between Philadelphia and Paoli will begin on May 30. There are now forty-six trains from Philadelphia to Paoli, and forty-seven inbound trains, while under the tentative schedule there will be fifty-one eastbound and fifty-four westbound trains. All cars for the electric service are equipped and ready. There are ninety-three of them, all steel cars, each with a seating capacity of fifty-four passengers. Eight of these cars were in the West Philadelphia yard on March 15 and will be used in making trial runs.

#### CINCINNATI FRANCHISE DEFEATED

At the referendum election on March 9 the franchise granted the Cincinnati, Newport & Covington Street Railway for a terminal in Cincinnati, Ohio, was defeated by a vote of 32,494 to 23,591, or a majority of 8903. Secretary Polk Laffoon of the company declined to make a statement in regard to the results. Some of the conditions of the franchise and the agreements upon which it was based have been complied with by the company. It is likely that the portions of the ordinance known to be objectionable will be revised to meet the views of the opponents of the franchise.

Speaking of the defeat of the franchise, W. W. Freeman, president of the company, said that probably no definite plans will be considered for a few days. The company's franchise on the Covington line has expired and it has no franchise on the division that reaches Cincinnati. Mr. Freeman said, however, that the company would be glad to keep its cars in operation, and Mayor Speigel announced that an agreement has been reached with Director of Public Service Fosdick by which the city will receive the same franchise tax that was paid before the expiration of the old franchise.

The transportation committee of the Federated Improvement Association, which opposed the franchise of the Cincinnati, Newport & Covington Street Railway in the recent referendum election in Cincinnati, has suggested that a committee made up of three members each from the Power League, the Business Men's Club, the City Club, the Chamber of Commerce and the Federated Improvement Association, be appointed to meet the officials of the company and members of the City Council in an endeavor to arrive at an agreement on a form of franchise that will be mutually satisfactory.

A conference was held on March 11 by those interested in the proposed construction of the Bond Hill line by the Cincinnati Traction Company, at which a number of residents of that suburb, Service Director Fosdick, City Engineer Krug, City Solicitor Schoenle and Walter Draper, vice-president of the Cincinnati Traction Company, were pres-

ent. Residents of Avondale were recently refused an injunction against the construction of the line on the ground that the street on which the tracks are to be laid had not yet been built. With the legal question settled an attempt will be made to reach an agreement in regard to the construction of the line.

#### LEGISLATION IN PENNSYLVANIA

The following bills affecting public utilities are pending in the Pennsylvania House: to repeal the Public Service Company law; to amend the Public Service law with municipal exemptions; to require lights on certain vehicles; to provide for the incorporation of omnibus lines; to provide a workmen's compensation act; to tax the real estate of public service companies; to require "all street cars to be equipped with air brake attachment and automatic air couplers"; to regulate the hours of employment of signal men, gatemen, etc., on any railroad by steam or electricity and provide compensation for extra labor; to require toilets on cars and terminal stations for street railways operating 15 miles; to empower cities of the second class to levy and collect taxes on railroad switches, turnouts, etc., on public streets; to empower cities of the second class to levy and collect taxes on poles, wires, cables, etc., on public streets; to regulate advertisements and solicitations for employees during strikes and other labor troubles; to revise, consolidate and amend the law relating to certain corporations; to establish a department of State police, etc., and providing for increases in pay; to permit members of the General Assembly and State officials the right of free transportation over carriers; to relieve from the payment of mercantile license tax corporations which pay a tax on capital stock; to regulate motor vehicles by changing the age condition so that no one under fifteen years shall be permitted to operate a car unless accompanied by a regularly licensed operator, no person between fifteen and eighteen to receive a license unless his competency has been attested by two licensed operators; to regulate the use of public highways by vehicles; to require suburban electric railways to provide waiting rooms; to take away from the Public Service Commission jurisdiction over counties, cities, etc., in certain matters and vesting the same in the court; amending the act to regulate the transaction of business by foreign corporations; to define public service companies and to establish a public service bureau in the Department of Internal Affairs, etc.; to provide for the equipment of all street cars with efficient air brakes, etc.; to limit the hours of labor of motormen, conductors and drivers employed by horse, cable and electric railways.

Among the bills introduced in the Senate are the following: to repeal the public service company law; to require the license and registration of private detective and detective agencies; to empower municipalities to construct and maintain street railway tracks and equipment for the operation of street cars and to lease said equipment, etc.; to authorize and empower municipalities to construct and give them the right of condemnation if necessary and to maintain and operate underground street railways and also street passenger or elevated railways connecting therewith or exchanging passengers with said underground street railways and to lease the underground street railway and any surface or elevated street railway connecting therewith to corporations, etc.; granting the right of eminent domain to boroughs and towns; directing the Public Service Commission to investigate the issuing of bonds of corporations, etc.; regulating the voting and meetings of stockholders of corporations; regulating and standardizing insurance policies.

Among the bills that have passed the Senate of interest to public utilities is one to empower municipalities to construct and operate overhead, surface or subway street railways.

Among the bills that have passed the House is the one to amend the act regulating auto vehicles, etc.

The bill in regard to the regulation of the "jitney" bus in Pennsylvania is referred to on page 603.

John R. Rose, Oklahoma City, Okla., and associates of Miami plan to build an interurban line to extend from Miami to Tulsa and north from Miami to connect with the interurban line in Missouri.

### OHIO COMMISSION SUSTAINED

In a decision handed down on March 16 the Ohio Supreme Court sustained the Public Utilities Commission in an order issued to the Hocking Valley Railroad to resume electric service between Hamden and Jackson. It is probable that the case will be appealed to the United States Supreme Court. The most important point involved is whether a railroad can abandon an unprofitable portion of its line when the property as a whole has shown a profit.

Some time ago citizens filed a petition with the Public Utilities Commission, alleging that the Hocking Valley Railroad had operated an interurban service between Hamden and Jackson since 1896, and furnished current for lighting to towns along the route and to private consumers. A year ago the company proposed to discontinue this service and an order was asked to prevent abandonment of operation. The company contended that the service did not pay and offered to substitute steam trains. The commission ordered the company not to discontinue the interurban service, but made no ruling on the question of furnishing current.

### MUNICIPAL OPERATION HAMPERED

Conflict between the requirements of federal and provincial statutes is responsible for a curious railway case in Brantford, Ont., dealt with in an order of the Railway Board on March 8. The city of Brantford owns a street railway acquired with municipal funds and under provincial authority; but it has no power to operate it because the original charter was a federal one. The City Council applied to the Railway Commission for relief, and Chairman Drayton, in his judgment, suggests that leave for operations be secured temporarily from the Minister of Railways until proper authority by parliamentary enactment is forthcoming. The Port Dover, Brantford, Berlin & Goderich Railway, a federally incorporated road, later changed its name to the Grand Valley Railway and acquired the Brantford Street Railway. Subsequently it became insolvent, and the city secured from the Legislature the right to purchase it. This was done, but the road is now on its hands without power of operation. Chairman Drayton says the Legislature has no more right to authorize operation of a federally incorporated road than it has to authorize its construction.

### NEW YORK COMMISSION INQUIRY

The hearing on March 12 before the legislative committee at Albany into the work of the Public Service Commission of the Second District of New York was confined to the activities of Commissioner Irvine and Chairman Van Santvoord. Mr. Irvine said that there was no conflict between the two State commissions. He was opposed to any change in the territory allotted to the commissions. The expense accounts of Mr. Van Santvoord were inquired into. The commissioner had attached numerous memorandums to most of his items and the reading of them caused much laughter. He listed a trip from Albany to New York and return as "300 miles of danger at 2 cents a mile." He also listed \$2 as the "amount paid to satisfy the modest but insistent demands of the intercostal subdiaphragmatic vacuities." On March 14 Col. William Hayward, counsel of the committee, injured his ankle severely in New York. This has delayed the progress of the inquiry, but it was expected that the sessions would be resumed late in the week.

### MELBOURNE ELECTRIFICATION PROPOSAL

R. F. Millane, Collins House, Melbourne, Australia, has submitted an offer to the Melbourne Tramway Trust offering to carry out the conversion from cable to electricity of one of the main routes to and through the city, and a committee has been appointed to consider his offer and an early decision is expected. The trust may accept the offer of Mr. Millane or decide to carry out the work itself. The cable tramways in Melbourne were installed about twenty-five years ago and are similar to the lines which were installed in New York and in Washington. The plan is to equip each car with underground contact and trolley pole like those on the cars in Virginia and Maryland that run into Washington. Mr. Millane desires to hear from contractors for material and equipment such as were used in the conversion of the cable lines in this country to the

underground system and to have such contractors quote prices for material and equipment. At a recent meeting of the Melbourne Tramway Trust it was agreed that the consideration of Mr. Millane's offer be postponed until the meeting of the board in February and in the meantime to obtain counsel's opinion as to the authority of the trust in connection with the proposal contained in the motion.

### CLEVELAND PROPERTY LEASE

The Cleveland (Ohio) Railway has leased its property at St. Clair Avenue and East 103rd Street to Harry S. French for ninety-nine years, the rental being based on a valuation of \$40,000. This property has been used for twenty years for a carhouse and repair shop, but a few months ago a new unit was completed near it and the company had no further use for the property. It will be improved with an apartment house and business buildings.

The company has asked Council for authority to purchase fifty new center-entrance cars at an aggregate price not exceeding \$300,000. Councilman Stolte stated that he would insist that the company sell fifty of the old cars for use in other places before this authority was granted.

Agreement on the proposed new franchise in Lakewood has been delayed by a difference between the company and Peter Witt, street railway commissioner, as to its terms. It is probable that a general conference of those interested in the matter will be called soon.

### CALGARY MUNICIPAL RAILWAY

In discussing the condition of the Calgary (Alta.) Municipal Railway Commissioner Greaves said that to operate the line as if it were owned by a private company would involve discontinuing service over some 10 or 20 miles of track. The citizens would not submit to this. P. S. Fitter, publicity commissioner, stated through a communication to the press on the finances of the line that although the loss on operation for the eleven months ended Nov. 30, 1914, was \$44,284, during the four years' operation of the line a surplus of \$300,000 had been built up over and above all fixed charges. The loss in operation was confined practically to the Bowness Park line and to the line to the Canadian Pacific Railway's Ogden shops. The present loss on this latter line is \$50 a day.

The Street Railway Men's Association has accepted the new wage schedule, which provides for a reduced rate of pay consequent upon war conditions. The new schedule, effective at once, provides as follows: while operating on the spare list, first year, 28 cents an hour; second year, 30 cents; after two years, 32 cents. Regular runs, first six months, 32 cents; second six months, 33 cents; third six months, 34 cents; fourth six months and thereafter, 35 cents. It is estimated that this schedule will effect a saving of about \$10,000 during the year.

### LEGISLATION IN OHIO

Governor Frank B. Willis of Ohio has disapproved the Smith bill, which required inclosed vestibules on all cars for motormen. His reason was that the measure stated no time at which it was to go into effect. It is stated that a substitute bill will be introduced to become effective on Nov. 15, 1915.

The bill introduced in the Legislature by Senator L. E. Myers, providing for the construction and operation of union stations by steam and electric railways jointly will permit leasing of all grounds, tracks, etc. The present law provides only for the purchase of grounds for such structures. In addition, the bill would make it possible to construct, maintain and operate terminal railroads and connecting tracks, warehouses, office buildings, hotels and other buildings for the use of the public or to own and lease them. The requirement that the maximum charge per passenger handled within the city limits shall not exceed 1 cent is also suspended by the bill. The bill is before the judiciary committee of the Senate.

Senator Stone has introduced a bill in the Legislature which, if made a law, will authorize the Ohio Public Utilities Commission to regulate all municipally owned service plants, with the exception of the issue of bonds. This authority would extend to fixing rates and establishing a uniform system of accounting.

**The Philadelphia Election.**—The special election in Philadelphia at which the city will vote on making \$6,000,000 available for transit improvements will be held on April 29.

**Chicago Unification Upheld.**—Quo warranto proceedings attacking the validity of the unification ordinances under which the Chicago (Ill.) Surface Lines have been operating for more than a year, were ordered vacated on March 17 by Judge Brentano in the Superior Court.

**Valuation Conference Postponed.**—The conference of railroad men and State utility commissioners with the Division of Valuation, Interstate Commerce Commission, scheduled for the week beginning March 22, has been postponed. At the present time it is the expectation that the conference will occur in the week beginning April 19.

**Labor Rider Defeated.**—The appropriations committee of the House refused to insert in the general deficiency bill the item of \$200,000 for the relief of those against whom judgment was found in the Danbury haters case. Ex-Judge Parker and Mr. Gompers contended that Congress did not intend to cover labor unions in the Sherman Act.

**Extension of Powers of New Jersey Commission.**—The Senate of New Jersey has passed Senator Read's bill placing municipally-owned utilities under control of the Board of Public Utility Commissioners. The bill in its original form did not affect Newark or Jersey City, but Mr. Read, in answer to opposition to the exceptions made, offered an amendment including first-class cities under the proposed law. The amendment was adopted.

**Pan-American Financial Conference.**—A cabled invitation from Secretary of State Bryan to all the countries of South and Central America to send three representatives to Washington as guests of the United States for the Pan-American Financial Conference on May 10 was transmitted to the foreign ambassadors and ministers on March 15. Mr. Bryan will send out later invitations to bankers and business men of this country to participate in the conference.

**Basic Conditions Sound.**—Theodore N. Vail, president of the American Telephone & Telegraph Company, on March 15 set forth in a letter to the security holders of that company, supplementing his annual report, his views respecting the general business situation and the course which should be pursued to restore prosperity. While admitting frankly that "there is a condition of disturbance, of economic unsettlement, it cannot continue indefinitely." He insists that the country was never in better shape basically.

**Ohio Efficiency Report.**—Kenneth McKinley, efficiency engineer of the Ohio State Civil Service Commission, has reported to the Howard committee in regard to the economies that can be worked with the Public Utilities Commission of Ohio. Mr. McKinley has recommended that nine positions be abolished and that the salaries of ten employees be reduced, for an annual saving of \$25,000. On March 13 it was announced that the recommendations would be adopted.

**Settlement of Claims at Toledo.**—An agreement was reached on March 12 between the city of Toledo, Ohio, and the Toledo Railways & Light Company in the matter of the company's paying its share of the cost of pavement on Cherry Street. The amount due the city was \$48,732, but for the first half of 1914 the city owed the company for street lighting \$60,704. In paying this bill the paving charge was deducted and a warrant issued for the remainder, \$11,971.

**Abandoned Road a Testing Ground.**—The City Council of Peterborough, Ont., has asked the Ontario Legislature to authorize the making of an arrangement with the Grand Trunk Railway for a lease to the Canadian General Electric Company of a portion of the right-of-way of the Peterborough & Chemong branch line as a testing track for electric locomotives. This branch line extends from Peterborough to Bridgenorth, and has not been operated for a number of years.

**Engineer Appointed to Draw Toronto Plans.**—E. L. Cousins has been chosen engineer to have charge of the work of drawing up the plans for Toronto's rapid transit system. Recently three engineers, R. C. Harris for the city, E. L. Cousins for the Harbor Board, and Mr. Gaby, of the Hydro-Electric Power Commission of Ontario, were appointed to submit a plan. At the request of Messrs. Harris

and Gaby, Mr. Cousins has been asked to do the work. The Harbor Board has granted him leave of absence until the work is completed.

**Ontario Hydro-Radials.**—The Ontario Hydro-Radial Union deputation waited upon Premier Borden at Ottawa on March 10 and asked the granting of a subsidy for building hydro-electric radial railways through Ontario. The Premier replied that so far as any legislation at the present session was concerned conditions would not permit the government to bring it in. As far as a declaration of future policy was concerned, the Premier announced that he would submit to his colleagues what had been urged, but would not make any announcement as to policy.

**Question of Authority.**—In an argument which has just been concluded before Mr. McIntyre, chairman of the Ontario Railway & Municipal Board, the Hamilton, Grimsby & Beamsville Electric Railway contends that the board has no right to make orders concerning the road. The question was raised as the result of the board ordering the company to install certain sanitary appliances on the cars. The company says that in 1895 the Dominion Railway Board issued an order allowing it to cross a steam railway, and that this established the company under the jurisdiction of the Dominion Railway Board.

**Ohio Commission Upheld.**—The Ohio Supreme Court has approved the decision of the Public Utilities Commission in a case in which the city of Cincinnati appealed from a commission order. Some time ago the Council of Cincinnati unanimously passed an ordinance requiring the Cincinnati Traction Company and the Cincinnati Street Railway to extend the Warsaw Avenue line along Glenway Avenue from Wilder Avenue to Seton Avenue. The companies appealed to the commission, which decided that the extension demanded was not practical because of the steepness of the grades and relieved the companies from complying with the terms of the ordinance.

**Subway Cable Accident.**—Fire supposed to have been caused by a workman drilling through the old subway wall at Seventh Avenue and Broadway, New York, into electric cables and wires at the north end of Times Square station of the present subway blazed fiercely between 3:15 and 5:10 a.m. on March 15, filling the tunnel with smoke. For two hours not a subway train stirred between Fourteenth and Ninety-sixth Streets. Shuttle trains were operated south of the downtown station and north of Ninety-sixth Street. The blaze spread to the heavy planking that has taken the place of pavement for Seventh Avenue at this point during the construction of the new subway. The telephone insulation was burned through and practically put the Murray Hill exchange out of operation.

**Reimbursing the Seattle Municipal Railway Fund.**—Mayor Gill, of Seattle, Wash., has signed the bill placing \$10,000 in the street railway fund to meet the deficit incurred in the operation of the municipal railway lines in that city, but City Comptroller Carroll is reported to have announced that when the warrants come to him for his signature on March 25 he will refuse to sign them. The comptroller regards the "loan" as a deficit appropriation and says that as there is little likelihood of the railway paying back the loan it will be necessary eventually to raise the money by general taxation to reimburse the general fund. The communication from Mayor Gill dealing with the question of the deficit of the municipal railway was published in part in the *ELECTRIC RAILWAY JOURNAL* of Feb. 27, page 431.

**The Cincinnati Inventory.**—It was stated at the office of the Ohio Public Utilities Commission on March 16 that the inventory of the property of the Cincinnati (Ohio) Traction Company had been in its hands for two weeks, but that the figures are only tentative and are so regarded. Before any step can be taken toward a final valuation, the inventory must be checked by engineers of the department and then the appraisals must be made. The resolution introduced in the Council giving City Solicitor Schoenle authority to bring proceedings against the Cincinnati Traction Company to compel it to permit him to examine its books for the purpose of making a physical valuation has been referred to the committee on street railways, with instructions to Mr. Schoenle to ascertain from the Public Utilities Commission when it expects to complete its similar investigation.

# Financial and Corporate

## BANKERS CALL FOR SUIT

**Appeal to Supreme Court Against Competition.**—The Ohio Public Utilities Commission recently authorized the Mahoning County Electric Company to purchase the plant of the Youngstown Heating Company through the issuance of \$600,000 of twenty-year 6 per cent bonds and \$400,000 of stock and to erect an electric generating plant which would come into direct competition with the lighting and power business of the Youngstown-Sharon Railway & Light Company, Youngstown, Ohio, in the business district. The commission held, however, that it was compelled to give consent to any reasonable issue of securities except in the case of telephone companies, and that the law did not provide for regulated monopoly in public utility service. The railway company has now appealed to the Ohio Supreme Court for relief from destructive competition.

Dick Brothers & Company, New York, who own and control 11,000 shares of the Long Island Railroad, on March 18 served a notice on Ralph Peters, president, and the directors to bring suit against the Pennsylvania Railroad for the restitution of alleged misappropriated funds and for the cancellation of certain contracts. This notice states that unless suit is begun by the railroad officials within ten days the banking house will bring suit in its own name against the Pennsylvania Railroad and the directors of the Long Island Railroad. Prior reference to circulars issued by the bankers asking for proxies were made in the *ELECTRIC RAILWAY JOURNAL* of Feb. 6 and Feb. 20.

**Rapid Transit Construction Resumed.**—With the Alien Labor law amended, the Public Service Commission of the First District of New York decided on March 16 that it could resume its program of construction, which had been held up for nearly three months. It ordered that bids be invited for the section of the Brooklyn Rapid Transit Company's subway in Seventh Avenue from Fifty-first to Fifty-ninth Street, and that they be opened on April 9. This contract has already been put up three times for bids, but had to be withdrawn on account of the alien law controversy. The change in the law requires that the existing construction contracts be modified so that the clause in them conforming with the old alien clause be made to fit the amendment to the law. Counsel of the commission has been instructed to prepare modifications so that the clause which required contractors to employ only citizens be made to demand merely preference to citizens.

Among the requests cited in the notice served upon Mr. Peters there was one asking for an injunction to restrain the payment to the Pennsylvania Railroad of moneys on account of advances alleged to have been made in carrying out construction projects on Long Island initiated by the interlocking directorates of the two companies. It was further requested that the Long Island Railroad be returned to its status as an independent company, that an accounting be made of all expenses authorized by the board of directors and of the cost of electrifying tracks in the commuting zone, and that the contract covering the carriage of Long Island passengers into the Pennsylvania Terminal be cancelled.

An official of the Long Island Railroad said that everything which the company had done had been authorized by the Public Service Commission, and that the company welcomed an investigation. It is doing better every year, and, according to the last report, showed a deficit only half as large as the year before.

## WAR REVENUES OF BERLIN TRAMWAYS

The Great Berlin Street Railway is operating all of Berlin's surface car lines, which are 240 single-track miles in length and have 2078 motor cars and 1334 trailers. The following table shows the comparative monthly revenues for 1913 and 1914 (also January, 1915, revenues 3,157,886 marks), indicating a decrease of 3,669,215 marks, or \$891,619, for the last year mostly because of the war.

REVENUES PER YEAR IN MARKS (24.3 CENTS).

Month	1913	1914
January	3,579,735	3,399,936
February	3,394,265	3,295,781
March	3,880,679	3,707,039
April	3,769,961	3,715,807
May	3,829,493	3,695,319
June	3,748,779	3,567,340
July	3,553,513	3,518,415
August	3,647,969	3,272,977
September	3,708,611	3,054,923
October	3,859,086	3,264,484
November	3,695,974	3,109,364
December	3,848,969	3,327,713
Total	44,483,065	40,803,855

## ALLEGED VIOLATION OF UTILITIES ACT

J. B. Hogarth, formerly general superintendent of the Chicago (Ill.) Railways, has filed a complaint with the Illinois Public Utilities Commission, alleging that the officers of the Commonwealth Edison Company, Chicago, by their purchase of \$20,000,000 of the common capital stock of the Chicago Elevated Railways collateral trust, violated the commission law. Mr. Hogarth also filed a second petition questioning the method of financing the Chicago Elevated Railways collateral trust and charging that the officers of the trust did not obtain the consent or authority of the commission to issue approximately \$23,000,000 of securities and that they failed to pay the State a fee of \$23,000 required under the commission act. In an interview with a representative of the *ELECTRIC RAILWAY JOURNAL*, one of the attorneys for the Commonwealth Edison Company admitted that his client did hold \$20,000,000 of capital stock of the collateral trust. It was asserted, however, that this purchase was made without violating the law, since the trust was made up of an association of individuals who had purchased a controlling interest in the four elevated railway companies. The trust was not a public utility and therefore was not under the jurisdiction of the commission.

## PROGRAM OF ASSOCIATION MEETING

### Gas, Electric & Street Railway Association of Oklahoma.

The fourth annual convention of the Gas, Electric & Street Railway Association of Oklahoma will be held in Oklahoma City on May 12, 13 and 14, with headquarters at the Lee-Huckins Hotel.

## ANNUAL REPORT

## Public Service Corporation

The statement of income, profit and loss of the Public Service Corporation of New Jersey, Newark, N. J., for the twelve months ended Dec. 31, 1914, follows:

Operating revenue of subsidiary companies.....	\$35,924,453
Operating expenses and taxes.....	\$19,892,708
Amortization charges .....	1,303,609
Total .....	\$21,196,317
Operating income .....	\$14,728,136
Non-operating income .....	351,161
Public Service Corporation of New Jersey income from securities pledged and from miscellaneous sources .....	2,484,645
Total income .....	\$17,563,942
Income deductions of subsidiary companies (bond interest, rentals and miscellaneous interest charges) .....	12,097,109
	\$5,466,833
Public Service Corporation of New Jersey income deductions—	
Interest charges .....	\$3,408,332
Amortization of debt discount and expense.....	223,664
Sinking fund for general mortgage 5 per cent bonds .....	209,500
Total .....	\$3,841,496
Net income .....	\$1,625,337
Appropriation accounts of subsidiary companies:	
Additional amortization of capital.....	\$2,750
Amortization of new business expenditures prior to Jan. 1, 1911.....	40,330
Adjustment of surplus account (credit).....	103
	\$42,977
	\$1,582,360
Appropriation accounts of Public Service Corporation of New Jersey—	
Adjustments of surplus account (credit).....	728
Net increase in surplus.....	\$1,583,088

The annual report states that the company under adverse conditions had a relatively successful year. The year's depression in business was felt by all the underlying companies. The normal annual gross increase in the railway company's business averages about 5 per cent, but during 1914 the operating revenue increased only 1.11 per cent. The normal annual gross increase in the electric company's receipts averages from 11 to 12 per cent, but last year the operating revenue increased 9.34 per cent. The normal annual gross increase in the gas company's business averages 7 per cent, but the operating revenue last year increased 3.61 per cent (partly owing to a difference in the rate for gas). The operating revenue of all the subsidiary companies increased \$1,331,979, or 3.85 per cent, as compared to an average normal increase of about 7 per cent.

No comparative figures are presented for maintenance expenses during the year, but it is stated that the amount, exclusive of ordinary maintenance, set aside for amortization was \$1,306,358. With the sinking fund charge added, the amount set aside during the year for amortization of properties and redemption of securities was \$1,515,858. The taxes paid during the year amounted to \$2,202,555, an increase over the previous year of \$139,573. In five years the taxes paid by the corporation have increased approximately \$1,000,000, but it is urged that the limit of the ability of corporations and individuals to meet these increases has about been reached, and that no further burdens of this character should be put upon property under present conditions.

The fire insurance carried as of Dec. 31, 1914, amounted to \$29,009,824. This is an increase over the corresponding period of the previous year of \$800,073. The premiums for 1914 amounted to \$102,808, a decrease, as compared with the previous year, of \$5,426, and a decrease in the rate per \$100 of insurance from 44 cents for 1912 and 38.3 cents for 1913 to 35.4 cents for 1914. The total expenditures of the welfare department during 1914 were \$79,794, an increase of \$14,316. The cost of accidents under the workman's compensation act was \$63,041, divided \$44,200 for required payments, \$9,101 for voluntary excess payments and \$9,732 for expenses—a total increase of \$6,622 for 1914.

The net expenditures charged to fixed capital accounts by subsidiary companies during 1914 were \$2,644,099 for electric companies, \$857,075 for gas companies and \$1,389,961 for railway companies, a total of \$4,891,136. Among

specific improvements may be noted the building and opening of the Paterson & State Line Traction Company from the Paterson city line to Ridgewood, and the building and opening of the Sewaren Spur, extending from the Public Service Railroad tracks at Port Reading Junction to Sewaren, and making possible a new through line from Newark to Perth Amboy. Altogether, during the year, the railway company built 10.787 miles of track extensions. With land purchases in Camden and Paterson, it may be said that throughout the State the railway has acquired for car-house, shop and terminal purposes practically all the real estate it needs.

The total passengers carried by the railway increased 0.71 of 1 per cent. The amount spent for accidents and the expenses in connection with the same was 4.27 per cent of the passenger receipts, as compared to 4.15 per cent for 1913. This company received honorable mention in the "safety first" contest for the Brady Medal. The following table shows the most important traffic statistics for 1913 and 1914:

	1914	1913
Revenue passengers .....	310,308,660	308,985,240
Transfers and passes .....	96,969,254	95,425,865
Total passengers .....	407,277,914	404,411,105
Percentage of passengers using transfers.....	21.2	21.1
Average fare per passenger, cents.....	3.83	3.82
Car mileage .....	50,792,889	49,853,408
Car hours .....	5,665,119	5,696,066
Passengers per day .....	1,115,830	1,107,976
Passenger receipts per car mile, cents.....	30.72	30.97
Passenger receipts per car hour, cents....	2.75	2.71

**Alabama Traction, Light & Power Company, Ltd., New York, N. Y.**—It is reported that for the sake of more efficient and economical administration, several companies have been merged with the Alabama Power Company, Birmingham, Ala., the chief operating subsidiary of the Alabama Traction, Light & Power Company, Ltd. Besides the Decatur Light, Power & Fuel Company, the Leeds Light & Power Company and the Pell City Light & Power Company, the merged companies include two electric railways, the Anniston Electric & Gas Company, Anniston, Ala., and the Huntsville Railway, Light & Power Company, Huntsville, Ala. It is believed that this merger will enable the participating companies to obtain a larger amount of credit and make needed developments.

**American Public Utilities Company, Grand Rapids, Mich.**—Bioren & Company, Philadelphia, are offering at par and interest an issue of \$1,500,000 of three-year 6 per cent secured gold notes of the American Public Utilities Company, dated March 1, 1915, and due on March 1, 1918. These notes are redeemable at any interest period for 101 and interest. They are secured by deposited collateral valued at more than \$6,000,000.

**Atlantic Gas & Electric Company, New York, N. Y.**—Judge Hand, of the Federal District Court, has filed a decree ordering the foreclosure sale of the Atlantic Gas & Electric Company within ten days in the event of a final default on bond payments. Edward H. Childs has been appointed special master for the sale. The reorganization plan, under which the controlled properties of this company are to be taken over by the General Gas & Electric Company, was described in the *ELECTRIC RAILWAY JOURNAL* of Jan. 23.

**Central California Traction Company, San Francisco, Cal.**—The California Railroad Commission recently held a hearing on an application to lease the Central California Traction Company to the Stockton Electric Railroad for a rental of \$12,500 a year for the first three years and \$15,000 a year for the following thirty-five years. H. Fleishhacker, vice-president of the former company, stated that the road was losing about \$14,700 a year because it was not possible to keep it in the highest condition of efficiency and to make improvements.

**Cleburne (Tex.) Street Railway.**—By order of a higher court the receivership of the Cleburne Street Railway, noted in the *ELECTRIC RAILWAY JOURNAL* of Jan. 23, has been vacated. John W. Floore, Sr., who holds the first mortgage of the company, states that the property will be sold immediately at public auction, and that if it is not purchased by others he will operate it. The line has not been in operation for several months.

**Cleveland, Southwestern & Columbus Railway, Cleveland, Ohio.**—The Cleveland, Southwestern & Columbus Railway has applied to the Ohio Public Utilities Commission for authority to issue \$319,875 of first consolidated 5 per cent bonds at 85, and, pending their sale, to hypothecate them at 65. The proceeds are to be used to reimburse the company for expenditures made in 1913 and 1914 and to retire \$200,000 of underlying Cleveland & Elyria Railroad first mortgage 5 per cent bonds maturing on May 1.

**Duluth-Superior Traction Company, Duluth, Minn.**—The directors of the Duluth-Superior Traction Company have omitted the usual April 1 dividend of 1 per cent on the \$3,500,000 of common stock of the company. This rate of dividend was paid quarterly from July, 1913, to January, 1915, inclusive. It has been decided, however, that a dividend of 1 per cent will be paid on July 1 to holders of record on June 15.

**Electric Bond & Share Company, New York, N. Y.**—The Electric Bond & Share Company is offering \$1,000,000 of new preferred stock to its preferred stockholders at par in the ratio of one new share for each five shares of old stock owned. The common stockholders of the company are being offered \$1,000,000 of new common stock at par in the same ratio. Stockholders of record of March 3 have a right to subscribe. The increase of the capital stock of this company by the addition of \$3,000,000 of preferred stock and \$3,000,000 of common stock was noted in the *ELECTRIC RAILWAY JOURNAL* of Feb. 20. According to a comparative income statement just issued by the company, the figures for the last two fiscal years ended Dec. 31 are as follows: gross income, 1914, \$1,558,521; 1913, \$1,554,404; net income, 1914, \$1,137,042; 1913, \$1,129,396; preferred dividends, 1914, \$298,392; 1913, \$277,900; common dividends, 1914, \$400,000; 1913, \$363,000 (additional special dividend, \$1,500,000); surplus income, 1914, \$438,650; 1913, \$488,495. The total surplus and undivided profits of the company at the close of business on Dec. 31, 1914, amounted to \$3,195,697.

**Empire United Railways, Inc., Syracuse, N. Y.**—It is reported that the \$1,083,000 of Rochester, Syracuse & Eastern Railroad three-year notes due on Feb. 16 are being retired by an issue of \$690,065 of Empire United Railways, Inc., guaranteed gold bonds and through the sale of the first mortgage 5 per cent bonds of the latter company.

**Grand Rapids, Grand Haven & Muskegon Railway, Grand Rapids, Mich.**—E. H. Rollins & Sons, Boston, are offering at 94 and interest, to yield about 5.75 per cent, \$500,000 of first mortgage 5 per cent bonds of the Grand Rapids, Grand Haven & Muskegon Railway. These bonds are part of a closed first mortgage issue of \$1,500,000, dated 1901 and due on July 1, 1926, and are an underlying divisional lien of the United Light & Railways Company. The subsidiary company owns and operates 47.26 miles of high-speed third-rail electric railway between Grand Rapids and Muskegon.

**Los Angeles & San Diego Beach Railway, San Diego, Cal.**—The California Railroad Company has authorized the Los Angeles & San Diego Beach Railway to issue a promissory note for \$2,500 to refund a similar note held by the American National Bank, San Diego, and two promissory notes for \$15,000 and \$4,000 to refund a promissory note of \$19,000 held by the Citizens' National Bank, Los Angeles.

**Oakland, Antioch & Eastern Railway, Oakland, Cal.**—It is reported that the last assessment on the stock of the Oakland, Antioch & Eastern Railway has been postponed until March 29. A prior postponement was noted in the *ELECTRIC RAILWAY JOURNAL* on Feb. 6. The company has filed an application with the California Railroad Commission for authority to renew three promissory notes totaling \$200,400 and to secure the renewals by the delivery of bonds on the basis of 60 per cent of the face value. The company also asks for authority to secure a note of \$21,028 heretofore issued to the Union Switch & Signal Company by the delivery of bonds on the same basis.

**Ogden, Logan & Idaho Railroad, Ogden, Utah.**—As predicted in the *ELECTRIC RAILWAY JOURNAL* of Jan 16, the stockholders of the Ogden, Logan & Idaho Railroad have authorized a new mortgage to secure an issue of \$10,000,000 of bonds. About \$2,000,000 of this issue will be put

out now to cover the present indebtedness of the company and the cost of the interurban extension to Preston, Idaho.

**Pacific Gas & Electric Company, San Francisco, Cal.**—The Pacific Gas & Electric Company has called for redemption on March 25, at 100¼ and accrued interest, \$1,000,000 of one-year 5 per cent collateral trust notes dated Dec. 15, 1914, of which \$4,000,000 are outstanding. The notes will be paid either at the Bankers Trust Company, New York, or at the office of the company in San Francisco. The company has sold to N. W. Halsey & Company and Harris, Forbes & Company, New York, \$2,000,000 of general and refunding 5 per cent bonds, \$5,000,000 of which are at present deposited as part collateral for the above-mentioned notes issued Dec. 15, 1914. Part of the proceeds of this bond sale will be used to retire the \$1,000,000 of notes on March 25, thus placing the finances of the company on a more permanent basis. On the same date, the \$4,000,000 of notes then maturing, for the payment of which the \$4,000,000 of notes of Dec. 15, 1914, were issued, will be paid. On March 8 the company filed an application with the California Railroad Commission requesting authority to issue and place in the sinking fund provided under its general and refunding mortgage, dated Dec. 1, 1911, \$367,000 of its general and refunding mortgage gold bonds.

**Pennsylvania Railroad, Philadelphia, Pa.**—The annual report of the Pennsylvania Railroad for the calendar year 1914 states that business conditions on the lines of the company were unsatisfactory during the year. The operating revenues of the Long Island Railroad amounted to \$13,220,334, and the operating income to \$3,318,434. The net income of this company showed a deficit of \$494,131. In connection with the report Samuel Rea, president, issued a warning to the country in regard to regulation, saying that a great deal of constructive work must be accomplished before governmental regulation is placed on a satisfactory basis.

**Peoria (Ill.) Railway.**—Merrill, Oldham & Company, Boston, are offering at 96 and interest, to yield about 5.5 per cent, a block of first and refunded mortgage 5 per cent gold bonds of the Peoria Railway, dated 1906. Of these bonds there are outstanding \$2,819,000, an additional \$435,000 having been retired.

**Public Service Corporation, Newark, N. J.**—Clark, Dodge & Company, New York, are offering for sale, to yield about 5.55 per cent, 6 per cent perpetual interest bearing certificates of the Public Service Corporation of New Jersey. These certificates are in form similar to certificates of stock, but are in effect perpetual collateral trust bonds, being secured by \$58,334,700 of stock collateral, or nearly three times the par value of the certificates outstanding. On the securities so pledged, the certificates have a lien prior to that of \$47,000,000 of general mortgage 5 per cent bonds.

**Utah Securities Corporation, Salt Lake City, Utah.**—The Guaranty Trust Company, New York, as trustee for the Utah Securities Corporation, has repurchased \$599,500 of ten-year 6 per cent notes in accordance with its recent invitation for tenders, as noted in the *ELECTRIC RAILWAY JOURNAL* of March 6. The average price paid was 80.499. An amount of \$25,369,500 of these notes has been issued, of which \$8,766,000 has been retired.

**United Railways & Electric Company, Baltimore, Md.**—It is reported that J. E. Aldred, former president of the Consolidated Gas, Electric Light & Power Company and the Pennsylvania Water & Power Company, will be elected a director of the United Railways & Electric Company. A substantial interest in the stock of the latter company was recently acquired by Aldred & Company, which firm is the fiscal agent for the first-named companies.

**Western Railways & Light Company, Peoria, Ill.**—Plans have been consummated for the merging of the Western Railways & Light Company with the Illinois Traction System. A total of 22,543 shares of common stock of the Illinois Traction System has been exchanged for 45,086 shares of common stock of the Western Railways & Light Company. The total amount of the Western Railways & Light Company issue outstanding was 45,218 shares.

Wheeling & Elm Grove Railroad, Wheeling, W. Va.—An amount of \$17,000 of 5 per cent first mortgage thirty-year bonds of the Wheeling & Elm Grove Railroad, dated March 1, 1898, has been called for payment.

**DIVIDENDS DECLARED**

Asheville Power & Light Company, Asheville, N. C., quarterly, 1½ per cent, preferred.  
 Capital Traction Company, Washington, D. C., quarterly, 1½ per cent.  
 Carolina Power & Light Company, Raleigh, N. C., quarterly, 1½ per cent, preferred.  
 Duluth-Superior Traction Company, Duluth, Minn., quarterly, 1 per cent, preferred; quarterly, 1 per cent, common.  
 Elmira Water, Light & Railroad Company, Elmira, N. Y., quarterly, 1½ per cent, first preferred.  
 Northern Ohio Traction & Light Company, Akron, Ohio, quarterly, 1½ per cent, preferred.  
 Philadelphia (Pa.) Traction Company, \$2.  
 Public Service Corporation, Newark, N. J., quarterly, 1½ per cent.  
 West India Electric Company, Ltd., Kingston, Jamaica, quarterly, 1¼ per cent.

**ELECTRIC RAILWAY MONTHLY EARNINGS**

BANGOR RAILWAY & ELECTRIC COMPANY, BANGOR, MAINE					
Period	Gross Earnings	Operating Expenses	Net Earnings	Fixed Charges	Net Surplus
1m., Jan., '15	\$65,330	\$30,842	\$34,488	\$17,515	\$16,973
1 " " '14	63,687	31,333	32,354	17,358	14,996
12 " " '15	779,395	374,728	404,667	209,275	195,392
12 " " '14	763,979	348,911	420,068	207,603	212,465
BERKSHIRE STREET RAILWAY, PITTSFIELD, MASS.					
1m., Jan., '15	\$70,363	\$68,158	\$2,205	\$17,340	†\$14,995
1 " " '14	75,568	\$3,790	8,059	15,473	†\$23,532
7 " " '15	594,388	535,095	59,293	120,646	†\$60,297
7 " " '14	616,906	534,744	82,162	106,354	†\$23,164
CHATTANOOGA RAILWAY & LIGHT COMPANY, CHATTANOOGA, TENN.					
1m., Jan., '15	\$81,330	\$60,208	\$21,122	\$29,349	\$8,227
1 " " '14	99,233	58,352	40,881	27,653	13,228
12 " " '15	1,067,193	701,579	365,614	341,105	24,509
12 " " '14	1,208,529	716,738	491,791	301,335	190,456
COLUMBUS RAILWAY, POWER & LIGHT COMPANY, COLUMBUS, OHIO					
1m., Jan., '15	\$274,752	\$164,178	\$110,574	\$38,719	\$71,855
1 " " '14	272,026	*171,949	100,077	40,356	59,721
12 " " '15	3,069,024	*1,878,975	1,190,049	477,823	712,226
12 " " '14	2,995,411	*1,939,873	1,055,538	491,241	564,297
COMMONWEALTH POWER, RAILWAY & LIGHT COMPANY, GRAND RAPIDS, MICH.					
1m., Jan., '15	\$1,241,903	*\$650,972	\$590,931	\$360,376	\$230,555
1 " " '14	1,228,577	*666,548	562,029	344,108	217,921
12 " " '15	14,019,809	*7,534,320	6,485,489	4,229,121	2,256,368
12 " " '14	13,733,037	*7,695,878	6,037,159	3,896,143	2,141,016
CONNECTICUT COMPANY, NEW HAVEN, CONN.					
1m., Jan., '15	\$604,464	*\$450,321	\$154,143	\$98,270	\$77,503
1 " " '14	591,824	*460,336	131,488	88,374	56,488
7 " " '15	4,796,849	*3,547,521	1,249,329	687,977	†\$13,141
7 " " '14	4,874,158	*3,573,768	1,300,390	625,527	†\$28,217
NASHVILLE RAILWAY & LIGHT COMPANY, NASHVILLE, TENN.					
1m., Jan., '15	\$184,546	*\$106,976	\$77,570	\$42,018	\$35,552
1 " " '14	187,831	*125,854	61,977	44,144	17,833
12 " " '15	2,237,022	*1,334,853	902,169	497,545	404,624
12 " " '14	2,209,078	*1,353,997	855,081	471,385	383,696
NEW YORK & STAMFORD RAILWAY, PORTCHESTER, N. Y.					
1m., Jan., '15	\$23,072	*\$24,635	\$1,564	\$7,876	†\$9,417
1 " " '14	22,588	*24,129	1,541	7,800	†\$9,317
7 " " '15	237,880	*186,560	51,320	55,130	†\$3,515
7 " " '14	232,720	*179,723	52,998	53,893	†\$585
NEW YORK, WESTCHESTER & BOSTON RAILWAY, NEW YORK, N. Y.					
1m., Jan., '15	\$35,495	*\$44,233	\$8,737	\$8,236	†\$16,348
1 " " '14	29,306	*49,868	20,562	5,226	†\$24,827
7 " " '15	260,611	*305,585	44,974	45,122	†\$88,734
7 " " '14	234,491	*345,873	111,382	36,777	†\$144,590
NORTHERN OHIO TRACTION & LIGHT, AKRON, OHIO					
1m., Jan., '15	\$280,839	*\$181,979	\$98,860	\$50,251	\$48,509
1 " " '14	270,961	*171,291	99,669	49,462	50,207
PORTLAND RAILROAD COMPANY, PORTLAND, MAINE					
1m., Jan., '15	\$73,370	*\$51,895	\$21,475	\$22,549	†\$1,074
1 " " '14	72,159	*52,505	19,654	23,242	†\$3,588
12 " " '15	1,046,053	*646,631	399,422	249,911	149,511
12 " " '14	1,036,975	*681,950	355,025	193,869	161,156
PORTLAND RAILWAY, LIGHT & POWER COMPANY, PORTLAND, ORE.					
1m., Jan., '15	\$489,713	*\$261,404	\$228,309	\$182,361	\$45,948
1 " " '14	582,610	*277,286	305,324	173,282	132,042
12 " " '15	6,189,274	*3,248,001	2,932,273	2,181,758	750,515
12 " " '14	6,752,754	*3,305,387	3,447,367	2,028,862	1,418,505

\*Includes taxes. †Deficit. ‡Includes other income.

**Traffic and Transportation**

**THE "JITNEY" BUS**

**Further Efforts Toward Regulatory Legislation—Labor's Attitude in Rock Island and Providence**

The closing hours of the session of the Legislature of the State of Washington were enlivened by the controversy over the "jitney." The proponents of the bill to regulate the bus called the attention of both Houses to the numerous accidents to "jitney" bus patrons and to the financial irresponsibility of the drivers of these buses. It was contended that the patrons of the buses were entitled to the same protection as was afforded to the users of street cars. The proposal was to require the drivers of "jitney" buses to give a surety bond in the sum of \$2,500. Those who favored the bill contended that a "jitney" driver who could not give a \$2,500 bond was not sufficiently responsible to be permitted to engage in hauling people. The bill passed both Houses, but was promptly vetoed by Governor Lister. On March 11 the measure was repassed over his veto by a vote of sixty-three to thirteen in the House and of twenty-eight to twelve in the Senate. The Governor contended that the regulation and control of the buses should be undertaken by the cities and towns, and stood out for the doctrine of home rule. He said that if the bill should be placed on the statute books it would be impossible to change or amend it in any way until a meeting of the Legislature in 1917. He said he appreciated the necessity for proper regulation and expressed the hope that the members of the Legislature from the cities of the first class would return to their respective cities and endeavor to have the city authorities pass such ordinances as would give to the public the protection to which it was entitled.

The Public Service Commission of the State of Washington, in a communication to the City Council of Seattle, states:

"We communicated some weeks ago with your honorable body with reference to the competition of the "jitney" bus, over which the commission has no jurisdiction. We called your attention to the fact that the operation of the "jitney" bus decreased the revenues of the company more than \$2,000 a month. Just prior to the advent of the "jitney" we arranged with the company for improved service in Seattle, including service to the outlying districts. With the advent of the "jitney" we felt that the company should be permitted to adjust its business so as to be able to compete with the bus. Whether the company can render the service required and obtain a reasonable return upon its investment is a question that can be determined only by a valuation of the property of the company."

In this connection it is of interest to note that the Puget Sound Traction, Light & Power Company notified the Port Commission of the city of Seattle that the present agreement of the company with that body whereby the patrons of the Port Ferry are granted a single 5-cent fare over the Port Ferry and the Ferry Hill line in West Seattle would be discontinued by the company on the expiration of the present joint traffic arrangement on March 16. A. L. Kempster, manager of the company, in returning the unsigned agreement, wrote the commission as follows:

"After carefully considering this matter, we feel obliged to inform you that on the expiration of the present agreement we must discontinue the joint fare arrangement heretofore existing. We are forced to this conclusion owing to the very serious loss of revenue suffered by this company by reason of unregulated competition of the "jitney" buses, particularly within short-haul territory. The authorities have permitted this ruinous competition to continue in face of the fact that by so doing one of the heaviest tax-paying institutions and most potent factor in the up-building of the community is being crippled. With these facts before us, it becomes our duty to conserve our revenue in every reasonable manner. It is not our desire to work unnecessary hardship upon any section of the community. On the other hand, the curtailment of service in unprofitable territory and the withdrawal of privileges heretofore extended to different sections of the



city must of necessity prove burdensome to some. This is a condition which we regret but cannot escape."

Regulations for the operation of motor vehicles for public transportation, including provision for payment of 10 per cent of gross receipts to the municipality in which the line is operated, are laid down in a bill introduced in the Pennsylvania Legislature by Mr. Jones of Susquehanna, chairman of the public roads committee. By the terms of the bill all cars must take out regular State licenses and file with the commonwealth a list of all routes by streets or roads, a \$10,000 bond for each machine operated for recovery of damages for death or injury and a statement of capacity of all vehicles operated. All operators must be of age. Before operating in any municipality the lines must arrange to pay 50 cents a month per car, to the treasurer of the municipality as a license fee. Cars operating on State highways are not required to have this extra license. Thirty days after Jan. 1 each line must file with the municipality granting licenses a statement of gross receipts, and pay 10 per cent for street maintenance. The Public Service Commission is given authority to regulate the lines. Fines are provided for violations.

Charles M. Talbert, director of streets and sewers of St. Louis, Mo., is preparing a "jitney" regulatory ordinance. Realizing the need, however, of the immediate regulatory measures on account of the promiscuous manner in which the "jitneys" are running, he, together with President McPheeters of the Police Board, conferred on March 8 and drew up a set of tentative rules which will be enforced till a permanent ordinance is adopted. No "jitney" will be permitted to operate without its owner first having secured a permit from the city and subscribed to the regulations. Five principal features are covered. All chauffeurs must be examined as to their competency to handle a car. All cars will be examined to see that they are in proper condition. No speeding to obtain passengers will be allowed. There must be no overloading of cars, and passengers must be taken on and deposited at the curb, instead of the middle of the street, as many now are. In addition, all chauffeurs must obey the usual traffic laws applicable to other vehicles.

A temporary or emergency ordinance for the regulation of "jitneys" and other vehicles engaged in public transportation has been introduced in both Houses of the Council of Kansas City. The ordinance contains twenty-five sections. The more important sections relate to the character and qualifications of the operators of this class of public transportation service and clearly set forth their responsibility and liability in regard to protecting the lives of the people. They are required to secure from the city franchises to operate their vehicles and to indemnify the city in bonds to cover personal injury. The city reserves the right to designate the routes to be traversed by the cars, the operating hours and schedules, to determine the qualifications of operators and to regulate the rates of fare.

In Atlanta regulatory legislation in the form of an ordinance prepared by P. S. Arkwright, president of the Georgia Railway & Power Company, and introduced by Councilman Lee is pending before a committee of the City Council. None of the terms of the ordinance is severe. It would require a bond to the city in the sum of \$10,000 for two cars or less under the control of one operator and \$20,000 for more than two cars. It contains no provision against overcrowding. In the course of an interview published in the automobile section of the *Atlanta Constitution* of March 14 the following was quoted as coming from E. W. VanDuzen, sales manager of the Mitchell Motor Sales Company:

"The assertion that "jitneys" are not lighted at night is a small detail that can easily be remedied by the expedient of lighting them. I believe they ought to be lighted. As for undesirables riding in them, as has been suggested might happen, the "jitney" is only a common carrier similar to any other common carrier in the character of the passengers it carries, and I see no reason for suspecting that the "jitneys" would carry a larger percentage of undesirables than any other common carrier."

Under the terms of an ordinance introduced in the City Council of Savannah, Ga., "jitney" buses are required to run on established routes, maintain regular schedules,

pay a license to the city and furnish indemnity bonds to guarantee responsibility for accidents.

An ordinance regulating the operation of the "jitney" has been prepared for submission to the City Council of Houston, Tex. The measure provides, among other things, for a \$10,000 accident insurance or personal bond, license according to capacity of car for carrying passengers, regulation requiring cars to run on one line only and on a schedule, prohibition of passengers being carried on running boards, fender or on car doors, a fare of not more than 5 cents and a requirement that cars must not stop more than 2 ft. from the curb.

No "jitney" licenses will be issued by the city of Nashville, Tenn., until the City Commission has disposed of the ordinance which it has under consideration. This has been amended to provide that the applicants for such licenses shall first deposit with the city a \$5,000 bond.

The Pacific Electric Railway, Los Angeles, Cal., has announced increases in service on a number of its lines, and General Manager McMillan is quoted as stating that "we are prepared to give the 'jitney' bus a run for its money." In this connection the *Los Angeles Times* said recently:

"Following a month of rather strenuous retrenchment the Pacific Electric Railway announcement of improved service is interpreted by many as evidence that the 'jitney' bus, like the seven-year locust, has about run its cycle here. As proof of this it is alleged that the number of light cars that are going back to the dealers under the mortgage clause after brief but hectic careers on our streets, is in excess of the purchases. But if the 'jitney' had seen its best days in the Southwest, in spite of Councilman Codding, it is becoming an increasingly live issue in the East."

Interesting instances of labor's attitude toward the "jitney" bus are furnished at Rock Island, Ill., and Providence, R. I. At a recent meeting in Rock Island of the Tri-City Federation of Labor, it was voted to put the "jitney" on the unfair list. The Davenport and Rock Island locals of the street railway men's unions entered a joint resolution asking that the federation go on record against the use of the buses by union men. The men fear that the intrusion of the "jitney" may lead to union men being forced out of employment by the curtailment of the electric railway service. On March 6 there were fourteen automobiles in competition with the Tri-City Railway.

In Providence a committee of labor men has been appointed to investigate the "jitneys" and to report to the Central Trades & Labor Union. Pending the outcome of the investigation it was voted to "ask members to refrain from using the 'jitney' service and to discourage as far as possible the use of the service by others." Members of Local Division No. 618 of the Amalgamated Association of Street & Electric Railway Employees defended the Rhode Island Company and said that consideration should be shown it until the affairs of the company could be readjusted under the federal decree for the segregation of the properties of the New Haven Railroad. "Jitney" service was referred to as "unregulated and unrestricted competition" and it was also stated that the operators are unorganized and that no responsibility attaches to them or the owners of the cars.

The idea of profit-sharing has been extended to the "jitney." In Houston, Tex., coupons are being given to patrons by one operator. On the Montgomery line in that city ten cars called "coupon" cars are being operated. A sign on the windshield of each of these cars announces that the passenger will receive a coupon with every fare paid and that five coupons will be exchanged for one ride.

The menace of the bus to pedestrians has been strikingly stated by Paul Beemer, city passenger and ticket agent of the Union Pacific System at Ogden, Utah, who recently returned to Ogden from a trip to the Pacific Coast. He said of the "jitney": "It sure stimulates the mind to active thinking, trains the eye for spectacles of peculiar character and inspires the belief that to be knocked off your footing means resignation to the inevitable. Owners anxious to clean up as much coin as possible while the fire of the fad is burning hottest take any chances to get the money, allowing the cars to become packed with human beings whom the driver distributes along the route of travel without even bringing the car to a stop."

Reference has been made previously in the *ELECTRIC RAILWAY JOURNAL* to the local associations of "jitney" bus

owners and to the strength and influence that they have exerted in their own behalf in a political way. According to William A. Sears, manager of the Motors Service Company, St. Louis, Mo., with twenty-two cars in service in that city, plans are under way for the organization of a national "jitney" bus association to be designed as a clearing house of information for the owners and operators of "jitneys."

Other automobile men than John N. Willys, of the Willys-Overland Company, have gone on record recently in regard to the "jitney." Among them is H. H. Franklin, president of the Franklin Automobile Company, Syracuse, N. Y. Mr. Franklin is quoted in part as follows:

"As crude as the 'jitney' may be, it is the beginning of a radical change in transportation. Fight it as they may, the street railways cannot stop the growth of the service. The rapid development of public automobile transportation during the next five years will be another wonder in the marvelous progress of the automobile. While at the present time the 'jitney' is any old automobile, it will not be long before cars will adapted to the service will appear. Moreover, the service will not be confined to cities. It will eventually cover the country from city to village and village to city, as do the interurban railways."

The letter addressed by W. Clayton, vice-president and managing director of the San Diego (Cal.) Electric Railway, to Stephen P. Kieffer, chairman of the Oakland Chamber of Commerce & Commercial Club Consolidated, in reply to his request for facts and opinions on the "jitney" bus situation, has been reprinted in pamphlet form. This letter is a review of the cause and effect of the "jitney" and the necessity for its regulation. Mr. Clayton concluded his letter as follows:

"If the 'jitney' bus is all they claim it to be, it will put the street car out of business by legitimate competition, but the competition street cars are suffering from to-day is not only not legitimate, but it is neither fair nor honest on the part of the people, the cities or the State. Street cars are willing to meet any legitimate competition if the people will give them a square deal, and I believe it is to the interest of the people, the municipalities and the State itself to see that the street railway systems of California are treated with the same measure of honesty and protection that the people themselves have demanded should be extended to them through the State and the State Railroad Commission."

#### LIMITING CAR CAPACITY

A meeting of the Board of Health of New York was held on March 15 to receive the protest of the New York Railways and the Brooklyn Rapid Transit Company against the orders of the board concerning the Eighty-sixth Street cars of the former company and the Graham Avenue cars of the latter. The Third Avenue Railway had agreed previous to the hearing to obey the order of the health commissioner with regard to Fifty-ninth Street by running three extra cars during the rush hours. Commissioner Goldwater stated that when the board issued an order it was presumed to be reasonable until it was proved otherwise, and that the burden of proof rested with the company protesting. He said the board was prepared to prove its case and is necessary would go to court about it. Dr. Goldwater would not admit that Mr. Peacock, counsel for the New York Railways, had any right to inspect the samples of germs, but said that he might do so. On March 16 the New York Railways notified the doctor that it would accept his order concerning the running of more cars on the Eighty-sixth street crosstown line. Dr. Goldwater wrote to Frank Hedley, vice-president and general manager of the company, that for the first few days, until passengers grew accustomed to the new regulations, policemen would assist the company's employees in observing the rules.

The Health Board had issued an order against the carriage of more than half as many standees as seated passengers by the Staten Island Midland Railway on some of its cars. Placards bearing an appeal from Dr. Goldwater to the citizens of Brooklyn, asking for their assistance and co-operation in his campaign had been posted at various points along the route of the Graham Avenue line and at the bridge terminals.

#### DETROIT CAPACITY ORDINANCE

The Common Council of Detroit, has passed an ordinance requiring 30 cu. ft. of air space for each passenger on the cars of the Detroit United Railway. Exception is made where cars are operating over the same tracks half a minute or less apart. The Council passed the ordinance without any hearing before any committee, and neither the street railway nor any other interested party was permitted to make known its objections. The same ordinance was defeated in committee when it was proposed several months ago, largely because the city police commissioner informed the Aldermen that he did not have sufficient men to enforce the ordinance.

The ordinance requires the board of health to measure each car and placard it with the number of passengers which may be admitted. It is estimated that the result of the ordinance will be to prohibit a standing load in excess of 40 per cent of the seated load. The new regulation becomes effective after the measure has been signed by the Mayor and then properly published.

The company in a statement to the public through its official publication, calls attention to the condition on its interurban lines and makes it plain that the surplus riders under the ordinance who board the cars beyond the city limits will be required to leave at the city limits and wait for other cars, and it suggests that a sufficient number of police be stationed at the city limits to make sure that these riders leave the cars. The employees of the two largest manufacturing concerns in the city will be affected, as both plants lie beyond the corporate limits of the city.

#### INCREASE IN FARES

##### Rate of 8 Cents, with Seven Tickets for 50 Cents, Announced by Blue Hills Street Railway, Effective April 15

The Blue Hills Street Railway, Canton, Mass., has issued the following announcement regarding changes in fares on its line effective on April 15:

"It appears to us that the only way to continue to serve the public with safety and to their reasonable satisfaction is to endeavor to increase the company's earnings. We believe that the least burdensome way to do this is to increase the unit of fare rather than to attempt to shorten the fare limit or introduce additional fare limits. We have therefore decided to increase the unit of fare to 8 cents per passenger, but to sell tickets at the rate of seven for 50 cents, which is practically a 7-cent fare.

"The new rate will go into effect on April 15 unless some order is issued by the Public Service Commission, whose decision in such matters is final.

"We hope that the change will bring in \$8,000 or \$10,000 in additional revenue. The increase from a 5-cent fare to a 6-cent fare resulted in about an 8 per cent increase in earnings, and, based on this figure, with the other information which we have on the general situation, we are led to believe that the above estimate is probably not far from what will prove to be the fact.

"The need of additional earnings is imperative. While the road in many respects is better off than it was at the time of the previous change in fare, and while it has reduced its deficit somewhat during that period, the cost of operation and the necessary increase in maintenance are so high that not enough is left after paying interest charges to take care of betterments, which we know must be done in the next few years in order to serve the public properly.

"We should be glad if we could hold out a hope that the increased earnings would result in dividends to the stockholders. They invested \$300,000 in cash some sixteen years ago. If they had placed the money in a savings bank at that time they could now draw out \$540,000. Instead they have a practically worthless security on their hands.

"The property has always been operated with the utmost economy consistent with safety and reasonable service, so that no saving can be hoped for in that direction. The tendency is rather upward in such expenditures, as is well known to every one.

"To increase fares is not a pleasant task, as it is extremely difficult to convince people of the necessity of such a move. We do hope, however, that the people of Canton and Stough-

ton who have had the service rendered by the Blue Hill Street Railway so many years below cost, will believe that we are acting for their ultimate best interests in seeking additional revenue.

"The investment, the earnings and the expenses are all matters of public record and the details are in our office, open to the inspection of any patron who desires to convince himself of the reasonableness of our position."

**Fare Reduction Denied.**—The Public Utilities Commission of Maine, has dismissed the petition of William H. Peaseless and others asking for a reduction in fares from 10 cents to 5 cents between Dunstan and Saco. The petition, in formal language charged that the Cumberland County Light & Power Company maintained discriminatory rates over the part of the line where the reduction was desired.

**Accidents in Ohio.**—The report of the Public Utilities Commission of Ohio for February shows that four persons were killed on interurban electric railways. Two were employees on duty and two were passengers. In all fifty-five persons were killed on steam lines, of which thirty-three were trespassers, twelve were employees on duty, two were employees off duty, one was a passenger, three were employees on the right-of-way and four were killed in highway-crossing accidents.

**Washington Trail-Car Order.**—The Public Utilities Commission of the District of Columbia has suspended, until July 1, 1915, Section 13 of Order No. 21 requiring separate conductors for trail cars in order to permit observations to be made with a view to determining whether the order should be amended by striking out Section 13. The Washington Railway & Electric Company and the Capitol Traction Company contended at the recent hearing before the commission that a single conductor made for safety.

**Free Ride Order Amended.**—The Public Utilities Commission of the District of Columbia has decided that Order No. 19 in regard to free transportation on street railways and other carriers in the District shall be amended to read as follows: "That hereafter no street railway or similar common carrier shall furnish free intra-District transportation other than to its own employees and to members of the metropolitan police, crossing police, park police, and fire department of the District of Columbia when in uniform and in the performance of their duties."

**New Transfer Privilege.**—An agreement has been reached between officials of the United Railroads, San Francisco, Cal., and of the Municipal Railways of that city permitting the exchange of transfers between the Stockton Street line of the Municipal Railway and the Fourth Street line of the United Railroads, on the basis of 50 per cent to each line. This gives the city lines immediate connection with the Southern Pacific Depot at Third and Townsend Streets and obviates the necessity for extension of the municipal system to this point, which would include an undesirable crossing of Market Street at a point already congested. It is probable that this new arrangement will also mean the discontinuance of the transfer agreement between the two systems at Geary and Kearny Streets as well as at the Geary and Larkin Street junction. Transfers have heretofore been exchanged at these two points on a 3-cent and 2-cent basis, in favor of the private company, and the exchange has cost the city something more than \$1,000 a month.

**New Wage Scale in Des Moines.**—On Feb. 23 the employees of the Des Moines (Ia.) City Railway approved a new agreement with the company which went into effect on March 1. Under it the wage scale of the motormen and conductors is increased 1 cent an hour. The men will receive 25 cents an hour the first year, 26 cents an hour the second year and 30 cents an hour after the third year. The wages of the carhouse, shop and power house employees are increased 1 cent an hour and in some cases the increase amounts to several cents. Some of the men, particularly oilers and wipers, have been receiving from \$2.10 to \$2.30 for a ten-hour day. These hours have been reduced to eight hours and a uniform wage of \$2.40 has been agreed upon. The increase for the men will average for from 7 to 9 cents. Women car cleaners have had their

pay increased from \$1.58 to \$2 for an eight-hour day. Seniority rights are also to be applied to carhouse and shop employees.

**Mr. Arnold on Service Standards.**—Bion J. Arnold, chairman of the Board of Supervising Engineers, Chicago Traction, testifying before the Public Utilities Commission of Illinois on March 10, outlined his personal views of rush-hour standard of service in Chicago. He divided the so-called "rush hour" into five parts as follows: For the first and last parts, consisting of twenty-five minutes each, fifty-three passengers per car, allowing 11 sq. ft. to each standing passenger. For the second and fourth parts, consisting of twenty-five minutes each, seventy-three passengers, allowing 4¼ sq. ft. to each standing passenger. For the third or middle part, this being the crest of the rush period, an average load not to exceed the number of seats and one standing passenger to each 3½ sq. ft. Mr. Arnold said that during the crest of the rush-hour period, the 600 largest cars would have a capacity of eighty passengers each, according to this idea of a service standard. He believed the present terminal facilities of the surface lines in Chicago to be such as to allow reasonable and adequate service.

**Safety on Public Service Railway.**—The Public Service Railway, Newark, N. J., is carrying an advertisement in the daily newspapers calling attention to its record for safety. The advertisement is 15 in. wide by 10 in. deep, and deals particularly with the commendation received from the judges in the contest for the Anthony N. Brady medal. The company says that during three years 1,194,793,266 passengers were carried without a single fatality due to collisions between cars or derailments. After reciting the object, the offer and the conditions of the Brady award the company said in part: "The Public Service Railway began its efforts to promote and safeguard the lives of its patrons and employees years before any contest was thought of. Its entry for the Brady medal was an incident. Its main purpose was, is and will continue to be to transport the public safely. The company management and the company employees will pursue the policy of doing everything possible to eliminate accidents and conserve life and health. It asks for the co-operation of the public so that the good work may be maintained for the benefit of all."

**Accidents in New York and New Jersey in February.**—According to the report of the National Highway Protective Society eighteen persons were killed during February by automobiles on the streets in New York City, nine of these being children under seventeen years of age. Electric railways caused the death of five and wagons four, as compared with ten by electric railways and two by wagons in February a year ago. Edward S. Cornell, secretary of the Highways Society, states that on account of the great increase in the number of automobiles it is necessary that all operators of automobiles should be licensed. The society will have a bill introduced along those lines in Albany. During February six persons met their death by automobiles, three by electric railways and one by wagon on the streets and highways of New York State outside of Greater New York, as compared with three by automobiles and four by electric railways last year. In New Jersey six persons were killed by automobiles and one by electric railway.

**Survey of Transit Conditions in Brooklyn.**—The Public Service Commission for the First District of New York has published in pamphlet form the survey of transit conditions on the Brooklyn Rapid Transit System submitted to the commission by Joseph Johnson, chief of its transit bureau. The survey is dated Dec. 31, 1914, and is addressed to Edward E. McCall, chairman of the commission. It contains 126 pages and cover. The report was rendered in connection with the inquiry before the commission regarding the service on the surface lines of the Brooklyn Rapid Transit Company, and its contents and recommendations have been referred to previously in the *ELECTRIC RAILWAY JOURNAL*. The final argument of the company before the commission in connection with this inquiry was made before the commission on March 8, on which date D. A. Marsh, counsel for the Brooklyn Heights Railroad and other surface companies, summed up the case of the company. Mr. Marsh's brief in this connection was referred to in the *ELECTRIC RAILWAY JOURNAL* of March 13, 1915, page 532.

## Personal Mention

Mr. E. Blaine Moore, formerly chief engineer of the Consolidation Coal Company, has been appointed assistant general manager of the Monongahela Valley Traction Company, Fairmont, W. Va.

Mr. W. L. Martin, who has been in charge of the legal department of the Alabama Traction, Light & Power Company, New York, N. Y., has been appointed vice-president and chief counsel of the company.

Mr. James O. Watson, formerly general manager of the Monongahela Valley Traction Company, Fairmont, W. Va., has been made vice-president. Mr. Watson will continue in active management of the railway.

Mr. Smith Hood, formerly general superintendent of the Monongahela Valley Traction Company, Fairmont, W. Va., has been made general manager to succeed Mr. James O. Watson, who becomes vice-president, as noted elsewhere.

Mr. C. K. Morrell, has resigned as superintendent of lighting with the Kentucky Traction & Terminal Company, Lexington, Ky., and has been succeeded by Mr. Washington Reed, lately of Smithfield, Va. Mr. Morrell, it is said, will enter business in Lexington.

Mr. James Mitchell, president of Alabama Traction, Light & Power Company, New York, N. Y., has been elected president of Alabama Power Company, the principal operating subsidiary, to succeed Mr. Frank S. Washburn, who became chairman of the board.

Mr. C. C. Cole, who has been day dispatcher of the Lewiston, Augusta & Waterville Street Railway, at Augusta, Me., has been appointed division superintendent of transportation of the company, succeeding Mr. Sherman W. Dunn. Mr. Cole was with the company for seven years.

Mr. L. M. Levinson, formerly manager of the Mineral Wells Traction & Light Company, Mineral Wells, Tex., and manager of the Shreveport (La.) Traction Company, has been engaged by the Bryan-College Interurban Railway, Bryan, Tex., to supervise the electrification and start operations under the new plan of the company.

Mr. Sherman W. Dunn, who has been connected with the Lewiston, Augusta & Waterville Street Railway as division superintendent of transportation, has resigned that office but will continue with the company at Augusta, Maine. Mr. Dunn has been connected with the company for twenty-three years. He entered its employ in the carhouse of the Augusta, Hallowell & Gardiner Railroad two years after that company commenced operating.

Mr. H. S. Newton, until recently general manager of the Mesaba Railway, Virginia, Minn., has been appointed general manager of the Ohio Valley Electric Railway, Huntington, W. Va., to succeed Mr. W. W. Magoon, resigned. Before becoming connected with the Mesaba Railway, Mr. Newton was general manager of the Hartford & Springfield Street Railway, Warehouse Point, Conn., for nine years. He was graduated from Ohio State University as an electrical engineer and has served with the General Electric Company, the Wheeling (W. Va.) Railway, the Syracuse (N. Y.) Railway, the Syracuse Consolidated Street Railway, the Syracuse Rapid Transit Company, the Syracuse, Lakeside & Baldwinsville Railroad and the Beaver Valley Traction Company, Pittsburgh, Pa.

Mr. Robert Trimble, first vice-president of the American Railway Engineering Association, was elected president at the annual convention in Chicago on March 16, 17 and 18. Mr. Trimble was born at Butler, Pa. After completing a public school course he entered the Western University of Pennsylvania (now the University of Pittsburgh), where he remained for three years. In July, 1875, he entered the service of the Pennsylvania Railroad as a messenger in the office of the chief engineer at Pittsburgh. He was then successively chainman, rodman, levelman, transitman, draftsman, assistant engineer and principal assistant engineer. He was made chief engineer of maintenance of way of the Pennsylvania lines in 1903. His jurisdiction is over the Northwest system of the lines west of Pittsburgh.

Mr. William D. Ray has resigned as vice-president and manager of the Northern Indiana Gas & Electric Company's

properties at Hammond, East Chicago, and Whiting, Ind., to become general manager of the newly organized Pennsylvania Utilities Company, with headquarters at Easton, Pa. The latter company operates in nearly fifteen communities contiguous to Easton, containing many quarries and large manufacturing plants. Mr. Ray entered the electrical field as electrical engineer for the Chicago & Northwestern and Northern Pacific railroads, and later was connected with the World's Columbian Exposition, Chicago, as assistant superintendent of electrical operation. In 1894 he was general superintendent of the Everett (Wash.) Street Railway, and later he became sales engineer for the Loraine Steel Company. Subsequently he was electrical engineer for two traction lines operated by the Detroit Construction Company, following which he superintended the construction of the Grand Rapids, Grand Haven & Muskegon Railway. In 1908 he was appointed contract agent of the Sanitary District, Chicago, and in 1910 went to Hammond for the Northern Indiana Gas & Electric Company.

Mr. Oscar T. Crosby has been appointed to take general charge of the distribution of supplies for the Commission for Relief in Belgium, and also a member of the executive committee. Mr. Crosby's headquarters will be in Brussels, and, as general director of distribution, he will succeed Mr. A. N. Connett, chief engineer and joint-director of J. G. White & Company, Ltd., whose appointment was mentioned in the *ELECTRIC RAILWAY JOURNAL* for Dec. 26, and whose business affairs permitted him to take the appointment only temporarily. The Commission for Relief in Belgium, whose work in that country Mr. Crosby will direct, is an American organization exclusively, with headquarters at 71 Broadway, New York. It is supported by voluntary contributions and has a fleet of forty-three vessels constantly carrying food and other supplies from America to the destitute in Belgium, estimated at present to be about 1,500,000 persons. The commission has been officially recognized by both the Allies and Germany. Mr. Crosby resigned from active electric railway management some few years ago, so that he has the time to devote to this work, and for it his extensive experience in administrative affairs and his knowledge of the French and German languages eminently fit him. Since his return from an exploring trip in Borneo last year Mr. Crosby has been very much interested in the proposed International Court of Decree and Enforcement, under which it is proposed to establish an international court at the Hague or some other suitable place, with sufficient international military and naval force to carry out its decrees. He has written a pamphlet advocating this plan which has been widely circulated and has been translated into a number of languages, including Japanese and Chinese. A joint resolution committing the United States to the acceptance of this plan was introduced in the Senate last month by Senator Shafroth, and a similar resolution was introduced in the House. These resolutions did not succeed in passing at the recent session of Congress, but Mr. Crosby hopes that they will be introduced at the next session. Among others who have actively been engaged with Mr. Crosby in support of this plan has been Mr. Elihu Root.

### OBITUARY

J. C. Rothery, of the Canadian Northern Railway, was found dead on March 10 near the Grand Trunk Railway tracks at Weston, Ont., having apparently fallen from a train. Mr. Rothery was born in Glasgow sixty-seven years ago. His first practical experience in railway building was gained during the construction of the Niagara Gorge Railway between Niagara Falls and Lewiston. He was afterward appointed manager of the line, and when the Niagara Falls, Park & River Railway was merged with the International Railway, Buffalo, he was made general manager of the system at the Falls. He next superintended the construction of the International Bridge across Niagara River at Lewiston. Upon the completion of the bridge he was appointed general manager of the East Liverpool Railway & Light Company, East Liverpool, Ohio, where he remained until 1910. He then entered the service of the Mackenzie and Mann interests as general manager of the Monterey Railway, Light & Power Company, Monterey, Mexico, and later supervised the building of the electrical line of the Toronto & Eastern Railway on the north shore of Lake Ontario. Since that time he has been superintending general construction work for the company, which is a Mackenzie and Mann interest.

# Construction News

Construction News Notes are classified under each heading alphabetically by States.

An asterisk (\*) indicates a project not previously reported.

## RECENT INCORPORATIONS

\***Panama (Pa.) Traction Company.**—Application for a charter has been made in Pennsylvania by this company to take over the property of the defunct Sugar Grove Electric Railway and extend the line through Youngsville, Sugar Grove, Jamestown, Lakewood, Panama, Sherman and probably Findlay Lake and North East.

\***Petersburg & Appomattox Railway, Petersburg, Va.**—Chartered in Virginia to build an electric railway from Petersburg to City Point, 5 miles. Capital stock, \$100,000. Officers: T. M. Wortham, president; B. W. LaPrade, vice-president, and W. W. Alexander, secretary and treasurer.

## FRANCHISES

**Los Angeles, Cal.**—The Pacific Electric Railway has received a franchise from the Council for an extension on Central Avenue in Los Angeles.

**Louisville, Ky.**—The Board of Public Works of Louisville has begun advertisement of the franchise for electric railway rights and privileges represented by the extension of the Chestnut Street line of the Louisville Railway. The franchise is to run for twenty years and an upset bid of \$500 is provided for.

**Geneva, N. Y.**—The Geneva, Seneca Falls & Auburn Railroad has asked the Council for a franchise to double-track Exchange Street from Seneca to the New York Central tracks in Geneva.

**Lancaster, N. Y.**—The Buffalo & Depew Railway has asked the Council for a franchise to extend its lines from its present terminus, through Ellicott Road and Central Avenue to the New York Central Railroad tracks in Lancaster.

**Cincinnati, Ohio.**—The City Council has adopted an ordinance requiring the Cincinnati Street Railway and the Cincinnati Traction Company to extend the Warsaw Avenue route along Glenway Avenue from Wilder Avenue to Seton Avenue in Cincinnati. Council's action was on the request of the Citizens' Club, of Price Hill, and the West Hills Allied Improvement Association.

**Linden, Ohio.**—Council committee on railroads has approved the ordinance creating the electric railway route from the Leonard Avenue viaduct to Linden and also to Shepard. The term of the franchise is to be twenty-five years and if the terms offered by the East Linden Electric Railway Company, which has applied for the franchise, are satisfactory, the franchise will be granted the company. The Shepard line will compete with the Columbus, New Albany & Johnstown Traction Company.

**Three Rivers, Que.**—The Three Rivers Traction Company has received a twenty-year franchise from the Council in Three Rivers. This is part of a plan to build a 30-mile railway in Three Rivers. The present intention of the company is to build 5½ miles of track within the city limits. [Aug. 1, '14.]

**Toronto, Ont.**—The Forest Hill Electric Railway has asked the Ontario Legislature for an extension of time on its franchise in which to build its projected railway on Forest Hill Road, Toronto, northerly, and northwesterly to 2½ miles north of Eglinton Avenue, also on Eglinton Avenue to 1 mile west of Dufferin Street and northerly on Dufferin Street 2½ miles. W. E. Grierson, Toronto, is interested. [Feb. 27, '15.]

**Montreal, Que.**—The Montreal & Southwestern Railway & Power Company has applied to the Quebec Legislature for an extension of time for the building of this projected line from Adirondack Junction, on the Canadian Pacific Railway, along the St. Lawrence River to the International boundary, and another line from Adirondack Junction, on the New York Central Railroad, to Sunder, Quebec. The provisional directors are: V. Casson, L. Dansereau, A. Geoffrion, G. N. Cusson, R. Gange, Montreal, Quebec. The company has power to operate by steam or electricity.

## TRACK AND ROADWAY

**Florence & Huntsville Interurban Railway, Florence, Ala.**—Surveys have been begun and preliminary arrangements are being made by this company on its 75-mile line to connect Florence, Rogersville, Athens and Huntsville. There will be three power stations and the repair shops will be located at Florence. Capital stock, authorized, \$100,000. Officers: S. Jacobs, Birmingham, president; Alan Jamison, vice-president; Thurston H. Allen, Florence, secretary and general manager, and T. W. Pratt, Huntsville, treasurer. Headquarters: Florence. [Dec. 19, '14.]

**Pacific Electric Railway, Los Angeles, Cal.**—Plans are being made to begin work soon laying new tracks on North Fair Oaks Avenue in Pasadena. The company has placed in operation its extension to connect Riverside, Arlington and Conora. [Nov. 14, '14.]

**Capital Traction Company, Washington, D. C.**—Plans are being made by this company to build a line on Seventeenth Street in Washington.

**Washington & Maryland Railway, Washington, D. C.**—This company has filed with the Public Utilities Commission a request for permission to extend its lines from Third Street and Kennedy Street to Thirteenth Street and Ohio Avenue northwest in Washington.

**Atlanta & Carolina Railroad, Atlanta, Ga.**—Arrangements are being made by this company to complete this electric line in the near future. The right-of-way has been purchased and the roadbed has been completed for a part of the way.

**Lula-Homer Railroad, Lula, Ga.**—Bids are being received until March 30 by this company to build its 14-mile proposed line from Lula to Homer. The track is to have 3000 ties per mile and 60-lb. relaying rails. D. G. Zeigler, engineer. [Nov. 7, '14.]

**Chicago & Northern Interurban Railroad, Chicago, Ill.**—No definite plans have yet been decided upon by this company when work will be begun on its line to connect Fox Lake, Lake Geneva, Barrington, Des Plaines, Park Ridge, Niles Center, Chicago and smaller towns between these cities. Headquarters: 127 North Dearborn Street, Chicago, Ill. [Feb. 27, '15.]

**Illinois Traction System, Peoria, Ill.**—A branch line to extend from near the Martin stop, 1½ miles north of Lincoln, and eastward to Wapella, 4 miles north of Clinton, is being planned by this company.

\***Elkhart, Ind.**—It is reported that H. E. Bucklen, Elkhart, Ind., will shortly apply for a supplementary charter for an electric railway line between the Indiana-Ohio state line and Toledo. Should this line be built it will form a through route between Toledo and Chicago in connection with the Bucklen roads and others already in operation.

**Charles City Western Railway, Charles City, Ia.**—Electrifying 18.5 miles and building 7½ miles of extensions will be completed by this company by Nov. 1.

**Tri-City Railway, Davenport, Ia.**—Rails have been ordered for the Fourth Street line which this company will build in Moline.

**Caney Light & Railway Company, Caney, Kan.**—Within the next thirty days this company expects to purchase one carload of poles, 25 ft., 30 ft. and 35 ft. in length. J. C. Miller, manager.

**Louisville & Interurban Railway, Louisville, Ky.**—An extension of the Orell line into West Point is being planned by this company.

**Southwestern Traction & Power Company, New Iberia, La.**—Plans are being made by this company to build soon a line from Jeanerette to St. Martinville.

**St. Tammany & New Orleans Railway & Ferry Company, New Orleans, La.**—This company, which has been operating a motor-car railway between Mandeville, Abita Springs and Covington, La., 13½ miles, will, it is stated, convert its railway to electric operation. Reconstruction of the track has been begun, and the erection of an electric power plant will be begun at once.

**Winnipeg (Man.) Electric Railway.**—The Manitoba Legislature is being asked to amend the company's charter by adding to its powers.

**Union Street Railway, New Bedford, Mass.**—Work has been begun by this company laying new rails on Kempton Street in New Bedford.

**International Railway, Buffalo, N. Y.**—Plans are being made by this company to double-track its line on Virgil Avenue as far as Kenmore Avenue in Buffalo.

**Ithaca (N. Y.) Traction Corporation.**—This company is making surveys of the Mitchell Street and Stewart Avenue lines in Ithaca.

**Walkill Transit Company, Middletown, N. Y.**—Plans are being considered by this company for an extension from Midway Park to connect with the extension of the Newburgh line from its Walden terminal, and taking in the towns in the adjacent territory, including Maybrook, Montgomery and Campbell Hall.

**Long Island Railroad, New York, N. Y.**—President Ralph Peters, of this company, has replied favorably to an inquiry made by the Public Service Commission as to whether his company would entertain a proposition on behalf of the City of New York for the extension of the City Rapid Transit Railroad from Corona to and through Flushing, by making a connection with its tracks at a point in Flushing Meadows, near the interlocking tower, at Flushing Junction; thence over its tracks on the Whitestone Branch, by way of Flushing (Bridge Street), to Whitestone, and by way of Flushing (Main Street) to the city limits, at Little Neck. Mr. Peters in his reply says he is willing to co-operate with the city in providing such service by permitting the use of his company's tracks through the territory described.

**New York, N. Y.**—New bids are desired April 9 by the Public Service Commission, First District, 154 Nassau Street, for the construction of Section 4 of the routes 4 and 36, a part of the Broadway, Fourth Avenue Rapid Transit Railroad in Manhattan. The work consists of a two, four and six track underground railroad northerly under Seventh Avenue, from Fifty-first Street to Fifty-ninth Street, and easterly under Fifty-ninth Street to a point 22 ft. west of westerly building line of the Seventh Avenue extended.

**Geneva, Auburn & Seneca Falls Railroad, Seneca Falls, N. Y.**—Plans are being made by this company to double-track its line from the Seneca Street switch to the New York Central crossing in Geneva.

**Asheville Power & Light Company, Asheville, N. C.**—An extension of its railway lines in Kenilworth Park in Asheville is being planned by this company.

**\*Alamance, Durham & Orange Railway & Electric Company, Burlington, N. C.**—This company, the incorporation of which is announced elsewhere in this issue, is making plans to begin work soon on the proposed 49-mile electric line from Ossipee to Durham. The route includes 58 villages. It is stated that interests connected with the Piedmont Trust Company and the North State Realty Company, both with headquarters at Burlington, and their interests are back of the railway plan, also that after the charter is obtained the several counties to be traversed will be asked to call elections on proposed bond issues to make subscriptions to the stock of the railway company. Junius Harden, Burlington, is among those interested.

**Consolidated Railways, Light & Power Company, Wilmington, N. C.**—First rails have been laid by this company from its loop at the entrance to the Navy Yard toward North Charleston, a distance of 2 miles.

**Pictou County Electric Company, Ltd., Stellarton, N. S.**—Work will be begun about April 1 on the extension to Parkdale.

**Northern Ohio Traction Company, Akron, Ohio.**—New track will soon be laid by this company on West Tuscarawas Street in Canton. A 90-lb. T-rail on steel ties and concrete foundation will be used for the new track. Plans are going forward whereby work will soon be begun on both the Arlington Street line from Spicer Street to Market Street and the extension of the East Exchange Street line in Akron.

**Cleveland, Ohio.**—Residents of the eastern section of Cleveland, Ohio, are urging the extension of the Payne Avenue line to connect with the 105th Street line. Street Railway Commissioner Peter Witt is opposing this on the ground that the cost will be \$25,000. He informed a meeting of the citizens that he would under no condition approve of

the extension. Conferences relating to the proposed new East Cleveland franchise have been postponed until arrangements are complete for improvements on Euclid Avenue.

**Dayton, Ohio.**—It is reported that the electric railway companies of Dayton, Ohio, will spend \$100,000 this season in the construction of tracks and plans for rerouting cars. At a conference of the presidents of the companies on March 10 plans were tentatively arranged for rerouting in order to allow the changes that have been planned on Main Street, between Monument and Fifth Streets in Dayton.

**Ohio Valley Traction Company, Portsmouth, Ohio.**—Contracts are being awarded by this company to build the extension from Sciotoville to Ironton.

**New Castle Traction Company, Youngstown, Ohio.**—Plans are being considered by this company to build a line on Atlantic Avenue and also to construct a terminal loop on the public square in New Castle.

**Oklahoma & Interstate Railway, Oklahoma City, Okla.**—Plans are being made by this company to award contracts and to begin work within the next sixty days on the 130-mile line to connect Columbus, Galena, Baxter Springs, Miami, Centralia, Collinsville and Tulsa. Surveys have been completed between Columbus and Baxter Springs and are now under way between Columbus and Tulsa. John R. Rose, Oklahoma City, president. W. K. Palmer, Kansas City, chief engineer. [Feb. 13, '15.]

**Aylmer, Ont.**—A by-law will be submitted to the rate-payers in the near future, authorizing the guarantee of their share of the bonds of the proposed hydro radial from Tillsonburg to London.

**Hamilton, Ont.**—The Board of Control has decided to ask the Provincial Hydro-Electric Railway to survey route for radial line from Hamilton to Fort Erie.

**Ottawa & St. Lawrence Electric Railway, Ottawa, Ont.**—It is reported that work will soon be begun by this company on the Perth and Smith Falls section of this projected railway. The line will extend through Rideau Ferry, and not as originally planned. [Feb. 20, '15.]

**Toronto, Barrie & Orillia Railway, Toronto, Ont.**—This company has applied to the Ontario Legislature to authorize the reduction of their capital stock and for an extension of time for the building of the projected line in Barrie, Ont., northerly to Orillia and southerly to Toronto.

**\*Toronto, Ont.**—Plans are being considered by citizens in and around Baysville, Ont., for the construction of a Hydro-Electric Radial Railway from Bracebridge through to the Wa Wa Hotel and ultimately extending to the Algonquin Park headquarters in the Muskoka district. The project has been endorsed by the Council and Board of Trade of Bracebridge and by the Councils of Baysville, Sherbourne, Nightingale and Clintock Townships. The projected line from Bracebridge to the Wa Wa will be about 24 miles, and power can be easily secured from any one of the numerous falls along the river. There are no engineering difficulties in the way. Sir Adam Beck has promised to give the matter every consideration.

**Niagara, St. Catharines & Toronto Railway, St. Catharines, Ont.**—Plans are being made by this company to build an extension on Bridge Street of the Falls division from Erie to Victoria Avenue, in Niagara Falls.

**Willamette Valley Southern Electric Railway, Portland, Ore.**—This company has placed in operation its line between Oregon City, Beaver Creek, Mulino, Molalla and Mount Angel. G. B. Dimmick, president. [Jan. 2, '15.]

**Easton (Pa.) Transit Company.**—During the next few weeks this company plans to rebuild its track on its South Side line, a distance of about 3 miles, using creosoted ties and 110-lb. Dudley section T-rail. These rails are manufactured by the Bethlehem Steel Company.

**Conestoga Traction Company, Lancaster, Pa.**—Surveys have been completed by this company for a new line 13 miles in length to be a branch of the Lancaster and Coatesville division. The new line will begin about 1 mile east of Conestoga Park, near Millinger's Church, follow along the old turnpike to the Horse Shoe Road, and along it to Witmer, whence it will cross the country to Bird-in-Hand, and thence along the old Philadelphia turnpike to Intercourse.

\*New Castle, Pa.—James L. Freeble, Pittsburgh, and associates are considering plans to build an electric railway from the corner of Haywood Street in Farrell to Mercer and New Castle.

**Monongahela (Pa.) Railways.**—Hereafter the company operating the railroad between Brownsville and Fairmont, W. Va., will be known as the Monongahela Railways Company, the name having been officially changed from the Monongahela Railroad Company the first of this month. The work of completing the line near Fairmont is now in progress and it is expected that service will be established in the near future.

**Eastern Pennsylvania Railways, Pottsville, Pa.**—Announcement has been made by this company of the abandonment of plans by the company to build an electric railway over Broad Mountain to connect Pottsville with Shenandoah. This line will now be constructed by the Schuylkill Electric Railway.

**Reading Transit & Light Company, Reading, Pa.**—Improvements to its lines in and about Reading, which are expected to cost about \$200,000, will be begun by this company as soon as the weather permits.

**Montreal & Southern Counties Railway, Montreal, Que.**—Work will be begun soon on the extension to Youville Square in Montreal.

**Ogden, Logan & Idaho Railway, Ogden, Utah.**—The stockholders of this company have authorized the issue of bonds for extension and other improvements on the company's lines in the sum of \$10,000,000. It is said that the company will use \$2,000,000 to pay off present obligations and to make immediate extensions, the remainder being reserved for future corporate purposes. Included in the work which is contemplated for the future is the construction of an interurban extension to Preston, Idaho.

**Clarkston, Wash.**—A. G. Nortz, promoter of the proposed electric railway through the Lewiston-Clarkston Valley, has announced that construction on the line will be begun at once. The contract has been awarded to Edward McGarry, Lewiston, to build the section of the line across the Snake River. [Jan. 19, '15.]

#### SHOPS AND BUILDINGS

**Brantford (Ont.) Municipal Railway.**—The commissioners have approved of this company's plans for a new passenger station to be built on the site of the old powerhouse on Colborne Street in Brantford. Work on the station will probably be started at once.

**Hershey (Pa.) Transit Company.**—This company's new carhouse in Hershey is nearing completion.

**Columbia Railway, Gas & Electric Company, Columbia, S. C.**—This company has awarded a contract to the Shand Engineering Company to build a new carhouse at Main Street and Rice Street in Columbia.

#### POWER HOUSES AND SUBSTATIONS

**Ohio Light & Power Company, Shawnee, Ohio.**—Within the next two months this company expects to erect new substations in Shawnee and Straitsville for the purpose of distributing electricity received from the Newark plant. When completed the local plant will be closed down.

**Oil Belt Terminal Railroad, Oklahoma City, Okla.**—Plans are being made by this company to build a new power plant on Lagoon Creek, between Oilton and Jennings, Okla. Frank Brown, president. [Oct. 17, '14.]

**Reading (Pa.) Transit Company.**—An order has been placed by this company with the Westinghouse Electric & Manufacturing Company for three 185-kva., single-phase, sixty-cycle, 2300-volt high tension, rotary low tension, outdoor type O. I. S. C. transformers.

**Southwestern Traction Company, Temple, Tex.**—A new substation is being built by this company in the western section of Temple.

**Parkersburg, Marietta & Interurban Railway, Parkersburg, W. Va.**—Work will be begun in the spring by this company on a new generating station to take the place of the present power house in Parkersburg. Sanderson & Porter, New York City, engineers, are expected to have preliminary details ready within sixty days.

## Manufactures and Supplies

#### ROLLING STOCK

**Toronto (Ont.) Civic Railway** is considering the purchase of ten more cars at a cost of \$100,000.

**Illinois Traction System, Peoria, Ill.**, has ordered from the Haskell & Barker Car Company fifty hopper bottom gondola cars, fifty-ton capacity.

**Brantford (Ont.) Municipal Railway** has ordered three single-truck pay-as-you-enter city cars from the Preston Car & Coach Company, Ltd., Preston, Ont.

**Toronto (Ont.) Railway** on March 8 placed in operation seven cars fitted with cross seats. Only one of the cars is new, the others being old cars remodeled and reconstructed.

**Alberta & Great Waterways Railways, Winnipeg, Man., Can.**, has purchased two McKee 55-ft. steel combined passenger-baggage 200-hp gasoline motor cars for service in northwestern Alberta.

**New York State Railways, Rochester, N. Y.**, noted in the ELECTRIC RAILWAY JOURNAL of March 13, 1915, as asking for bids on one sample car, has ordered this equipment from the G. C. Kuhlman Car Company.

**Ogdensburg (N. Y.) Street Railway**, noted in the ELECTRIC RAILWAY JOURNAL of Feb. 27, 1915, as expecting to purchase four one-man cars, has ordered this equipment from the Wason Manufacturing Company.

**Carolina & Yadkin River Railway, High Point, N. C.**, has ordered from the Southern Car Company one electric locomotive for the purpose of moving cars over the tracks of the North Carolina Public Service Company in the city of High Point.

**Boston & Worcester Street Railway, Boston, Mass.**, noted in the ELECTRIC RAILWAY JOURNAL of March 6, 1915, as expecting to purchase new cars, has ordered five interurban closed cars from the Osgood-Bradley Car Company, and five open cars from the Wason Manufacturing Company. The open cars will be equipped with rattan seats.

**Ogden, Logan & Idaho Railway, Ogden, Utah**, has ordered a 50-ton Baldwin-Westinghouse electric locomotive. This locomotive will be equipped with Westinghouse field control No. 562-A-5 motors and type HLF control, arranged for full speed operation on 750 or 1500 volts. The locomotive will be used for freight service and with 25 per cent adhesion will exert a maximum tractive effort of 25,000 lb.

#### TRADE NOTES

**Fairmont Machine Company, Fairmont, Minn.**, has changed its name to the Fairmont Gas Engine & Railway Motor Car Company.

**Carlton R. Mabley**, for the past five years general manager of the R. I. V. Ball Bearing Company, has joined the selling organization of the S.K.F. Ball Bearing Company.

**Tool Steel Gear & Pinion Company, Cincinnati, Ohio**, has received an order for gears and pinions for the four new cars which have recently been ordered by the Kansas City, Clay County & St. Joseph Railway.

**American General Engineering Company, New York, N. Y.**, has secured a renewal contract on its A. G. E. reinforced trolley wheels for the 1915 requirements of the Brooklyn (N. Y.) Rapid Transit Company.

**G. Drouve Company, Bridgeport, Conn.**, has received an order for "anti-pluvius" puttless skylights and "straight-push" sash operators for the new group of buildings which the Stone & Webster Engineering Corporation is constructing for the Massachusetts Institute of Technology, Boston, Mass.

**Titanium Alloy Manufacturing Company, Niagara Falls, N. Y.**, advises that the United Railways of St. Louis has placed contracts for the following open hearth titanium treated rails to be rolled during the second quarter of this year: with the Lorain Steel Company, 1400 tons; with the Illinois Steel Company, 1350 tons; with the Pennsylvania Steel Company, 800 tons. The Los Angeles (Cal.) Railway has also ordered from the Lorain Steel Company 500 tons and from the Pennsylvania Steel Company 1000 tons. All

of these rails are to be treated with 0.1 per cent titanium, added in the form of ferro carbon-titanium.

Prepayment Car Sales Company, New York, N. Y., held its annual meeting on March 16, and the president's report showed that a very satisfactory business had been done during the past year. Reference was made to the development of safety devices in connection with car door and step operating mechanism and the further development of pneumatic devices for electric railway and interurban cars. The report further states that owing to the increase in business during the past year the company had taken over full control of its sales, with its own special representatives, and had cancelled the sales agency of the Electric Service Supplies Company, which theretofore was general sales agent for the company.

Thomas R. Woulfe has resigned as manager of the light and power department of the Cleveland, Southwestern & Columbus Railway, effective April 1, 1915. He will enter into partnership with Frank B. Rae, at present consulting engineer, 315 Engineers' Building, Cleveland, under the name of the Rae-Woulfe Company, consulting, electrical and mechanical engineers. Mr. Woulfe has held his present position for three years. He was formerly superintendent of the gas and electric property of the Illinois Northern Utility Company at Sterling, Ill.

Westinghouse Electric & Manufacturing Company has received the following orders for electrical equipment: Corpus Christi Street & Interurban Railway, No. 323 motors and K control; Burlington (Vt.) Traction Company, No. 101-B-2 motors and K-28-B control; Tidewater Power Company, Wilmington, N. C., No. 323-A motors and K-10-J control. The Shore Line Electric Company has ordered ten double truck cars from the Wason Manufacturing Company, to be equipped with Westinghouse No. 632-B M ventilated motors and type HL control. The Charleston & Interurban Traction Company will soon place in service six new passenger cars equipped with Westinghouse No. 306 motors and K-36-J control.

Union Switch & Signal Company, Swissvale, Pa., at the annual meeting of its stockholders on March 9 in the Westinghouse Building, Pittsburgh, Pa., elected the following directors: J. D. Callery, J. J. Donnell, William McConway, J. R. McCune, J. R. McGinley, M. S. Rosenwald, T. W. Siemon, W. D. Uptegraff and H. H. Westinghouse. The newly elected directors later went into executive session and chose the following officers for the ensuing year: President, Mr. Uptegraff; vice-president and treasurer, Mr. Siemon; secretary and assistant treasurer, Thomas S. Grubbs; assistant secretary, G. F. White. The new executive committee that was appointed is composed of Messrs. Callery, Donnell, McCune, Siemon and Uptegraff.

McIntosh & Seymour Corporation, Auburn, N. Y., has two of its new Diesel type oil engines on exhibition at the Palace of Machinery at the Panama-Pacific Exposition. The larger of these oil engines is of 525 brake-hp and is the largest and most powerful of its class in the exposition. It is using fuel oil supplied at the header of Machinery Palace. At the price of 92 cents per barrel of 42 gal. this fuel will give about 850 brake-hp hr., or say 525 kw-hr., at a cost of \$1. The machine is of the four-cylinder type, and, operating on the four-stroke cycle, develops this power at 165 r.p.m. The smaller Diesel engine shown by the McIntosh & Seymour Corporation is a four-cylinder set of 280-brake-hp capacity designed to turn at 200 r.p.m. In character it is distinguished from the larger set chiefly by its greater compactness due to the higher running speed.

Royal Manufacturing Company, Rahway, N. J., announces that hereafter it will sell its cotton and wool waste under guarantees that are asserted to be new in this field. One guarantee is that the purchaser will always get exactly what he orders. This will be accomplished by providing the customer with a sampling folder which contains six white and six colored grades of cotton waste. A second guarantee is that the tare of "Royal" waste will be limited to 6 per cent, the company refunding the difference on all bales upon which the tare is overweight. A third guarantee is that of furnishing bales to exact weight. The determination of the company to conduct its business on a high plane is shown also in the adoption of a trade-mark, "Our Waste Is Your Gain," in the stamping of the word "Royal" on each steel band and

the adoption of the phrase "Look for the Brand on Each Steel Band." The packing of the bales has been standardized, clean, light burlap and new steel bands being used instead of rope or shabby burlap.

James Walker and George H. Cressler have announced their association under the firm name of Walker & Cressler, consulting engineers, with offices at 742 First National Bank Building, Chicago. Mr. Walker has been engaged in consulting practice in Chicago for ten years, being identified during that period with work in connection with the Chicago Elevated Railways, the Chicago Surface Lines, the Chicago Association of Commerce Committee of Investigation on Smoke Abatement and Electrification of Railway Terminals, various electric railroad, lighting and power companies, and financial institutions interested in public utility properties. Mr. Cressler has been the past ten years vice-president and chief engineer of the Kerr Murray Manufacturing Company, Fort Wayne, Ind.

Southwark Foundry & Machine Company, Philadelphia, Pa., announces that it has secured the exclusive United States license to manufacture the Harris valveless engine, Diesel principle, which will hereafter be known as the Southwark-Harris valveless engine. The engine will be built in sizes from 75 brake-hp to 1000 brake-hp for both marine and stationary service. The recent extensive improvements which the company has made to its plant and equipment insure the proper facilities for the manufacture of this engine. The company has added to its engineering staff Leonard B. Harris, the inventor of the Harris valveless engine, as consulting engineer and naval architect, and his extensive experience in power engineering, especially in the marine field, will be available for all prospective customers. J. P. Johnston, who has been interested in and connected with the development of the Harris valveless engine, will also be associated with the company in charge of its oil engine sales. The Southwark Foundry & Machine Company will also continue to manufacture a full line of steam turbines, d.c. and a.c. generators, centrifugal air compressors, centrifugal blowers, turbine pumps, hydraulic pumps, hydraulic presses, steam hydraulic presses, surface, jet and barometric condensers and air pumps.

#### ADVERTISING LITERATURE

Economy Welding Machine Company, Kansas City, Mo., has issued a catalog which describes and illustrates its portable welding outfits which are equipped with welding and carbon remover torches.

Whiting Foundry Equipment Company, Harvey, Ill., has issued a large sheet which contains a reprint of the rules for safely operating cranes as issued by the National Founders' Association.

Chicago Pneumatic Tool Company, Chicago, Ill., has issued Bulletin E-35, which supersedes Bulletin D-30, and which describes and illustrates its Universal electric drill for operating on direct or alternating current.

Ohio Brass Company, Mansfield, Ohio, in its January-February, 1915, *O-B bulletin* illustrated several of the difficult features of overhead work constructed by the Memphis (Tenn.) Street Railway, in which O. B. overhead materials are used.

Atlas Preservative Company of America, New York, N. Y., has issued a catalog describing its methods for using "Atlas A" weed killer and track preservative. Through the elimination of track vegetation the performance of section gangs is confined by the aid of this method to the essential upkeep of track structure without the usual interruptions that result from the necessity of removing vegetation. The equipment for sprinkling the weed-killer, photographs of which are shown in the catalog, consists of one or more tank cars fitted with spraying apparatus and all necessary accessories for handling the chemical. The catalog contains a number of pairs of illustrations taken on several railroads showing their weed-infested condition, before applying the preservative, and their total absence from vegetation several months after application, which are self-explanatory in demonstrating the effectiveness of the weed killer. A repellent compound, designed to prevent cattle from grazing on the treated area, is used wherever advisable and is included in the service given.