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The illustration shows one of the trains being operated by the Cincinnati Traction Company, equipped with Westinghouse No. 510 Motors and HL Control.

Westinghouse Electric & Manufacturing Company  
East Pittsburgh, Pa.



No. 510, Thirty-five H.P. Motor



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Our mailing list includes subscribers in Canada and South America, in Japan and Australia, and in the European countries. In addition to railway men, there are manufacturers, city officials, engineers and bankers among the regular readers. But beyond these, items appearing in the JOURNAL often reach thousands of people who never see its pages.

It is a common occurrence for articles to be reprinted in other publications—a practice entirely approved if a line is run crediting ELECTRIC RAILWAY JOURNAL. Within the last month articles and quotations have been reprinted by such publications as the *Literary Digest* in the magazine field, the *New York Times* in the newspaper field, the *Commercial & Financial Chronicle* in the financial field, the *Genie Civil* in France, the *Elektrotechnische Zeitschrift* in Germany, the *Tramway and Railway World* in England, *L'Elettrotecnica* in Italy, and so on. The combined circulation of the periodicals which have lately reprinted matter from the JOURNAL totals well over two million.

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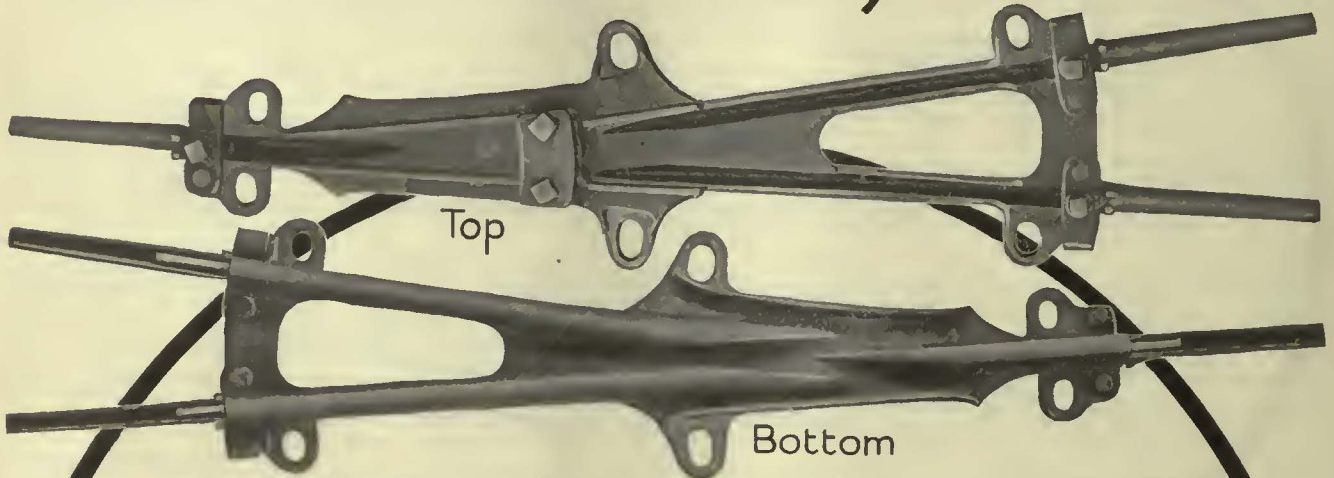


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# Type CR Universal Trolley Frogs Can Be Used On Any Turnout.



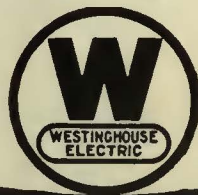
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O-B Pull-over with O-B XH Strain Insulator

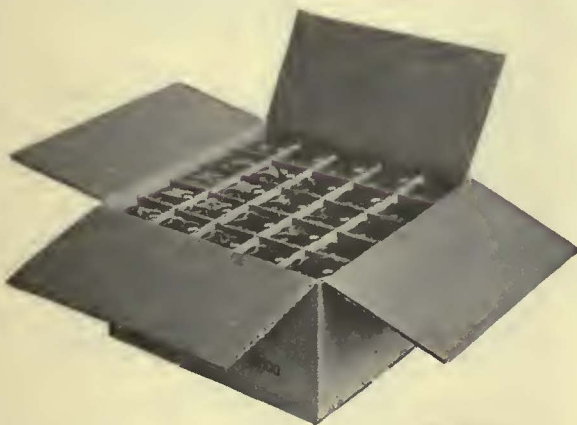


O-B Pull-over with O-B Wood Strain

## Keep the Curves where They should be with O-B Pull-overs

Sturdy O-B Pull-overs hold the trolley wire to its place. They are made of malleable iron in husky "I" section. O-B Sherardizing shields them from weather.

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SEMAPHORE

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STOP



CAUTION



PROCEED



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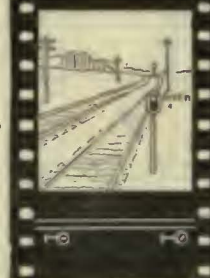
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CAUTION



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what *automatic block signaling* will do for *your line*.



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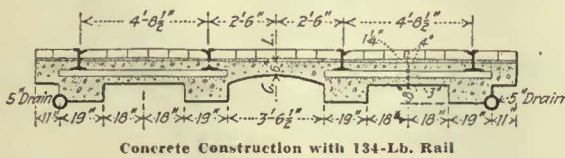
SWISSVALE, PA.





### Steel Tie Track in Youngstown Has Stood Hard Wear

SEVEN years experience with solid concrete and steel-tie construction has convinced the Youngstown Municipal Railway that this type of installation is the most satisfactory for tangent track. All new work therefore, is being designed along these lines. Nearly



9,000 ft. of double track was laid on Wilson Avenue in 1916 with monolithic steel-tie construction, and since that time almost no repairs have been needed.

The tangent track is built with 14-in. concrete foundation below the rail. International steel ties are used, together with 9-in., 134-lb. Trilby rail. The paving is of 4-in. Bessemer brick blocks laid on a 1 1/2-in. cushion of sand. All joints are thermit welded. On curves, however, wood ties are used and the joints are not welded. A 5-in. tile drain carries off the water.

The trolley service on this track is fairly heavy, as all city cars, seventy-eight in number, pull out and pull in via Wilson Avenue. Moreover, there is a five-minute headway all day with safety cars, which drops to a two-minute headway in the rush hour, the trippers being heavy two-man cars. Prior to 1920 the all-day service also was operated with large cars, although not on such a short headway as prevails with the present safety cars.

A few joints pulled apart during the first winter after the track was laid but since then there have been practically no joint failures on the tangent track. An exception should be noted, however, in the case of one joint exactly on the crest of a little hill, which pulls apart regularly once a year when the weather gets cold. With the monolithic construction there has been less trouble than usual because of water getting into the paving.

Since the completion of the Wilson Avenue job, track has been laid with the same type of construction on other streets, and it has proved uniformly satisfactory. A minor variation has been introduced by the use of 7-in. Trilby rail, and the depth of the trench for the foundation has been changed from 8 in. to 4 in. In some places the tile drain has been omitted. However, the monolithic construction with steel ties has been closely adhered to, and new work is being similarly designed.



Track in Good Condition After Seven Years of Service

Hard Wear  
Seven Years' Experience

All New Work  
on Twin Ties

No Repairs Since 1916

No Joint Failures

No Water Into Paving

Uniformly Satisfactory

This article appeared on page 850  
Electric Railway Journal, May 19.

The International Steel Tie Company  
Cleveland

# Steel Twin Tie Track

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# "SHELBY"

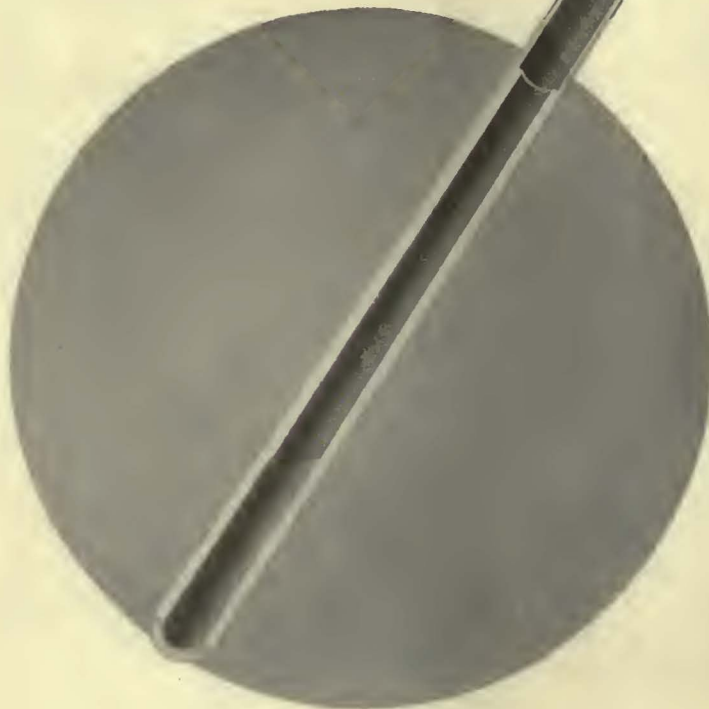
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# TROLLEY POLES

*Reinforced where reinforcement is needed, without adding superfluous weight or sacrificing resiliency.*



THE standard "SHELBY" Poles are made from 13 gauge material, as years of practical experience have shown that a lighter gauge may fail by local injuries, and a heavier gauge simply adds to the weight of the pole without increasing its strength to a corresponding extent. The theoretical requirement for a pole of minimum weight points out a method for increasing the strength of the pole without a proportionate increase in the weight. This method consists of the use of a reinforcement at the base end and on the inside of the 13 gauge member.

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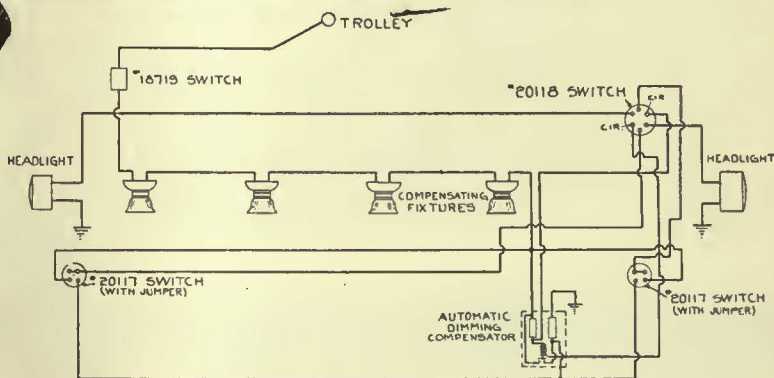
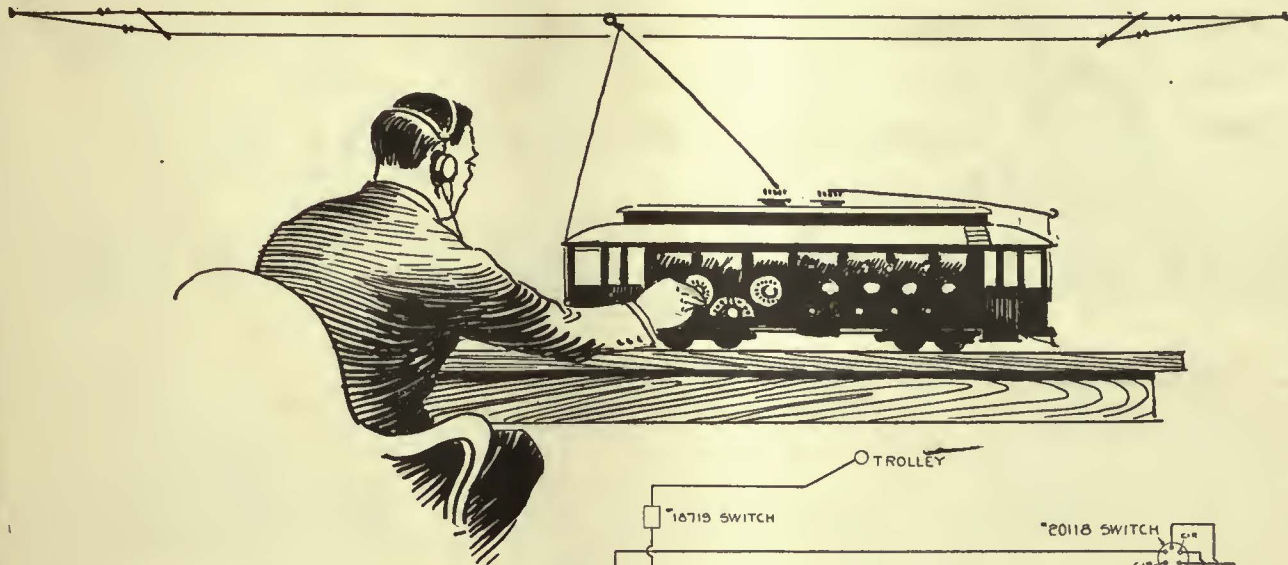
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- 2—Golden Glow headlights
- 1—Automatic compensator dimmer
- 4—Compensator lighting fixture
- 2—"Bright" and "Dim" switches
- 1—DP, DT switches

Diagram shows wiring connections for double end car with two headlights, either headlight operating in series with one circuit of interior car lights, equipped with compensating fixtures including switches for operating opposite headlight and using type USA automatic compensating-dimming resistance.

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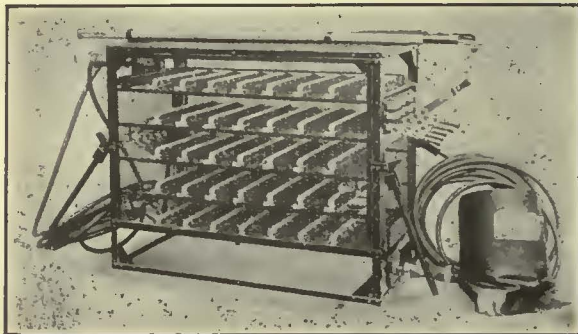
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with

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—and a smooth run-off

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**Rail Grinder**

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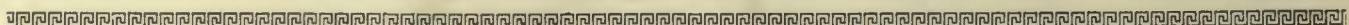
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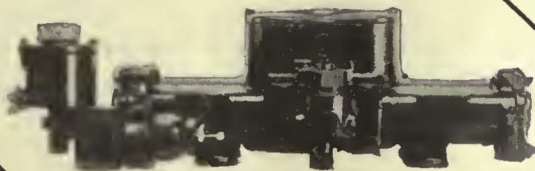
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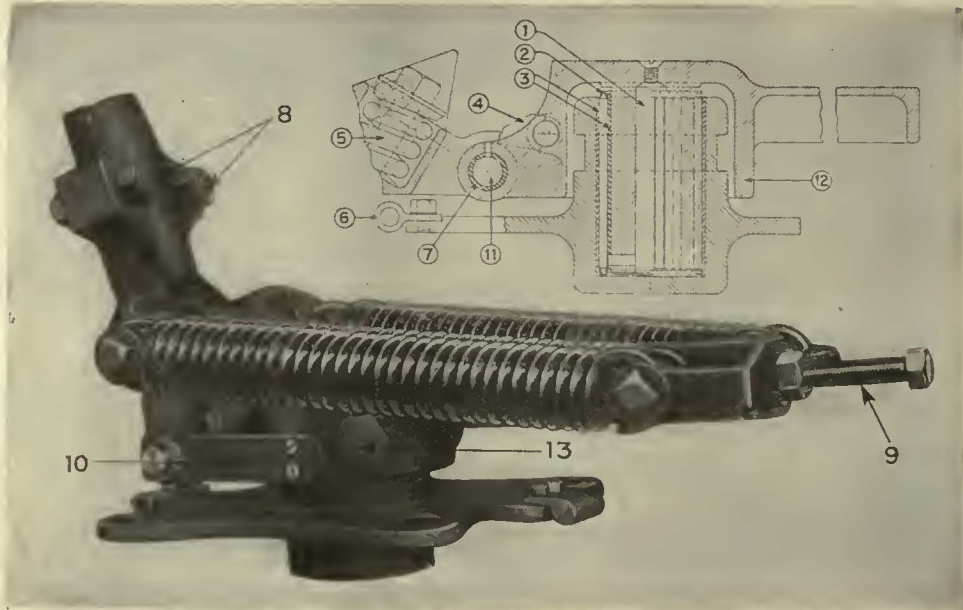
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4. **Trigger Lock.** Locks Pole Socket in horizontal position, enabling one man to change poles in the barn under low headroom.
5. **Buffer Spring.** Cushions the pole socket in case the wheel leaves wire.
6. **Terminal Connector.** Cast Bronze Connector for sweating to Motor Lead insuring good contact. Clamp type furnished if preferred.
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**R.D. NUTTALL COMPANY**  
PITTSBURGH, PENNSYLVANIA

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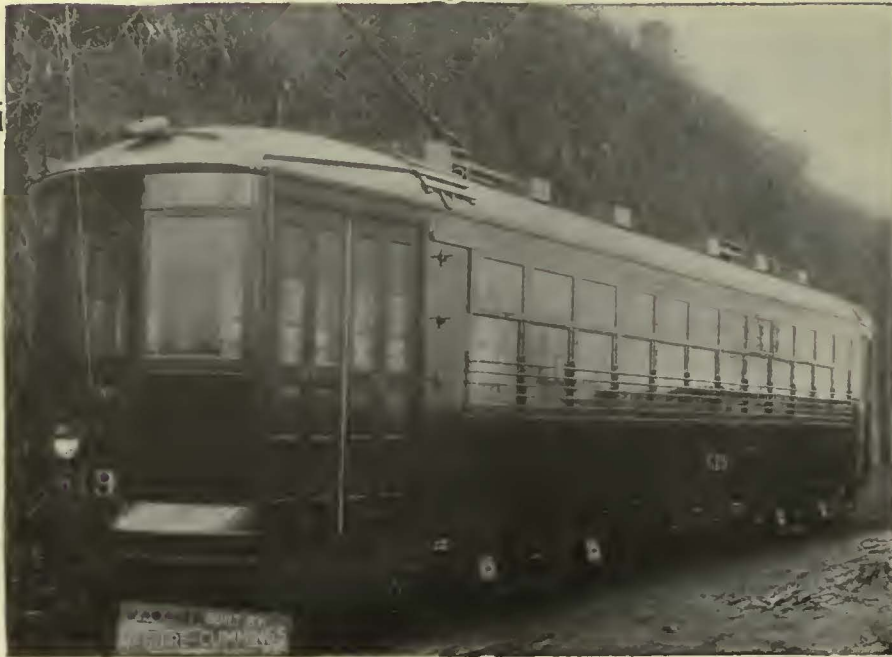
Westinghouse Traction Brake Company

General Office and Works: Wilmerding, Pa.

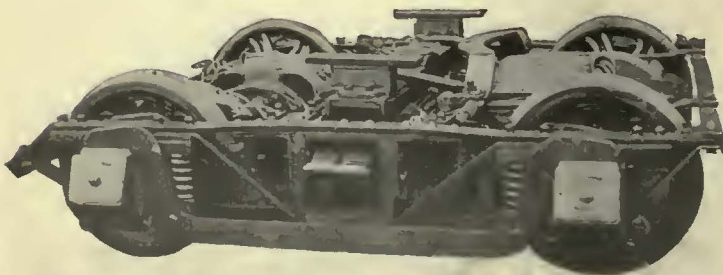
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New York, Saturday, June 2, 1923

# Electric Railway Journal

Consolidation of *Street Railway Journal* and *Electric Railway Review*

Published by McGraw-Hill Company, Inc.

HENRY W. BLAKE and HARRY L. BROWN, *Editors*



## Track Mileage per Unit of Population Is Liberal in United States

**I**N THEIR publicity campaigns electric railway managers could profitably emphasize the contrast between mileage per unit of population in this country and elsewhere. For example, from the recent report of the Ministry of Transport of Great Britain it appears that on that island the mileage of electric railway track used in serving the public is 4,275. This is the single-track equivalent of 2,570 route-miles. The population of Great Britain (England, Scotland and Wales) is approximately 43,000,000, so that there are practically 100 miles of single track per million people, or one mile of track per 10,000 people.

In the United States, with its population of, say, 110,000,000 (105,710,620 by the 1920 census), there is a single-track mileage of 47,150. Thus the mileage of single track per million of population is nearly 430, or 4.3 times that in Great Britain. Correspondingly there are only about 2,335 inhabitants per mile of single track.

Of course, mileage is only one element of service, and there is in many places in this country more mileage than the traffic warrants. At the same time, liberal mileage is an indication of readiness to serve. This profusion of mileage is an evidence of the expectation of railway promoters that business would follow the track. It is an inheritance from pre-automotive days, which could not be duplicated under present competitive conditions. Public appreciation of these facts, although it would have no direct bearing on the riding habit, would tend to facilitate the reduction of the paving and other illogical burdens.

## A Revival of Interest in the Subject of Paint

**E**VERY one who has had an opportunity recently to visit various electric railway properties has found renewed interest in the matter of car painting. This may be because for a number of years a great many companies had hardly enough money to paint the cars at all and could select only that pigment and treatment which seemed to promise the greatest protection for the least price. The present revival of interest in the subject may be stimulated by a better realization by the management of the need of improving public relations and of attracting traffic. At any rate much thought is being given by many properties now to the subject of color and color schemes, and much expenditure is being made for paint.

There is no doubt that repainting will make a dingy car much more attractive, and that in this work of repainting a certain amount of ornamentation, striping, etc., is justified. A bright looking car suggests to the passenger a desire to ride, as well also as a feeling that the company wants to give good service in other par-

ticulars besides that of the appearance of its cars. It is worthy of note that one of the first steps taken by the Interborough Rapid Transit Company, following its recent voluntary reorganization, was to paint the cars, stations and structure of the Manhattan Elevated Railway a light orange in place of the brown drab color used for so many years. This is part of a campaign by the company to win patronage back to the elevated lines.

Generally speaking, in this renewal of interest in paint for car bodies, there seems to be a reaction against the darker hues and in favor of the brighter and lighter colors, particularly the yellow shades. One advantage of yellow is that it permits the car to be seen readily at a distance, especially in the dusk. Another reason may be that yellow colors are supposed by some authorities to be very durable. Whatever the motive, the practice of keeping the rolling stock well painted is to be commended.

## Subways Under Debate in Chicago, Detroit and Philadelphia

**T**HE subject of subway construction has become a very live question in Chicago, Detroit and Philadelphia, and in each city the question has arisen as to the extent to which the proposed subway system should be adapted for the use of surface cars.

In New York, of course, the subways and elevated lines supply purely a rapid transit service. There is no use of either the subway or elevated railway lines by surface cars, and there is no general system of free transfers, as in Boston, between the surface cars and the rapid transit line. The topographical conditions in New York differ also from those in Boston and in the three other cities named. In these four cities the area served is fan-shaped, with a spread of 180 deg. or more, the business district occupying a comparatively small area at the radial focus, whereas the lower half of Manhattan Island, New York's business district, is long and narrow.

In these circumstances it is not surprising that a different kind of subway layout than in New York is desirable and that there should have arisen a demand in some of these cities for a different kind of subway, namely, not long, through routes but shorter lines whose purpose is more to relieve the congestion on the streets of a limited area downtown by putting the surface cars under ground. At the moment, the questions of the actual kind of subway to install and the routes to be followed are more acute in Philadelphia and Detroit than in Chicago. There matters relating to actual subway construction have been rather in abeyance since the Ridgway-Parsons-Arnold report in 1917, but under the new municipal administration the matter will have to be taken up in Chicago right away.

In Detroit the situation is largely the same as in

Philadelphia. The Mayor has appointed a special rapid transit commission to consider the subject. In Philadelphia this committee has reported in favor of a distinct rapid transit system, and in both cities those concerned in the operation of the street railway system have publicly declared their strong preference for some plan which will take the street cars off the streets in the congested center.

Of course, in all this talk about subway construction, the fact should be realized that subways are expensive undertakings at best, and with the present high cost of materials and labor are more so now than ever before. With the congestion downtown in our modern cities, an expensive method of transportation may be worth while. But subways are a luxury and cities with subway aspirations must realize that the conditions under which subway transportation is thought to be given in New York for 5 cents are most exceptional in many ways. A 10-cent fare, as in Boston, is a much more likely charge, if the proposed subways are not to be a serious burden on the taxpayer.

Undoubtedly Chicago and Detroit will work out their subway proposals on a satisfactory basis and Philadelphia will decide on its form for a north and south subway to supplement that now running east and west on Market Street. Subways with elevated railway extensions are necessary in all of these three cities. It is to be hoped, however, that the plans adopted will recognize three principles: The first is that the transportation given should be co-ordinated in service at least, if not in ownership, with the present transportation facilities; second, that provision be made for a sufficiently high fare to pay for the service, and, third, whatever plan is adopted as best suited for existing conditions, there shall be provision for expansion in future along approved engineering lines.

### Our Supply of Timber Must Be Conserved

**F**ORTUNATELY for the future of the timber supply in this country there are a few prophets who have the temerity to tell us where we are heading in consuming timber much faster than it is being produced. Prophets of evil are never popular, but when their outspokening is obviously prompted by unselfish motives they ought to be listened to and their warning ought to be heeded. The United States is so rich in natural resources that the possibility of any of these coming to an end has in the past been so remote that we have gone ahead heedlessly without regard to an ultimate depletion of the supply. It is not remote, however, in the case of timber. Price and quality comparisons of popular species of wood over a period of twenty or twenty-five years tell the tale. An important Eastern railway system reports that it paid for hemlock in 1904 \$24 per thousand feet, board measure, whereas the price is now \$63.50. The corresponding prices for white oak are \$70 and \$160. Unfortunately also while price goes up quality goes down, and for the same reason, namely, that good timber is hard to get. Shifting from the previously plentiful hemlock and white oak to cedar, pine and fir is only a temporary remedy. These woods will not last forever.

Increasing prices and difficulty in getting good timber form the principal correctives of present conditions. They bring preservative treatment into the range of economic practicability, and they stimulate the develop-

ment of substitutes and the art and science of forestry. The preaching of the prophets will be most effective when, in addition to telling the industries why prices are high and quality low, it gives full information as to the availability and characteristics of preservatives and substitutes. On the other hand it is the duty of timber users to investigate these things to learn if they are using the best practices.

Sentiment will not greatly affect the deplorable timber situation, except as it bears a relation to economics. Given full information, however, timber users will gradually adapt themselves to the changing conditions and will bring pressure to bear upon the government to push reforestation. Scientific forestry as a private business rather than a public concern will also come in due course, but only when timber prices are much higher than they are now.

### How Can Surface Car Trains Best Be Motorized and Controlled?

**T**HE advantages of two-car trains have been recognized for years. Trains save man-power and electrical energy, and get through street congestion with less difficulty than when the same number of cars are run as separate units.

Two different methods of train operation are practically standard. The first is to use heavily-motored cars to haul dead trailers, and the second to couple together motor cars equipped with multiple-unit control. The first method is simpler and the first cost is less, but the available power, if sufficient to be satisfactory for train service, is too great when the motor car is operated alone and the all-day efficiency is relatively low. The second plan gives a better distribution of the motor capacity and a higher all-day efficiency, but the first cost is greater and the complication of mechanism considerably increased. It has the advantage, however, that the motor capacity may be divided between the cars in a ratio dependent on their duty. For instance, four motors on the car intended for all-day service and two on that used in the rush periods only has been found a satisfactory division of the power. The control equipment, however, usually is identical on all cars.

In order to get the advantage of motor capacity correctly apportioned for the work each car has to do, without the expense incident to independent control for the car used only a few hours a day, a new type of two-car train described in this issue has been developed by the Pittsburgh Railways Company. This result has been accomplished by equipping the second car with two motors without control. The arrangement for connecting the electrical equipments is very simple, only three wires being needed in the train line. The performance is as good as that of any other train with motors properly chosen for the work.

The great objection to this arrangement is that the second car of the train, though motorized, remains a trailer. Having no control nor trolley pole, it cannot be operated independently, and about the yards or shops it must be handled by a live car in the same manner as any true trailer. The engineers who developed this car did not consider this disadvantage serious enough to outweigh the simplicity, light weight and low cost gained by this arrangement. It will be very interesting to note whether or not this opinion will be borne out in practice, as the view usually taken is against the use of non-mobile equipment.

# Economics of I. & C. Re-equipment

Indianapolis & Cincinnati Traction Company to Be Changed Over for Direct-Current Operation—  
Improved Car Designs and Progress in Automatic Substation Development  
Major Factors in Justifying Change—Estimated Savings Equal 14  
per Cent Return on the Additional Investment

ABOUT eighteen years ago the Indianapolis & Cincinnati Traction Company, Indianapolis, Ind., equipped its lines for operation at 3,300 volts, single phase, 25 cycles. At that time the outlook was favorable for a general extension of alternating-current service for electric interurban work in the Middle West, and the adoption of this type of equipment on this system was followed by a period of high-grade service which met the requirements of the territory reasonably well. Recent developments in motors and automatic substations, however, and excessive costs of operation with this early alternating-current car equipment have thrown new light upon the relative economies of alternating and direct current service. President Charles L. Henry and other officials have lately been giving considerable thought to the possibilities of changing over the system for direct-current operation, and a few weeks ago Prof. Albert S. Richey of the Worcester Polytechnic Institute, Worcester, Mass., was requested to investigate the problem and report upon it. The company's decision to make the change followed Professor Richey's favorable recommendation. The directors of the railway approved the project on May 15, as was noted in the JOURNAL for May 19. Since then contracts have been let totaling \$736,146, as follows:

To the Westinghouse Electric & Manufacturing Company, which originally equipped the road, for the complete motor, air brake and control equipments for twelve new motor passenger cars, and four extra motors; four complete equipments for freight motor cars, and the full equipment for eight automatic substations, one semi-automatic substation and one portable automatic substation. The details of this order, type of equipment, etc., appear in two items on page 948.

To the Baldwin Locomotive Works for twelve pairs of passenger car trucks.

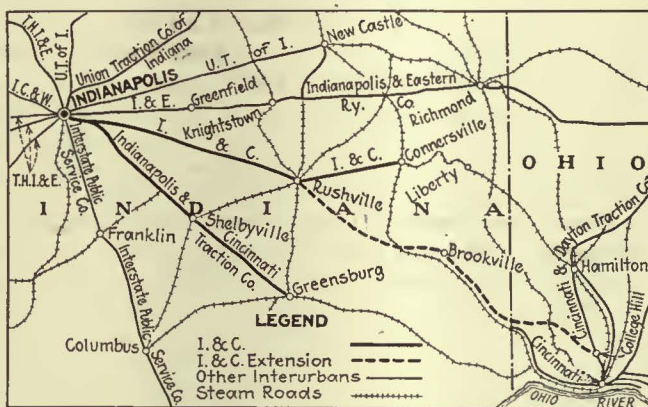
To the Cincinnati Car Company for twelve all-steel car bodies.

To the Western Electric Company for 37.7 miles of 500,000 circ.mil and 62.4 miles of 300,000 circ.mil cable.

Additional work of rearranging the present transmission lines and putting up new 600-volt feeder cable, which will be done by the company, is estimated to cost \$42,000. The total actual cost of the changeover will therefore be \$778,146.

The system at present consists of two lines, one route being from Indianapolis to Rushville and Connersville and the other from Indianapolis to Shelbyville and

Greensburg. Cars are operated into and out of Indianapolis over the direct-current, 600-volt lines of the Indianapolis Street Railway, and the two lines of the interurban system branch from a junction about 4 miles from the center of the city. From Indianapolis to Connersville the distance is about 58 miles and to Greensburg about 49 miles. It is proposed to extend the interurban system from Rushville 73 miles to Cincinnati, reaching a downtown terminus at Canal and Walnut Streets. The proposed change to direct-current service will be made with this extension in view, all present engineering designs having been established as a part of the ultimate development of through electric transportation by high-speed rolling stock between the terminal cities for which the company is named. In fact, the decision to proceed with the



Present Route of Indianapolis & Cincinnati Traction Company and Proposed Extension to Cincinnati

changeover of the present system for d.c. operation was made conditional upon two things: First, that nothing should be done on the present system except that which would fit in as a part of the complete extended system, and, second, that whatever is done must be carried out in such a way as to avoid any additional cost resulting from doing the work in two parts. But from the very thorough study made, it appears that the changeover of the present system will result in a return of over 14 per cent on the additional investment whether the line is ever extended to Cincinnati or not.

## HOW CHANGEOVER WAS FINANCED

An interesting thing about the financing of this work by the Indianapolis & Cincinnati Traction Company is that the money was entirely arranged for and in the bank before any contracts were let. The project was financed by J. F. Wild & Company, a local state bank and investment banker, through the issuance of 6 per cent equipment trust certificates for the principal amount, and with a cash payment ahead of this equal to 20 per cent of the entire cost of the equipment. Against this equipment trust the bankers will issue preferred and common stock, which will be sold locally.

It will not be possible to get an entrance into Cincinnati until the latter part of 1924, because the new rapid transit and interurban loop which is being built by the city will not be ready prior to that time, but when through service between Indianapolis and Cincinnati can be established, it is estimated from a study made by engineers and by Mr. Henry that it is safe to expect sufficient earnings to pay present fixed charges, 7 per cent on the new money necessary to complete the

line, and have sufficient remaining to pay 5 per cent dividends on the present \$1,000,000 of preferred stock and 5 per cent on the present \$2,000,000 of common stock. This is thought to justify the anticipations of the men who organized the project originally.

The company has had a hard time during the years it has been waiting to get a satisfactory entrance into Cincinnati and has barely paid fixed charges and operating expenses. In 1922 it fell \$10,000 short of paying these. Prior to the plan to build the rapid transit and interurban loop in the bed of the Old Miami Canal there has been no way of gaining entrance to the city on any practical basis, on account of the wide gage of the local car lines, excessive cost of separate tracks over streets not occupied by the local lines, the resulting slow operation on the surface, etc.

#### THE ENTRANCE INTO CINCINNATI

The Miami Canal was leased to the city by the state under a specific condition that it be used for transportation purposes, and with the further specification that the track must be of standard gage and that interurban railways must have the right to use the track for reasonable rental. It will be under the control of a rapid transit commission appointed by the city. The loop will be 17 miles in circumference when completed. Of this 10 miles is now contracted for, including subway construction for part of it. When this first section of the loop is completed it will give the interurban a connection into the heart of the city, the terminus at Canal and Walnut Streets being only four squares from the Gibson Hotel.

The plan of the interurban will be to build 64 miles of new line from Rushville, Ind., to College Hill, Ohio, where connection will be made with the Cincinnati & Dayton Traction Company. Operation will continue over this company's line for 4 miles to the point of connection with the canal bed loop, with 5 miles over the loop to the terminus. As the distance from Indianapolis to Rushville is 41 miles, this gives a total distance from the center of Indianapolis to the center of Cincinnati of 114 miles, which can be easily handled in a three-hour schedule.

Following are given the engineering, economic and operating considerations which led to the decision to make the present change from a.c. to d.c. operation, in preparation for the extension through to Cincinnati. This is largely taken from the report prepared for the railway by Professor Richey.

#### REASONS FOR CHANGEOVER AND RESULTS EXPECTED

The interurban lines of the company are at present supplied with energy from a two-phase steam generating plant at Rushville. Energy is generated at 2,300 volts, transmitted at 33,000 volts to transformer stations and delivered to a No. 0000 trolley at 3,300 volts, single phase. Nine transformer substations are at present in service, the average distance between those on the Cincinnati division being 10.8 miles and the maximum 11.88 miles, the corresponding figures for the Shelbyville division being 11.8 and 11.96 miles.

The principal, if not the only, serious handicap under which the present operation of the system is being conducted centers around the deficiencies of the single-phase, alternating-current equipment. At the time of installation (1905) there was every evidence that the system was entirely proper for an interurban road of this character. Since then very great improvements have been made in direct-current railway operation, including

the development of the interpole and self-ventilated motor, the simplification of control apparatus and the satisfactory development of the automatic rotary converter substation. Similar favorable developments have not been made in alternating-current apparatus, and for these reasons there is at present no question as to the superiority of the direct-current system for this class of work. The alternating-current system would not be considered today on a road of this character. Further, the time has been reached in the history of this road where the differences in operating costs between the two systems will pay a good rate on the money required to make the change to direct-current operation. This change involves the following:

1. Change of motors and electrical equipment on the cars.
2. Installation of substation apparatus for the supply of direct current.
3. Rearrangement of transmission lines so as to supply three-phase energy to the rotary converter substations.
4. Change in power supply to three-phase, 60 cycles.

While making the necessary changes as outlined above, a further very desirable change is that of the passenger cars themselves to take advantage of the development of the modern steel car with its lighter weight and reduced maintenance costs.

Standard pressures for direct-current operation of roads of this character are 600, 1,200 and 1,500 volts. It was not difficult in this case to determine upon 600 volts, as there are numerous connecting city and interurban lines in this territory, all of which have standardized on 600 volts.

The benefits which will be derived from the proposed change to 600-volt direct-current operation are:

1. A relief from trying delays at present experienced due to failures of various kinds in connection with the single-phase car equipments.
2. A very considerable reduction in the power consumption of the cars and a consequent saving in power costs.
3. A very material saving in the cost of maintenance of cars and car equipments.

#### LIGHTER CARS WITH GREATER CAPACITY

An incidental but very important feature of the change will be the introduction of new and more comfortable rolling stock, which, in connection with the improved schedules, should result in a very material increase in traffic and earnings. The twelve new all-steel combination passenger cars will be somewhat larger but considerably lighter in weight than the present rolling stock. The proposed car will be 60 ft. long over all, with a seating capacity of fifty-four. It will weigh about 36 tons completely equipped. Baldwin trucks are to be used with improved design over those already in service. The motors proposed for the new cars are of 105-hp. rating, the present motors being of 100 hp. capacity, but nearly twice as heavy as the new ones. The slightly increased capacity of the motors and the considerable reduction in car weight give the proposed motor a very decided margin of capacity over the requirements. This will permit of occasional trailer operation and will result in much lower maintenance costs than in cases where the capacity margin is small. The cars and equipment as proposed will be suitable for interchanging in all the present local and high-speed passenger service and the future local service on the Cincinnati extension. With the latter completed, the through express service will be supplied with new,

larger cars, specially equipped for this service, including 140-hp. motors, the same as specified at present for the freight cars.

The all-steel bodies and the modern motors will result in a very considerable saving in maintenance costs, while the lighter weight of the complete car and the better efficiency of the motor equipments will result in a material decrease in power consumption. A comparison of the weights of the present and proposed cars follows:

	Present	Proposed
Car body, without electrical or air-brake equipment.....	43,400 lb.	33,000 lb.
Trucks, without motors.....	19,680 lb.	22,000 lb.
Four motors.....	24,480 lb.	12,700 lb.
Electrical and air-brake equipment on car body.....	15,460 lb.	4,515 lb.
Total weight of car.....	103,020 lb.	72,215 lb.

It is proposed to use the present car bodies and trucks for freight service and to equip four of these cars with new direct-current motors of the same type as proposed for the passenger cars, but of 140 hp. capacity. These motors are the same, with the exception of gearing, as would be used in the high-speed express service on a through line to Cincinnati, so that when this line is built the motor equipment would be standardized on the two sizes of 105 and 140 hp. The plan is to leave the present motors on two of the freight cars with a change in control apparatus, which will consist mainly in the removal of the transformer and other single-phase equipment and will involve operating the single-phase motors connected permanently in groups of two in series for direct-current operation. While these equipments will be less economical and somewhat heavier than new direct-current apparatus, it is believed advisable to retain them in service for line car and occasional freight use. The mileage operated with these two cars will be small, and until the freight business requires more cars in regular operation these single-phase motors will operate satisfactorily.

#### FULL AUTOMATIC SUBSTATIONS TO BE USED

One of the principal drawbacks in the use of direct current for a road of this type has been the labor cost of operating substations with rotary converters. Until the last few years each substation required a man in constant attendance, at least two men per substation for twenty-four-hour operation. Lately, however, automatic switching apparatus has been developed and tried out to such an extent that it is now entirely safe to rely upon it. The fixed charges on its additional first cost and the maintenance expenses are so much less than the former labor cost that its use is unquestionably advisable in such a case as the Indianapolis & Cincinnati road. If the substation is located where a man is available for the occasional operations of starting up and shutting down, the automatic apparatus may be reduced considerably in cost; such equipment is known as "semi-automatic." The present plans of the company include full automatic substations at all locations except Rushville. Here the installation will be in such close proximity to the shops that a semi-automatic equipment is proposed.

The present transformer stations are located along the lines at intervals of about 10 to 12 miles. These are suitable for the location of 600-volt direct-current substations under present service conditions. When through operation to Cincinnati is begun the required substation interval will be about half these distances, with the same substation capacities.

These capacities chosen for the new direct-current substations are 500 kw. each for the four substations between Indianapolis and Rushville and 300 kw. each for

the five remaining substations. The present buildings are adaptable without change for the indoor apparatus of the new substations. A portion of the new equipment, consisting of transformers and high-tension switching apparatus, is designed for outdoor installation on land available immediately adjacent to the substation buildings.

As every substation is equipped with but one rotary converter, it is proposed to install a complete 500-kw. rotary converter automatic substation in one of the present passenger cars for use as a portable substation. This may be utilized in case of breakdown at any of the permanent substations or for any increase of capacity which may temporarily be required at any point where there are sidetrack facilities.

The present transmission lines are insulated for 33,000 volts, but are single-phase lines. One set of two wires extends from the power plant to each substation on the Rushville division and two sets of two wires each extend across country to Shelbyville, with four wires between Shelbyville and the adjacent substations in each direction, extended by two wires to the terminal substations on the Shelbyville division. This gives transmission lines in various sections consisting of from two to six wires. Under the new conditions a three-phase line of three wires will be required over the entire system. This will involve in some places taking down three wires, in some places one, and in others the erection of one additional wire, besides some additional three-wire lines. The size of the wire and the insulators at present in use is satisfactory, and unnecessary wire which comes down can be used almost entirely for the new circuits where such are necessary. While the present transmission line insulators are satisfactory, it is doubtful whether those not necessary under the new arrangement could be moved satisfactorily to new locations, and the cost estimates of the change to direct current include new insulators for the new construction.

With the source of power supply at Indianapolis for the divisions as at present operated and at or near Cincinnati for the Cincinnati extension, 33,000 volts is satisfactory for the three-phase transmission, which enables the present wire and insulators to be used.

#### DIRECT-CURRENT FEEDER REQUIREMENTS

With the present distribution pressure of 3,300 volts, no supplementary feeder is required for the trolley wire. With direct-current distribution at 600 volts, it will be necessary to provide a supplementary copper feeder of 500,000 circ.mils between Indianapolis and Rushville, using one of 300,000 circ.mils on the balance of the line. The estimates of cost were based on a copper price of 20.9 cents per pound for this class of cable; the final contract for the purchase has, however, already been made at a considerable reduction on account of a lower stage in the copper market.

The present power plant at Rushville is well designed, efficient and reliable considering its capacity. It has been demonstrated, however, that for a road of this character it is nearly always possible to purchase power cheaper than it can be generated, principally on account of the better diversity factor and the load factor of a much larger station. The present generators at Rushville are two-phase, 25-cycle units, while the direct-current substations require three-phase, 60-cycle current. There seems no doubt that it would pay to arrange to purchase energy for this system rather than to make the expenditure necessary to convert the Rushville station, and the estimates are based on the plan to

purchase energy at a conservative figure of 1.25 cents per kilowatt-hour.

Due to the proposed change from 25-cycle to 60-cycle service, and also to the elimination of the 3,300-volt alternating current now used on the trolley wire, it will be necessary to change some transformers in the service of distributing local light and power, and it will also be necessary to change some of the apparatus, such as motors, in the service of power customers. It is estimated that this outlay will not exceed \$10,000.

ANNUAL CHARGES

In Table I is given an estimate of the costs which will be incurred to re-equip the road as above described. These estimates make no provision for salvage on existing equipments. It is probable that there is no salvage value in the electrical equipment of the present passenger cars except the junk value of iron and copper, and no attempt has been made to estimate this junk value. It is considered possible that the steam and electrical equipment of the Rushville station, which is two-phase, 25-cycle apparatus, may net from \$75,000 to \$100,000 salvage, but the estimates show that it will pay to make the change to direct-current operation, even without allowance for salvage.

Table II shows the estimated operating costs which will be affected by the proposed change to 600-volt direct-current operation, together with the estimated comparative figures under the new operation. The proposed change will have no bearing on nor should it affect any of the operating accounts not shown in this tabulation.

The operation which will be affected by the proposed change has been grouped under the four headings of power, substation operation, maintenance of cars and maintenance of track. The direct power generation costs are shown as completely eliminated, as well as the item of power station depreciation. The latter will be eliminated if and as soon as this equipment is done away with by substitution of purchased power and without question as soon as it is sold and removed. The power station building is admirably adapted for use as a shop and may be employed to advantage for this purpose whenever increased shop facilities are required, although this will probably not be until the road is extended to Cincinnati.

The cost of power under the proposed plan is based on careful estimates of the power consumption of the new car equipment, a car-mileage as at present operated, an amount of commercial power the same as at present and an estimated cost of 1.25 cents per kilowatt-hour for the purchased power.\*

Under the head of substation operation, the present direct operating costs are eliminated and replaced by the cost of an inspector and repairman who will cover all substations, plus an estimated cost for maintenance of substations. The present direct cost of car maintenance, which is excessively high, has been eliminated and replaced by conservative estimates of the maintenance of steel passenger cars with modern direct-current equipments, based on the present mileage and 3.2 cents per car-mile. This figure is at present being attained by interurban roads in Indiana with cars and equipment not so modern as those here contemplated.

The maintenance of freight cars has been taken at the present mileage, but at a larger figure of 3.6 cents per car-mile on account of the wooden bodies and be-

TABLE I—ESTIMATED COST TO RE-EQUIP SYSTEM FOR 600-VOLT DIRECT-CURRENT OPERATION

<b>Passenger Cars—</b>	
12 Passenger cars, including installation cost of trucks, air brakes and electrical apparatus.....	\$190,236
12 Pairs trucks.....	35,000
12 Four-motor equipments, 105-hp. motors and control.....	89,400
4 Extra 105-hp. motors, at \$1,500 each.....	6,000
12 Air-brake equipments for passenger cars, at \$1,044.60 each.....	12,535
<b>Freight Cars—</b>	
4 Four-motor equipments, 140-hp. motors and control, at \$9,456 per set.....	31,526
2 Extra 140-hp. motors, at \$1,750 each.....	3,500
Installation of motor and control equipment, at \$675 per car.....	2,025
1 Air compressor at \$656, plus installation, \$100.....	756
<b>Substations—</b>	
5—300-kw. rotary converter substations with complete apparatus for full automatic operation, at \$15,025.....	75,125
3—500-kw. rotary converter substations with complete apparatus for full automatic operation, at \$19,097.....	57,290
1—500-kw. rotary converter substation with complete apparatus for semi-automatic operation.....	16,850
Erection, installation and testing of nine substation equipments, including outdoor transformer foundations, including \$1,540 for protective fences, etc.....	27,500
1—500-kw. rotary converter automatic substation apparatus, installed in present passenger car for portable substation..... in-	20,000
<b>Electric Light and Power—</b>	
Cost of converting transformers and customers' apparatus.....	10,000
<b>Overhead Lines—</b>	
Material for changing over transmission lines from single-phase to three-phase, 2,286 poles at \$10.75 per pole.....	24,575
Labor for taking down transmission wire from 54.8 miles, at \$150 per mile.....	8,220
Labor for installation of transmission wire on 45.5 miles, at \$250 per mile.....	11,375
Material for new three-phase transmission lines from Hoffman and New Bethel to Junction, 500 poles, at \$5.40 per pole.....	2,700
Labor for new three-phase transmission lines, 10.5 miles, at \$300.....	3,150
Direct-current feeder, bare copper strand, 37.7 miles 500,000 circ. mil and 62.4 miles 300,000 circ. mil.....	128,570
Material for installation of 600-volt feeder, 4,950 poles, at \$1.21 per pole.....	5,990
Labor for 600-volt feeder.....	20,000
<b>Supervision—</b>	
Supervising and erection engineer.....	3,000
	<b>\$785,323</b>

cause of the fact that it is proposed to continue the operation of some of the single-phase motors. There is no doubt that there will be some reduction in the cost of track maintenance due to the reduction in weight of car equipment. It has frequently been estimated that 40 to 50 per cent of track maintenance costs are in direct proportion to the weight of cars, but in the present case an allowance of 30 per cent has been made, showing an estimated annual saving of \$4,300.

The savings computed, with allowance for additional substation operating costs, amount to \$142,280, which may be applied on depreciation of the new equipment and interest on the new investment. Allowing 4 per cent depreciation on the entire new investment, there remains \$110,867 as the net saving in operation due to

TABLE II—COMPARISON OF PRESENT ANNUAL OPERATING COSTS WITH ESTIMATED COST OF OPERATION WITH PROPOSED DIRECT-CURRENT EQUIPMENT

	Present	Proposed
<b>Power—</b>		
Operating costs, 1922, coal, labor, repairs and miscellaneous expense.....	\$146,843	
Depreciation charges.....	35,768	
Cost of purchased power, 1,337,000 (1922) car-miles, at 3.75 kw.-hr. per car-mile plus 481,000 (1922) kw.-hr. light and power, at 1.25 cents per kw.-hr.....		\$68,684
<b>Substation Operation—</b>		
Operating costs, 1922, labor, repairs and miscellaneous exp.....	1,557	
Inspector for automatic substations.....		2,400
Maintenance of substations, nine at \$500.....		4,500
<b>Maintenance of Cars—</b>		
Maintenance costs, 1922, including electrical equipment and depreciation.....	76,260	
Maintenance of steel passenger cars with modern d.c. equipments, 1,010,000 (1922) car-miles, at 3.2 cents.....		32,320
Maintenance of other cars, wood bodies, d.c. operation, mostly modern motors, 404,000 (1922) car-miles, at 3.6 cents.....		14,544
<b>Maintenance of Track—</b>		
Maintenance costs 1922.....	72,302	
[Passenger car-mileage is 71 per cent of total]		
Of the expenses due to passenger cars 70 per cent are unchanged by reduction in weight, amounting to.....		35,934
The remaining 30 per cent of the cost due to passenger car-mileage are reduced in proportion to the weight, amounting to.....		11,100
The remaining 29 per cent of the total track maintenance costs will be the same as in 1922, as they are on account of continued use of present equipment other than passenger.....		20,968
Depreciation, 4 per cent on estimated investment of \$785,323.....		31,413
Total.....	\$332,730	\$221,863
Net saving (14.1 per cent on estimated investment of \$785,323).....		110,867

\*The actual cost of energy for the year 1922 was 2.16 cents per kilowatt-hour, and it is now expected that the purchased energy will be obtained for 1.4 to 1.6 cents per kilowatt-hour.



the substitution of direct current, or 14.1 per cent on the estimated cost of \$785,323.

#### EFFECT OF CHANGE ON OPERATING REVENUE

Entirely aside from the subject of cost of maintenance and operation, the proposed change as outlined herein should be productive of a marked increase in operating revenues, according to Mr. Richey. The present equipment is productive of many exasperating delays in the service, due to the unreliability of the single-phase motor and control equipment and the complications further involved by the necessity of operating such equipment over the direct-current lines in Indianapolis. In the past three years the times cars were pulled out of service due to electrical equipment failures have amounted to nearly 2,000, or an average of 664 per year. A study of the train dispatcher's reports for the first eighteen days of April shows 110 cases of delays to schedule sufficiently important to be included in the dispatcher's report, and including only those delays directly traceable to the single-phase equipment and which would not be expected with proper d.c. equipment.

When it is remembered that all of these delays are on a road which operates in regular service only fifteen passenger cars, it will be realized that an unwarranted irregularity in schedules must result. Such irregularity would be practically smoothed out by the substitution of modern direct-current equipment even if of the same capacity as that at present operated. The present cars weigh 51½ tons and carry a motor equipment of 400 nominal horsepower, which amounts to 7.8 hp. per ton of car. The proposed cars weigh but 36 tons and will carry a motor equipment of 420 nominal horsepower, amounting to 11.6 hp. per ton, or an increase of nearly 50 per cent over the present. This increase in relative motor capacity will still further eliminate delays, including those trips when trailers are handled. The change from an irregular and ragged operation to that of regular strict maintenance of schedules would without question produce a considerable increase in patronage.

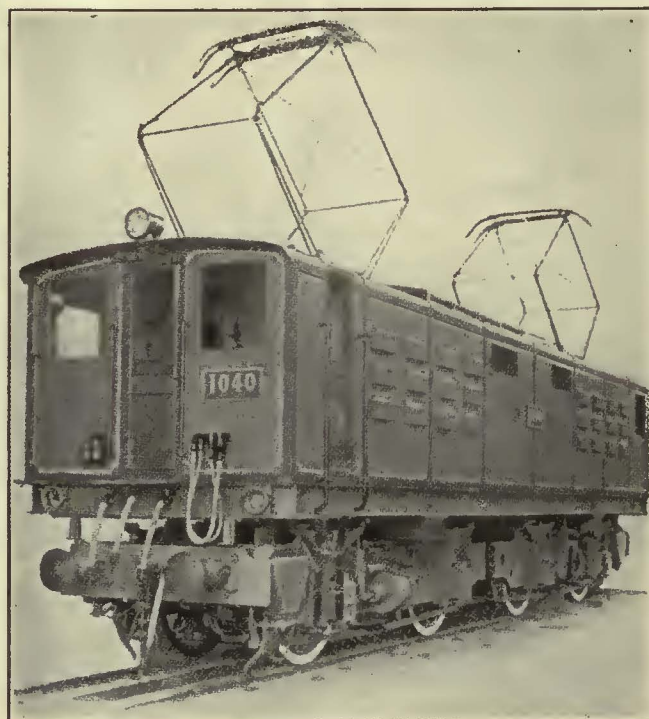
The cars contemplated in the proposed plan are of all steel construction, somewhat larger than the present cars, and will have very greatly improved riding qualities. In addition to the fact that these cars will have less maintenance and operating cost, there will be a considerable advertising value to the comfortable and attractive all steel cars. Further, it is the universal experience that the re-equipment of a road with new rolling stock brings a certain amount of new business.

Taking all of these matters into consideration, it is the opinion of the consultant that the re-equipment of the road as contemplated herein will increase the passenger revenue by an amount somewhere between 20 and 35 per cent of the 1922 revenues, or by an amount somewhere between \$95,000 and \$165,000. The result will depend largely on the amount of advertising publicity which is given to the change. With a consistent, aggressive advertising policy, started coincident with or a little before the new operation is begun, it will be possible to approximate the latter named increase of \$165,000 annually. There is, of course, the possibility that with so large an increase in passenger business it may be necessary to operate a heavier schedule during some portions of the day, which would correspondingly increase operating expenses, and in this case the net result would not be as large as the figure quoted. However, it should be possible to increase the net revenue by some amount between \$125,000 and \$150,000 per year.

At the present time the total operating revenue of the light and power department is approximately \$30,000. With three-phase power available it will be possible to furnish better power service than from the present single-phase lines. With these improvements in the light and power service, it should be possible to double the gross revenue of this department, especially through proper advertising and solicitation.

### Japanese Electrification Progressing

THE Japanese government is going into the matter of electrifying the State Railways in a thorough and comprehensive way. In pursuance of its general plan, in 1921 the government ordered two 65-ton (130,000-lb.) freight locomotives from each of four firms. An illustrated account of the locomotives fur-



Freight and Local Passenger Locomotive for Japanese Government Railways

nished by the General Electric Company was given in the issue of this paper for Dec. 23, 1922, page 975. In June, 1922, an order was placed with the English Electric Company for thirty-four locomotives, the number required for the 1923 program. (See *ELECTRIC RAILWAY JOURNAL*, July 15, 1922, page 140.) These locomotives are now being delivered.

The leading article in the *Tramway & Railway World*, London, for May 10 is devoted to an illustrated description of the later locomotives, with details of the shipping procedure. The freight and local passenger locomotives are of the 0-4-4-0 type, that is the body is supported on two 2-axle trucks without pony axles. The weight is evenly distributed on the four axles, being kept within the limit of weight per axle of 16½ tons (or 33,069 lb. to be exact) imposed by the government railways. The locomotive trucks are articulated, so that drawing and buffing stresses do not go through the superstructure. The locomotives are designed for the government standard of 1,500 volts, direct current, and each is equipped with four 306-hp. motors arranged in groups of two in permanent series.

Seventeen of the locomotives will be used entirely for freight service and nine others for hauling local passenger trains. These are all of the type described above with the exception that the gear ratio is adjusted on the freight locomotives to give a maximum speed of 40 m.p.h. and the others a maximum speed of 53 m.p.h.

The eight passenger locomotives are of the 4-6-6-4 type. The superstructure is mounted on two articulated trucks, each with a pony truck and three driving axles. This locomotive weighs practically 108 tons (215,000 lb. more exactly), the distribution of weight being nearly 13½ tons (27,000 lb.) on each driving axle and on each pony truck. Six motors of the same type as those used on the other locomotives are included in the electrical equipment.

## Why the Unlimited Pass Was Withdrawn in Youngstown

The Youngstown Municipal Railway, First Sizable Company to Try This Plan, Was Blamed for Having a 9-Cent Fare When the Actual Revenue per Passenger Was Less than 7 Cents

ON APRIL 1, 1923, use of the unlimited weekly pass in Youngstown was discontinued after a trial lasting somewhat longer than a year. Although the scheme had been tried in several smaller places prior to its inauguration by the Youngstown Municipal Railway, the experiment of this company attracted special attention because of the greater size of the city.

The arrangement inaugurated at that time, with rates of 9 cents cash, six tickets for 50 cents and 1 cent for transfer prevailing, was a weekly pass giving the holder unlimited riding privileges for \$1.25. Many jitneys were then operating in the city and one of the results expected from the pass was the gradual conversion of jitney riders into regular car riders. It was thought that people would buy the pass and use the railway to the exclusion of all other means of transportation. This object was, in fact, accomplished to a large extent, but in the long run the scheme failed to produce a revenue that would yield a fair return.

Since the inauguration of the pass the gross revenue of the company has increased materially, but there was an increase in the volume of general business in the district about the same time that the railway showed a gain, and it is impossible to say how much of the latter was due to the pass and how much was due to other causes. Two years ago the steel mills were operating at not over 25 per cent of their capacity, whereas they are now operating at about 90 per cent of their capacity.

On account of the great changes in industrial conditions in the Mahoning Valley during the past few years revenue figures are likely to be misleading. Although pass riders were recorded on the fare registers, there was no way to distinguish between original rides and transfer rides. Consideration has therefore been given more to the matter of average fare than to revenue or total passengers.

In general, those people who used the railway oftener than fifteen times a week availed themselves of the pass, and those who rode less frequently paid fare by cash or ticket. If all passengers had bought passes the profit on the occasional rider would have balanced the loss on the frequent rider, but as it was, the railway lost on the latter and failed to gain on the former. The actual

return per revenue passenger became less than 7 cents and was steadily decreasing at the time the pass was withdrawn.

The transferable feature of the pass deprived the railway of many fares. In one case several barbers employed in the same shop arranged their lunch hours so that one pass sufficed to take them all home for the mid-day meal and bring them back to work again. Canvasers, telegram delivery boys and others engaged in similar occupations used the pass to secure a large number of rides at an extremely low rate. The proprietor of two moving picture theaters located some distance apart on the same street car line and each giving three performances a day bought a pass for the messenger boy so that he could carry the films from one theater to the other. The boy traveled forty times a day on week days and eighty times a day on Saturday and Sunday. By using a weekly pass his average fare came to a fraction of a cent.

Under the so-called 9-cent fare, the company was actually receiving less than 7 cents. Yet if a stranger inquired concerning the fare in Youngstown he was told that it was 9 cents. There was more or less popular clamor against what appeared to be a high fare, although it was not bringing the railway a fair revenue. The situation was, therefore, thought by the Street Railway Commissioner to be unsatisfactory. A service-at-cost plan is in effect in Youngstown and a conference of all interested parties was called. The commissioner held that the principle of unlimited rides for a small fixed sum was economically unsound, and advocated the abolition of the weekly pass and a reduction of the cash fare.

On April 1 a new rate was inaugurated for an eight weeks trial. Under this arrangement, the cash fare is 7 cents, tickets are sold three for 20 cents, and transfers 1 cent. It was thought that this plan would produce a greater average return per passenger while at the same time reducing the high cash fare. A decrease in riding was expected to follow this change, and preliminary reports indicate that the number of passengers has decreased more than 16 per cent. One reason given for this is the bad reaction of the change upon former users of the pass. That feeling, however, is likely to disappear in a short time.

### NEW RATE APPEARS TO BE INADEQUATE

Figures compiled up to date indicate that the new fare may not be adequate, as told in the *ELECTRIC RAILWAY JOURNAL* for May 12. The revenue has decreased more than 15 per cent. Due to a greater use of tickets there are now actually fewer 7-cent cash passengers than there used to be 9-cent cash passengers. However, the increase in ticket sales is not enough to prove that pass holders of former times are spending just as much for carfare as before.

In spite of the falling off in revenue under the new rate, there were net receipts applicable for interest and dividends during the first month of \$7,500. However, this was much less than in the preceding two months as the net revenue after all operating deductions had been made was approximately \$22,300 in February, 1923, and \$24,500 in March. If the present rate does not prove satisfactory at the end of the eight weeks trial an 8-cent cash rate with seven tickets for 50 cents will probably be the next step. It is hoped, however, that with the uncertainty of unlimited riding for a fixed sum eliminated, a satisfactory rate will soon be found.

# Pittsburgh's New "Light Six" Train

A Standard Light-Weight Motor Car Has Been Arranged for Operation with a Motorized Trailer—  
Only Slight Modifications in Platform Controller Are Required, with a Three-Wire  
Train Line—Emergency Braking Is a Feature

A NEW type of two-car train, composed of low-floor cars, has been developed by the Pittsburgh Railways. The salient feature is the use of two motors on the second car, arranged for forward motion only and without a separate controller. This results in simplification of the wiring on both cars and allows the use of the standard K-43 type of controller on the forward car. Only a three-wire connection between the two cars is needed, and it is energized only when power is on the motors. The regular motor car, being of light

door being added and electrical equipment installed. It is considerably better for all-day service than the so-called trailer-hauler described in the preceding paragraph, and its four 35-hp. motors have ample capacity so that it can handle rush-hour loads admirably as an independent unit where such operation is suitable. For many of the long-haul runs in the rush hours, however, train service is preferred.

The low-floor motor car is so light in weight that it was felt by the management that it would not have



Pittsburgh Railways' Low-Floor Motorized Trailer Train

weight, is better suited for all-day operation than would be a car carrying the entire motive power for the train.

For many years the company has been using two-car trains for handling the rush-hour service. Originally these were made up with standard double-truck motor cars hauling obsolete single-truck cars from which the motors were removed, and which were remodeled for use as trailers. In 1910 a type of light-weight center-door trailer, especially designed for this service, was developed by the company's engineers. This car was distinguished by its small diameter wheels, which permitted an extremely low floor. It was described in *ELECTRIC RAILWAY JOURNAL* for Dec. 10, 1910.

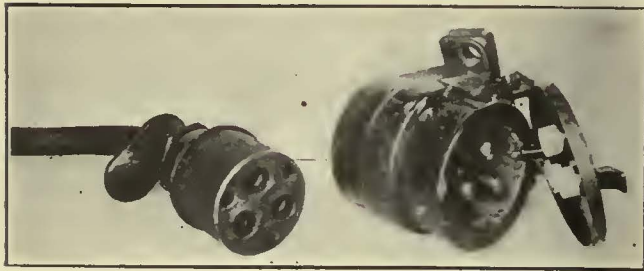
But one type of car is available in Pittsburgh with sufficient motor capacity to stand regular daily service hauling these trailers. This type, which was introduced a number of years ago, is a standard end-entrance double-truck car equipped with four 60-hp. motors. While cars of this type can make satisfactory schedules when hauling trailers, their weight and motor capacity are excessive, as judged by modern standards. Moreover, some of these cars have been in use for such a period of time that they are approaching the end of their useful life and may have to be replaced.

Another type of motor car which has become standard with the Pittsburgh Railways is the low-floor, center-door car. The design is quite similar to that of the low-floor trailer. In fact, the first car of this type, described in *ELECTRIC RAILWAY JOURNAL* for Aug. 3, 1912, was one of the trailers modified, a front-entrance

sufficient traction to haul a trailer, as the wheels might slip on the heavy grades encountered on many of the Pittsburgh lines. While motors of sufficient capacity to haul light trailers might have been designed for mounting on the small wheels, still there would be the waste of energy due to hauling the excess weight around all day. Furthermore, it was considered desirable to make some arrangement whereby the existing cars with the 35-hp. motors might be utilized for train operation.

The company now has a considerable number of the trailer-haulers in all-day operation on lines where rush-hour train service is used. Since the decision had been made by the management not to re-equip the low-floor cars so they could haul trailers the question arose as to whether or not the additional equipment needed for expansion of the service should be of the older and less desirable type, merely to be able to haul the trailers for a few hours night and morning.

Tests made in Pittsburgh and elsewhere show that the power demanded by two-car trains is only 50 per cent to 60 per cent in excess of that taken by a single motor car making the same schedule speed under like conditions. The extra motor capacity required, therefore, is only about half that needed for single-car operation. A study of the situation made it apparent that if a satisfactory method of getting this additional capacity could be developed a desirable combination would be effected. In the past numerous plans have been tried by the Pittsburgh Railways and other companies for



Three-Wire Cable Connector and Socket Which Has Cover that Short Circuits Motors When Closed

using a two-motor car for special service as the second car of a train in connection with a four-motor car running throughout the day. A complete individual control system for each car, with some form of multiple-unit operation, has always been employed in such an arrangement.

THE CONTROL SYSTEM

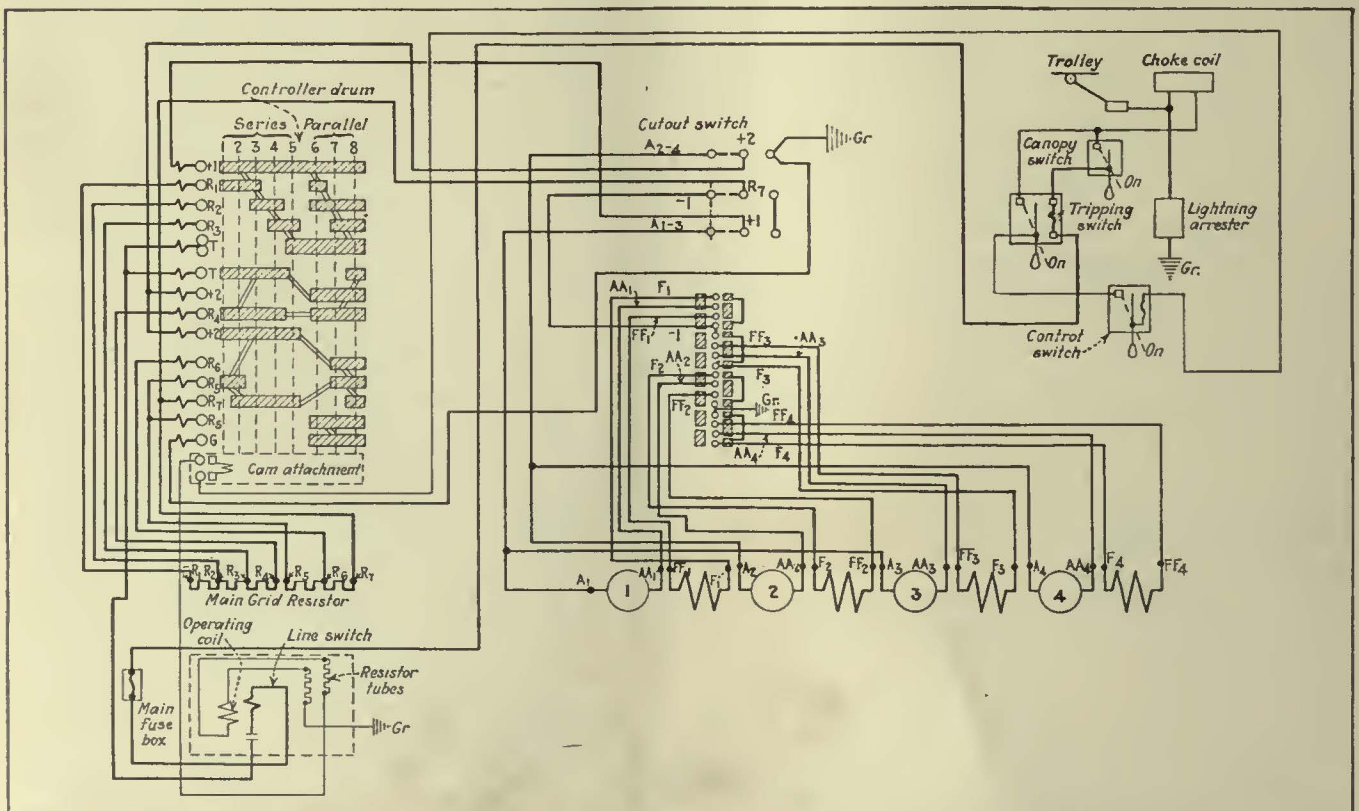
In designing the control and method of operation for the Pittsburgh Railways trains, for which P. N. Jones, general manager, and F. R. Phillips, superintendent of equipment, were responsible, it was decided that since the company was accustomed to handling dead trailers at the carhouses and had all facilities for doing so there would be no objection to continuing the practice. No attempt was made, therefore, to provide an independent control system for the second car of the train. While the trailer is motorized, it must be handled in exactly the same manner as a dead trailer. This, however, is not considered by the management a disadvantage sufficient to nullify the value of the plan, especially since considerable expense and complication are obviated.

The motor car of the test train is one of the company's latest low-floor cars. A description of this general type of car was given in ELECTRIC RAILWAY

JOURNAL for July 3, 1915, although some minor improvements have been made in more recent orders. This car is equipped with four 35-hp. motors with K-43 control. The standard wiring for this control is shown in the first of the two diagrams.

In making the layout for train operation it was considered essential to retain the motor and control equipment intact, on account of standardization and first cost. For use with the two-car train the only modification is the addition of three contacts on the reverser drum, and the individual motor cutout switches, as shown in the second diagram. Three leads only connect the two cars. The two motors on the second car are mounted on its forward truck, and the field and armature of each are permanently connected in series for the forward direction of motion. If it is necessary to back the train, the motors on this car are simply cut out of circuit by throwing the reverser to the reverse position and the train is operated by the four motors on the leading car. Since few backward moves are made, and they necessarily must be at low speed, this is no disadvantage. It is this plan that may be considered the radical innovation, and on which the simplicity of the wiring depends.

As will be seen from the diagram, the motors of the leading car are grouped in pairs connected permanently in parallel in the standard arrangement, each pair being operated as a unit in the control. The two motors of the second car are added in parallel, one to each of the other pairs. The resistance of the grids is such that satisfactory starting will be obtained either for the motor car alone or when coupled with the motorized trailer. It has been found that, using the same grids, the variation in rate of acceleration between the operation of the four-motor car by itself and when it is coupled with the two-motor trailer is so slight that it is not noticeable. With the six motors in circuit the resistance is somewhat less in proportion to the current



Standard Wiring Diagram for K-43 Control of Pittsburgh Low-Floor Motor Cars

demand, so that the train accelerates at about the same rate as the single motor car.

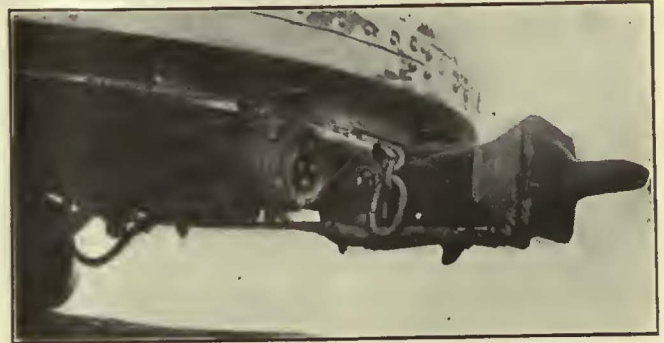
INDIVIDUAL MOTORS MAY BE CUT OUT OF CIRCUIT

In case trouble develops in one of the motors of a standard four-motor equipment, both that machine and its mate usually are cut out of circuit by means of the switches in the controller, and the remainder of the run finished with the other two motors.

A special feature of this control is the arrangement of the connection board in the base of the controller so that a motor can be cut out independently. If any one motor of the six fails it is taken out of the circuit and the remaining five used. While there is some unbalancing of current in the series positions, due to having two motors in series with three, it is not enough to cause any trouble. In fact, it is not so hard on the machines as when two motors of a standard four-motor equipment are cut out of the circuit and the remaining pair have to haul the car. In case any two motors are disabled simultaneously, one being in each group, the remaining four motors can be used. They will be balanced in both the series and the parallel positions, and the car will operate at slightly reduced speed and with heating somewhat greater than is normally the case.

An interlock is provided by extending the cam located at the base of the main drum of the controller and used to operate the line switch. In the rare event that two motors in the same group are disabled at the same time and have to be cut out, this cam prevents the current flowing through the motors until the drum is turned to the first parallel position. In other words the control is changed from series parallel to plain rheostatic. Thus every contingency is provided for short of disability of all the motors, or of so many of them that it would be unsafe to move the cars with the remainder.

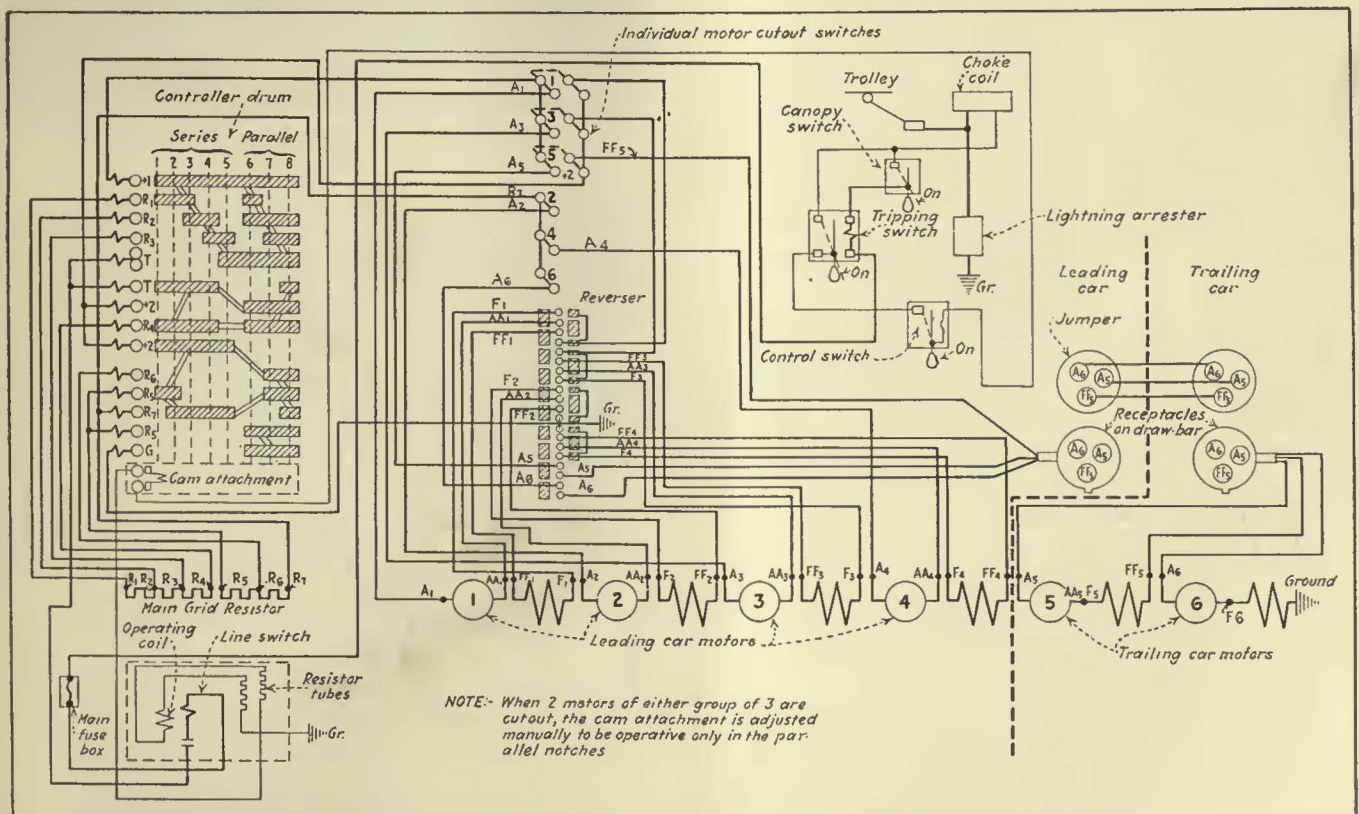
The connection between the two cars consists of a



The Socket for Making Connection Between Cars Is Mounted on the Coupler

three-point receptacle on each car, with a three-line jumper connecting them. One novel feature is the provision for emergency braking. In the lid of the receptacle on the trailer car are three contacts, which appear white in the illustration. These contacts are connected together and are grounded. In case the train pulls apart the jumper will be pulled out of the receptacle on the trailer. The lid of the receptacle will then be forced down by means of a spring, and the contacts will provide a short circuit on each of the motors. Since the connection of these motors is permanently made for forward motor action it will be correct for backward generator action. In this way a powerful dynamic braking effect will be obtained. Then if the train should break in two while going up grade, the second car would begin to run backward, but would be retarded immediately by the dynamic braking, so that it would quickly be reduced to a low speed.

In tests made it was found that the train could be broken apart going up a 6 per cent grade, and the second car would at once slow down to a lower speed than a walk. A motor car following up the grade would then be able to approach the one that had broken loose and



Modified Wiring Diagram for K-43 Control for Use with Six-Motor Train

stop it without danger. In the event a break occurred on a down grade the second car would, of course, be in contact with its leader, and the dynamic braking would be unnecessary. Of course, the car is provided with air and hand brakes, so that the above is a very remote possibility. In any ordinary case the conductor of the second car would be able to set the hand brakes when the car was retarded to a low speed by means of dynamic braking.

#### ENERGY SAVING IS SHOWN BY TESTS

The test train now is operating daily on a regular Franks'town Avenue run. The motor car is scheduled to make about 150 miles per day, while the trailer is in use for two round trips or 33 miles. On this particular run the arrangement saves 925 ton-miles a day out of a total of 4,012 ton-miles that would be run if the ordinary type of 240-hp. trailer-hauling motor car were used. Additional power is saved because the motors are better suited to the size of the car. The train is better able to make its schedule in the rush hours when power is needed, while the equipment of the standard low-floor motor car is ample for the non-rush. In the preliminary tests already made the energy saving was about one-fourth of the total that would be required for the standard trailer-hauler running all day, with a trailer added for the two rush-hour trips.

One advantage observed in making a trip on the car is the absence of the jerks, due to taking up the coupler slack at starting, that are common in ordinary trailer operation. The second car starts along with the first, and while there is a slight lag of the trailer during acceleration, due to the leading car supplying more than one-half of the accelerating force, this is scarcely noticeable even to a trained observer. Tests have shown that the drawbar moves out of its normal position only about  $\frac{1}{2}$  in. at any time during the acceleration. This results in smoother operation, and gives greater comfort than is had with the usual motor and trailer operation.

The low-floor car loads and unloads much more quickly than the older end-door car, with its narrow passages and high steps. In service this train is making its schedule better than other trains on the same route. This is due to two reasons, its ability to load and unload quickly and the quick starting obtained.

### Electric Steam Boiler on North-Eastern Railway

THE North-Eastern Railway, Great Britain, is using on its electrified sections an electrically heated steam boiler, designed by C. O. Bastian in consultation with Messrs. Merz and McLellan. *Electrical Industries*, London, gives details as follows: The boiler is of the fire-tube type, each of the 144 tubes being fitted with a Quartzalite heating element. The boiler is 3 ft. 4 in. in diameter and 3 ft. 4 in. long and is capable of supplying enough steam for the longest train handled by the railway in ordinary service. The full loading is 408 kw. and at three-quarters load, with an input of 298 kw.-hr., 970 lb. of water was evaporated at 120 lb. pressure in twenty-four minutes.

The Quartzalite element for this boiler consists of a quartz tube  $\frac{3}{4}$  in. in diameter, inside of which is a close spiral heating element of Tabasco resistance wire. The tube butts onto a mica washer, in the end of a hollow porcelain terminal, which is held by spring pres-

sure to the terminal plate of the boiler. The end of the element is silver-soldered to the terminal, which traverses the porcelain.

This heating boiler operates on 1,500 volts, direct current.

## Supporting an Extensive Overhead Network

Substantial "Back-Boned" Construction with Catenary Messenger Supports Has Minimized Maintenance Work on Forty-one Branch-Offs at Butler Street Carhouse in Atlanta

ON ACCOUNT of the large number of tracks branching off from the single track on Butler Street, Atlanta, Ga., into the Butler Street carhouse and adjoining yards, unusual precautions were necessary to safeguard the overhead construction against failure. Until recently there were thirty-one tracks branching



Overhead Connecting Curve Construction at Butler Street Carhouse in Atlanta

off at this point, and the overhead construction involved was briefly described in an article in the issue of the *ELECTRIC RAILWAY JOURNAL* for March 20, 1920, page 563. Since that time ten tracks have been added, making the present total of forty-one.

The main trolley wire over the original installation was of No. 000 copper, the thirty-one branch wires being of No. 000 galvanized iron. In the new installation, however, both main trolley and branch-offs are of No. 000 copper.

On account of the considerable weight of this overhead construction, with the consequent tendency toward sagging over the switches and curves, two  $\frac{1}{2}$ -in. steel messenger wires were strung along the entire frontage of the carhouse and yard. One messenger is directly over the switches and the other is just beyond the point where the tracks straighten to enter the carhouse. The trolley network is supported to a large extent from these messenger wires by the usual catenary construction. This is shown clearly in the illustration on this page.

The manner in which the network is supported is shown in the accompanying illustrations. The overhead

work is of the type known as "back-boning," the trolley wire on each curve being paralleled by galvanized strand,  $\frac{3}{8}$  in. in diameter.

All span wires and pull-offs in this installation are made of  $\frac{3}{8}$ -in. galvanized guy strands and are attached to the trolley wire at intervals of 7 ft. The attachments to the wire are made by means of double curve pull-overs. To provide insulation, a 9-in. wood strain insulator is linked into the eye of the pull-over on the outside of the curve. A  $\frac{3}{8}$ -in. guy strand (the back-boning mentioned above) is run through the insulator eye at the end away from the trolley wire, and the span wires and pull-offs are also attached to the insulator eye at this point.

A 9-in. wood strain insulator is also inserted in the eye on the side of the pull-over toward the inside of the curve, and a short span wire is run from the other end of this insulator to another insulator attached to the trolley wire on the next track. The wire over the second track is installed just like the one described.



Catenary Messenger Supports and "Back-bone" Reinforcement Insure Durability in the Overhead Network

This "back-boning" serves to keep the trolley wire off the rails in case of a break and, by allowing continuous operation in spite of a break, it prevents interruption to service. All repairs on such construction can be made by trouble crews and a considerable saving is effected in this way.

The poles on the outside of the curve, which support most of the strain, are 8 in.-10 in. standard steel tubular poles set 7 ft. in concrete. They are set approximately 30 ft. apart. The poles located on each side of the outdoor track are A-grade creosoted pine, set 100 ft. apart.

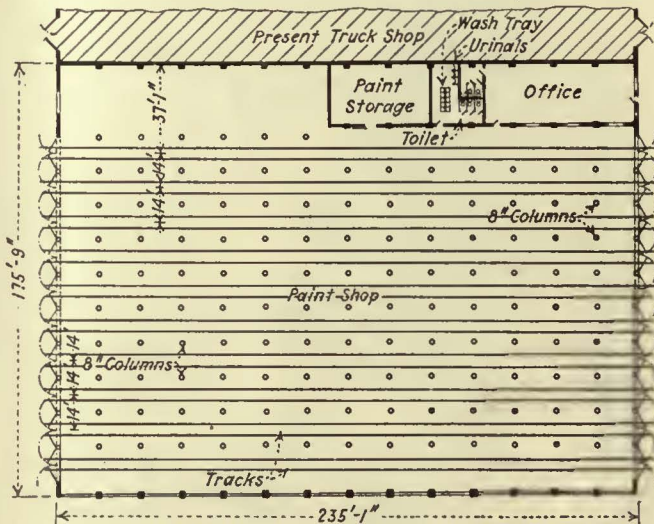
The weight of the construction over the entire ten new tracks was found to be too heavy to be supported by two lines of poles and a third line was set between the fifth and sixth tracks at intervals of 100 ft. The poles in this line are 6 in.-8 in. standard steel tubular poles. The poles at the end of the track are of creosoted pine and one pole is set for each two tracks, the wires being held in place by V-guy construction.

The cost of the new work on this installation, that is, over the ten new tracks, was about \$2,420, while the whole installation over the forty-one tracks cost approximately \$9,000.

## \$125,000 Paint Shop for Detroit

A Feature in the Construction of This Paint Shop Is the Method of Supporting the Scaffolds—The Painting Methods Also Are Described

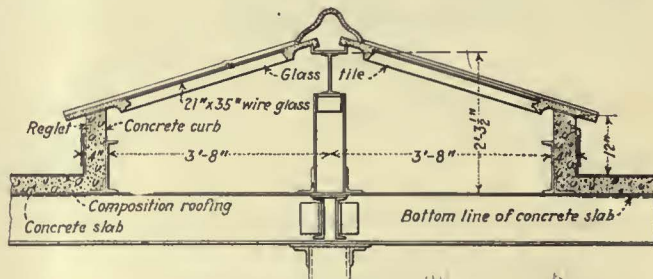
THE Detroit municipal railway is just completing the construction of a paint shop capable of accommodating fifty double-truck cars. It is being erected at Highland Park, close to the present repair shop of the system. When the property of the Detroit United



Plan of New Paint Shop

Railway was taken over by the city on May 15, 1922, the D.U.R. turned over its repair shops at Highland Park but kept its paint shop, which had recently been built. This building has since been converted by the company to office and repair shop purposes. This made a new paint shop for the municipal system immediately imperative. The one now being erected will cost about \$125,000, and as it possesses a number of novel features, an account will be presented.

The building measures 175 ft. 9 in. x 235 ft. 1 in. outside dimensions, and is of steel and brick construction with concrete floor and composition roof and with monitors extending over each track. The end doors are of wood, metal lined on the inside, and steel sash at the top. The building is also well lighted by side

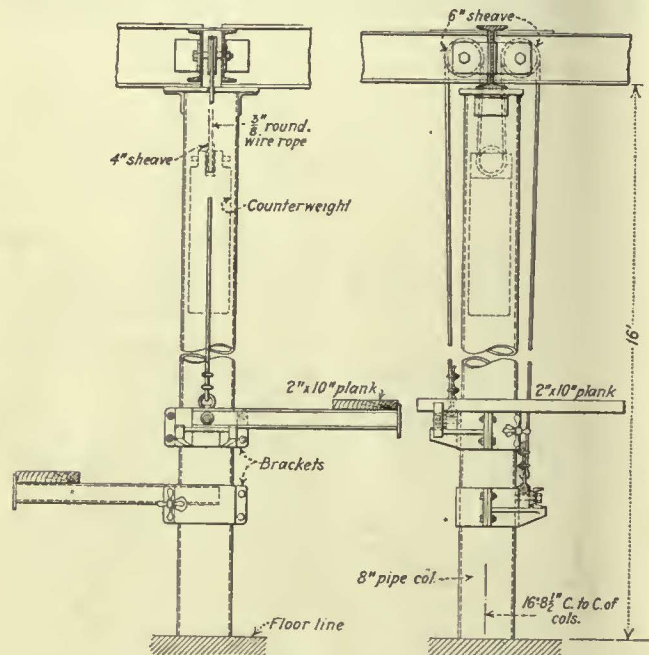


Section Through Monitor Roof

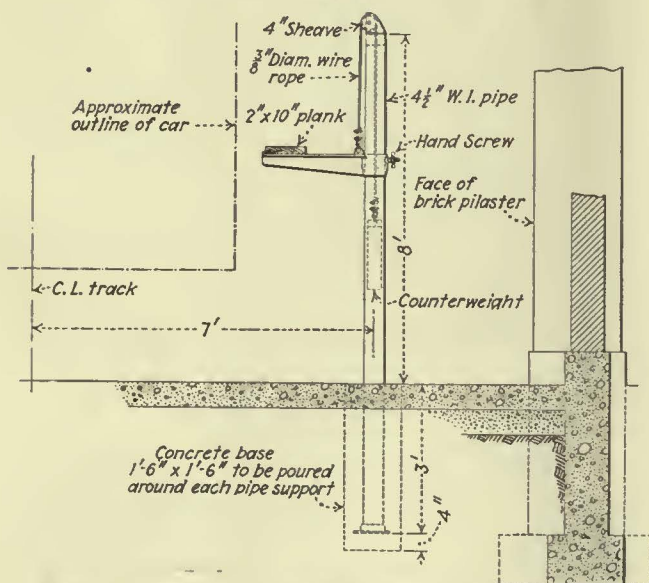
windows. It also contains a fireproof paint storage and mixing room.

Perhaps the most interesting feature of the building from a street railway standpoint is the method of mounting the brackets which support the scaffolding for painters. The support for the roof girders between each two tracks is a row of thirteen 8-in. wrought-iron columns, and these columns are used to support the scaffolding brackets. Inside of each column is a counterweight for balancing the weight of the

scaffold, as shown in the drawing below. A  $\frac{3}{8}$ -in. wire rope is carried first around a 4-in. sheave on the counterweight and then over two 6-in. sheaves at the top of the column. The ends are attached to the brackets, which can be set in position by a handscrew. When not in use these brackets can be swung parallel to the tracks and thus be out of the way. For the bracket



Method of Supporting Painters' Scaffolding on 8-In. Supporting Columns



Method of Supporting Painters' Scaffolding on Outside of Tracks Near Wall of Building

supports nearest to the walls of the building, where there are no columns, a somewhat different arrangement is followed. The lower drawing shows this method.

PAINTING METHODS

It is the plan of the municipal railway to use the enamel method in painting its cars, applied by spray guns. The equipment department has been using the DeVilbis spray gun, manufactured in Toledo, and will have an equipment of ten of these guns when operation begins in the new shop. It has been found that one man with this gun will do the work of three with the

brush, and the brush method is used only for painting the wooden sash. The headlining of the car will be painted two coats of white enamel and all other parts one coat. London gray enamel has been adopted for the inside finish of old cars, and canary yellow for the exterior body color. The cleaning of the trucks for painting is accomplished by the use of a water jet sprayed at high velocity by means of air at 100-lb. pressure. The under side of the cars will also be painted, the paint being applied by the gun method. It is expected that cars will require only four or five days in the shops for painting.

CAR WASHING

While not directly connected with car painting, car washing is closely related to the preservation of the surface finish of cars, and the practice of the Detroit Municipal Railway will therefore be described. The standard practice in car cleaning, with some time studies of the approximate time required, is outlined as follows:

CAR CLEANING PROGRAM

*Daily Cleaning*—Sweep car body, vestibule and steps. Sprinkle slightly. Brush out corners and around pipes with hand brush, and sweep refuse into basket. Spray with disinfectant. Time for double-truck car, twenty-five minutes; time for single-truck car, eighteen minutes.

*Car Washing*—Cars to be washed every three days, using plain water only. Exteriors to be thoroughly wet below the roof line, then scrubbed with bristle brushes, rinsed and allowed to dry. Double-truck car, sixteen minutes; single-truck car, eleven minutes. Interiors: Windows only to be washed with clear water and sponge and wiped dry with rubber window cleaner. Double-truck car, forty-two minutes; single-truck car, thirty minutes.

*Monthly Cleaning*—Bodies to be scrubbed with prepared car cleaner and washed. Interiors: Windows to be washed as above. Deck windows to be washed. Moldings to be wiped with oiled dustcloth. Lamps and shades to be cleaned. Curtains to be dry wiped. Side walls, vestibule walls to be washed with sponge where necessary.

*Yearly Cleaning*—All interior woodwork to be washed with prepared cleaning solution, rinsed with clear water and dried.

*General*—In bad weather, especial care must be given to windows. Keep them clean at the sacrifice of the bodies. During stormy weather, when outdoor work is impossible, devote all time of the outdoor crew to interior cleaning. Monthly cleaning to be carried on continuously; that is, do not bunch the work at the end of the month, but do a share of it daily, keeping careful record of date of monthly cleaning so that not more than a month elapses between cleanings. Car-cleaners will be required to report to carhouse foremen of any car defects noted.

For the washing every third day of the exterior, as mentioned in the program just given, the car is run through a spray shower in the carhouse, as described on page 705 of the issue of this paper Oct. 28, 1922. The car body is then scrubbed with brushes and rinsed by running through the spray shower again.

Liverpool to Abolish Two Classes on Tramways

THE Corporation of Liverpool has decided to return to the one-class tramway system. Fifteen years ago the experiment with first and second class tramcars was begun, but as the system proved unsatisfactory, a double-deck method was inaugurated—first-class passengers on the lower and ordinary fare passengers on the upper deck. Partly owing to the fact that no passengers were allowed to stand in the double-deck cars, that arrangement also has proved unsatisfactory and unprofitable. Hence the proposal to return to one-class cars.



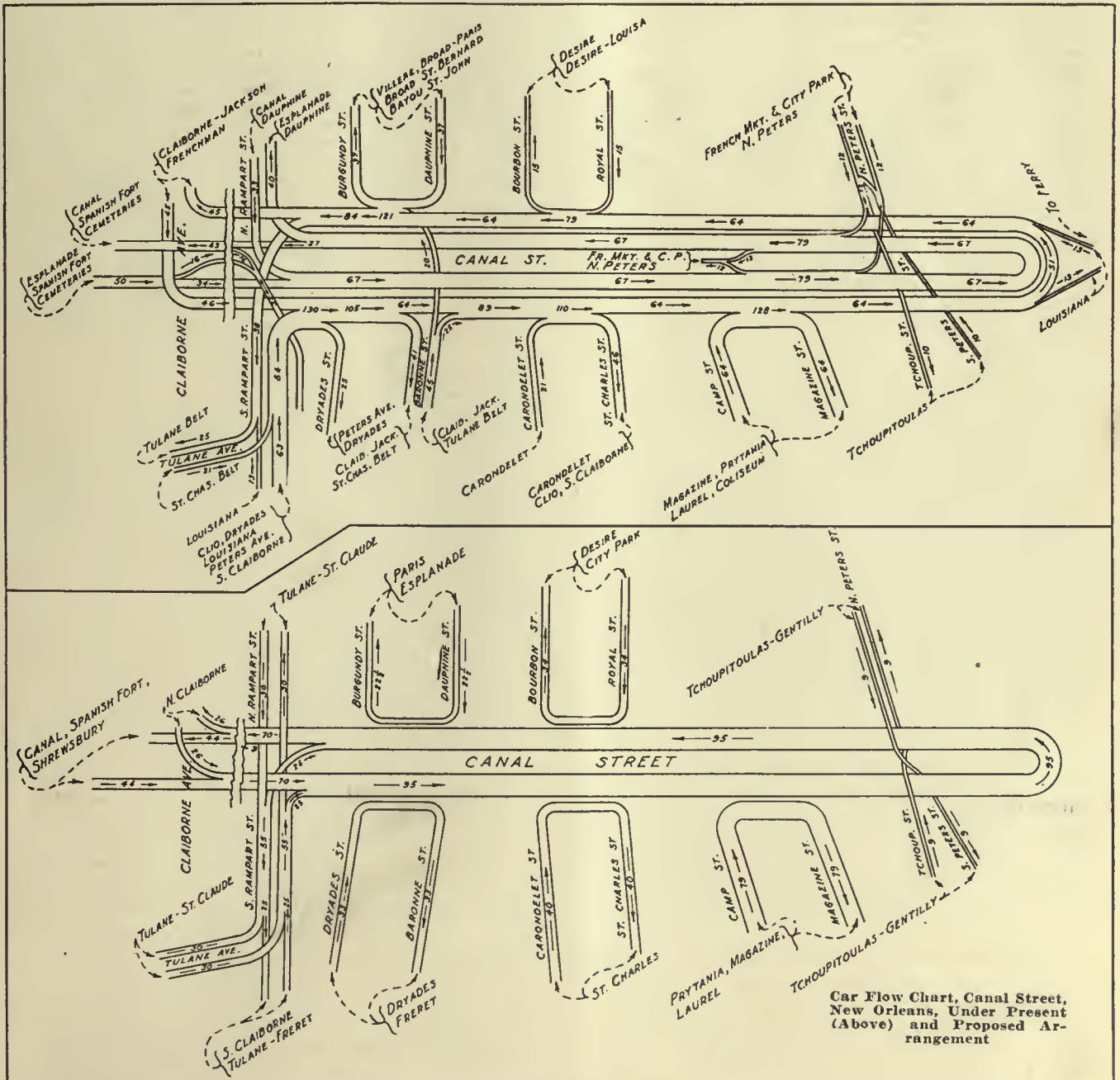
# Canal Street Rearrangement, New Orleans

Car Speed Increased in Downtown Section—Amount of Track on Canal Street Reduced 50 per Cent and Special Trackwork 75 per Cent—Traffic Congestion Decreased and Street Capacity Doubled—Greater Safety for Patrons and Improved Parking Facilities for Automobiles

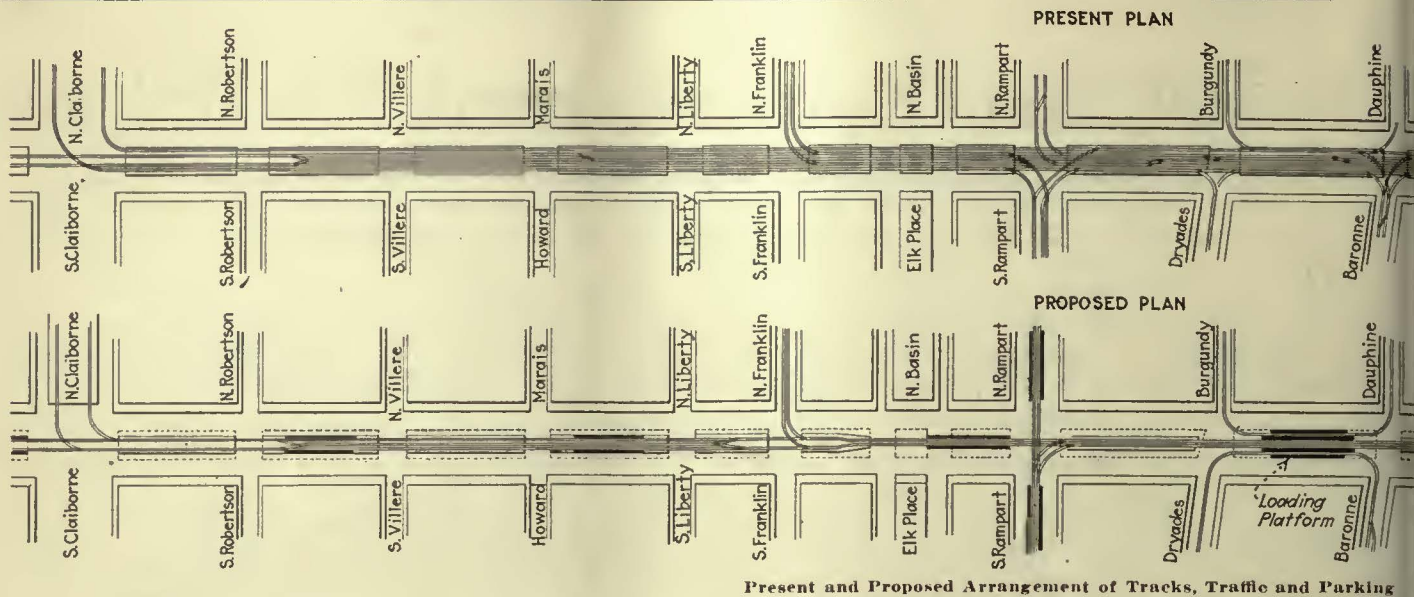
SECTION III of the report for the city on the local transportation system in New Orleans by John A. Beeler deals with the track facilities and traffic conditions on Canal Street, the principal thoroughfare of the Mississippi River seaport. This great thoroughfare of magnificent proportions, the report states, is the dividing line between the up and down town sections. It is as unique in its characteristics as it is important in its location. With a width of 170 ft. between property lines, it provides separate roadways for traffic in both directions, while its broad, commodious, neutral ground should afford more than ample facilities for

street car tracks. Its width and plan provide an excellent opportunity for developing the easy flow of a great volume of both vehicular and street car traffic.

From the Canal Street loop to Claiborne Avenue, a distance of less than 1 mile, there are, including connections at intersecting streets, 6.91 miles of track, or the equivalent of seven tracks for the entire distance. The two gages, requiring a third rail, and the conglomeration of costly special work are an inheritance from the days of competitive lines. Every line in the city but one is now routed to cover some portion of this section of Canal Street. Despite the multiplicity



Car Flow Chart, Canal Street, New Orleans, Under Present (Above) and Proposed Arrangement



Present and Proposed Arrangement of Tracks, Traffic and Parking

of tracks, the car movements are so delayed and hampered that a speed of but little better than 6 m.p.h. is maintained through the day. During the rush hours this speed drops to 4.75 m.p.h.

During the morning and evening rush periods, it is no unusual thing to see twelve or more cars within the limits of one block. About one-quarter of these will be loading, while the rest are waiting. The slow loading; interference by turning movements of cars, especially the left-hand turns; the use of non-clearance curves; the counter-traffic movement of vehicles, and the frequency of stops, paralyze service in spite of all facilities at hand. The large number of motor cars and trucks in use, together with the demand for parking space, have so congested the roadways that general traffic fairly trickles through. Conservatively stated, the engineer points out, the utilization of roadway space for all moving traffic is now at a minimum.

An accompanying drawing shows the present and proposed track layout on Canal Street. From this it will be seen that the through tracks are reduced in general from five to two, and that the lines looping back at Canal Street are operated over separate tracks, so as not to interfere with the through movement of cars on Canal Street. This reduction in the number of tracks releases a large amount of the area of the neutral ground for parking purposes and loading platforms. The general plan so increases the capacity of the street that in the blocks where four tracks remain and with four recommended loading platforms in place there will be room for three lines of moving traffic all of the way through on either side of the tracks, and with room for standing vehicles alongside the curbs, as compared to but one line on one side and two on the other as at present. The present arrangement permits parking of cars in any block at right angles to the length of the street, thus materially reducing the space available for through traffic, whereas in the proposed arrangement, parking of cars would be permitted only in the blocks between loading platforms, where their presence would not diminish the space available for moving traffic.

The simplification of the movement of cars is most easily visualized by reference to the car flow charts, as at present and under the proposed plan, reproduced herewith. Figures behind the arrows indicate the maximum cars per hour. In comparison with the present system the proposed plan of operation reduces

the number of left-hand turns from 119 to 25, the number of right-hand turns from 314 to 25, the number of left-hand car interferences from 471 to 75, and the number of right-hand car interferences from 374 to 25. This makes a reduction in both directions between Wells and Rampart Streets of from 433 to 50 turning movements, and from 845 to 100 interferences.

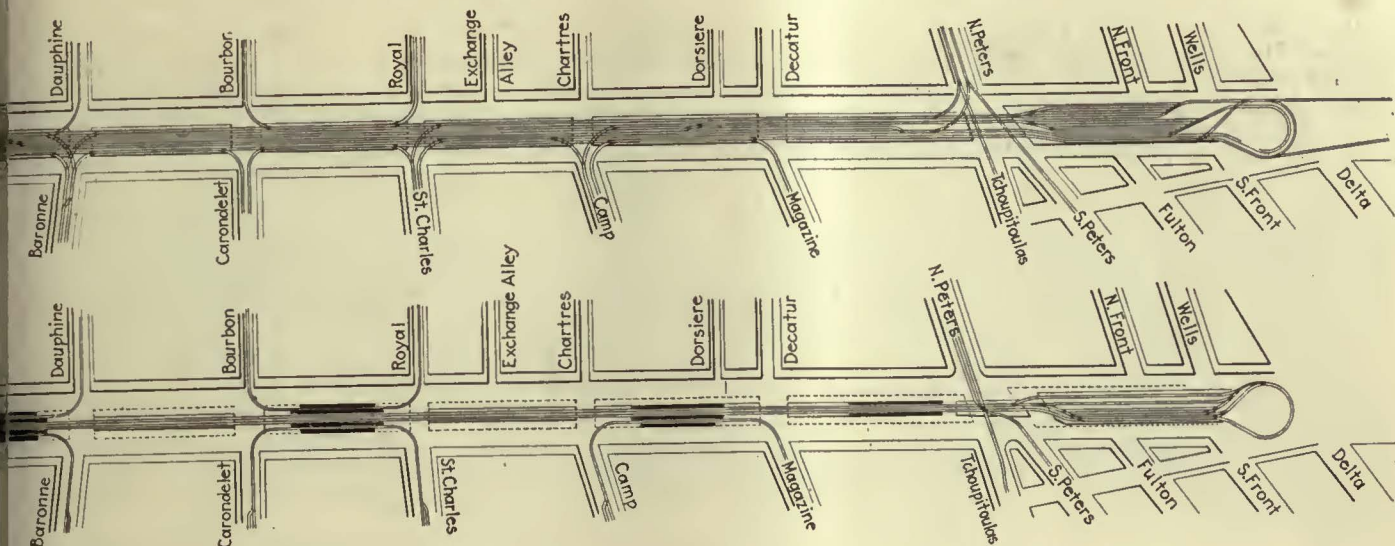
The report states that the movement of main-line cars will not be hampered by the intersecting lines which terminate at Canal Street, from either the up or down town section. Neither will the latter lines be interfered with or delayed by the traffic of the through Canal Street cars, as they will be completely segregated from each other. In place of the present tangle of special work and overhead wires, there is substituted a clean-cut system of independent main-line tracks and simple non-interfering curves without switches, crossings or turnouts.

The effective roadway space would be virtually doubled. This would permit at all times three moving lines of vehicles, with ample space for standing trucks or automobiles next to the curb. The area of roadways between Wells and Rampart would be increased from 206,741 sq. ft. to 280,281 sq. ft., and between Rampart and Claiborne from 133,450 sq. ft. to 195,520 sq. ft. This is an increase of 73,540 sq. ft., or 35 per cent, in the roadway between Rampart and Wells alone, where every foot should be used to its maximum capacity. It will also make available 62,070 more sq. ft. above Rampart Street.

In the blocks where the uptown and downtown lines terminate, stops would be made at loading platforms, permitting easy transfer from one line to another. These stops are located in alternate blocks. In the other blocks the present outside tracks would be removed and the space there reserved for parking, thus creating a protected parking space.

In regard to the loading platforms recommended, the report states that on Canal Street they should be not less than 200 ft. long, 6 ft. wide and 10 in. above the top of the rail. To secure full advantage of the plan, double berthing of street cars must be practiced at all times. The use of street collectors during periods of heavy loading is also recommended.

The consultant finds that the tracks and special work on Canal Street are now in such a bad state of repair that the greater part of them will have to be rebuilt during the next few years. It would seem, therefore, that now is the opportune time to make the proposed



Arens and Loading Platforms on Canal Street, New Orleans

changes. If tracks and special work are renewed as they now exist, perpetuation of the present deplorable condition will continue, with the accompanying costly maintenance and cumbersome operation.

On the other hand, the installation of the proposed plan would do away with the necessity of the renewals or replacements now contemplated by the company. The track under the proposed plan could be constructed at a considerable saving over the cost of the necessary renewals, and would materially and permanently reduce operating and maintenance costs. The advantages of the new plan as to track may be seen in the brief comparison in the table in the next column.

This represents a reduction of 51 per cent of track-miles and 75 per cent in the special track and overhead

work. The most important reductions are in the items whose maintenance and renewals are greatest, that is, curved track and special work.

	Present	Proposed
Track in miles.....	6.91	3.40
Curved track in miles.....	0.94	0.22
Track crossings, number.....	60	11
Switches, complete, including mats and frogs.....	60	25

This simplification on Canal Street would result in both immediate and lasting financial benefits. To renew the property along its present lines would cost approximately \$410,000. The new plan can be installed for \$304,000, which will be an immediate saving of \$106,000. The estimated annual maintenance and renewal cost of the present plan is \$62,000 as against \$27,000 under the proposed plan, or an annual saving of \$35,000.

## Bonus Given in Racine for Saving Energy

THE Milwaukee Electric Railway & Light Company encourages the motormen on the Racine division to save energy in car operation by paying a bonus depending upon the saving made. In Racine all of the cars are of one type, namely, Birney one-man cars, except for a few rebuilt safety cars and the trains used during the rush hours. There are two types of trains, namely, a two-car train, consisting of a motor car and a trailer, and the articulated two-car three-truck train, like those used in Milwaukee. Tests have been made with each of these cars and trains to determine the power used, and to simplify the keeping of records all Economy meter records are reduced to the Birney standard.

The present plan was put in operation after it had been determined that the average energy consumption of the Birney cars under Racine conditions at the time the plan was begun was 1.3 kw.-hr. per car-mile, and the company offered to divide the gain made below this figure in the proportions of 40 per cent to the men, 40 per cent to the company and 20 per cent for the expenses necessary to keep the records of the system. Originally, this saving was divided equally among the men, but later (March 1, 1922) the plan was begun of rewarding the more efficient motormen by dividing the bonus in proportion to the efficiency shown.

To do this, it is obviously necessary that the operating conditions, so far as energy consumption is concerned, should be the same for the men compared, and it is quite possible, of course, on any system that one

line may be more hilly or construction work may be going on, or for some other reason some runs require more power than others. Hence, instead of taking the standard of 1.3 kw.-hr. for each line, the average energy consumption per car-mile for each line is taken as the standard and each man is graded as to whether he does better or not so well as the average. The bonus for the entire system, based on the 1.3 kw.-hr. figure, is then divided up among the different lines according to the car mileage on each line, and the bonus for each line is divided up among the men according to their performance. For instance, in Racine during March, 1923, the total bonus earned from energy saving by the seventy-six men employed was \$118.23, the average power consumption being 1.12 kw.-hr. per car-mile, on the Birney car basis. The highest man on the list, instead of getting an average of \$1.56, received \$3.20. His operating average was 0.94 kw.-hr. and he operated during the month 1,543 miles. The motorman using the greatest amount of power used 1.43 kw.-hr. He was penalized 26 cents and was the only man on the list who was penalized.

The way in which an individual bonus would be calculated is as follows:

Assume

- a = Average energy consumption of any particular line
- b = Average energy consumption of the individual
- M = Total car-miles operated on the line

$m$  = Car-miles operated by the individual

$V$  = Total value of the energy saved

$0.4V$  = The trainmen's share of saving made,

then any individual bonus equals a proportional share of the total bonus from energy saving based on car-miles operated, or  $\left(\frac{0.4V}{M} \times m\right)$ , plus the increment earned due to individual efficiency relative to the line average or  $(a - b) \times m \times 0.4V$ .

In other words, the individual's bonus is  $\frac{0.4V m}{M} +$

$(a - b)m 0.4V$ , which is equivalent to

$$m \left( \frac{0.4V}{M} + 0.4V(a - b) \right)$$

Of course when  $b$  is greater than  $a$ , the expression  $0.4V(a - b)$  becomes minus, but only in exceptional circumstances would  $b$  be so large as to make the whole expression a minus quantity. It will also be observed that as every operator is interested in increasing the value of  $V$  there is an incentive for the efficient men to teach the inefficient men to operate more efficiently.

The following is a list of the amounts in round figures since January, 1921, of the savings or loss in energy measured in dollars divided among the men on the Racine system according to the plan described:

January, 1921	Loss \$29	March, 1922	Gain \$86
February, 1921	Loss 22	April, 1922	Gain 91
March, 1921	Loss 23	May, 1922	Gain 134
April, 1921	Gain 17	June, 1922	Gain 156
May, 1921	Gain 22	July, 1922	Gain 113
June, 1921	Gain 77	August, 1922	Gain 183
July, 1921	Gain 91	September, 1922	Gain 169
August, 1921	Gain 75	October, 1922	Gain 180
September, 1921	Gain 72	November, 1922	Gain 128
October, 1921	Gain 61	December, 1922	Gain 68
November, 1921	Gain 23	January, 1923	Gain 78
December, 1921	Gain 00	February, 1923	Gain 73
January, 1922	Gain 22	March, 1923	Gain 118
February, 1922	Gain 44		

It will be noted that the savings are greater in the summer than in the winter months. This is only natural when an annual standard is set, but as any inequalities even themselves out during a year and an annual standard is simpler, the company holds to that plan.

A bonus along the lines mentioned is being considered for the Milwaukee system of the company, but no definite plan has been decided upon. The combined property has 750 cars equipped with Economy meters, having installed the first 350 meters in 1917.

## Carrying Safety to the Public—IV\*

Visualizing the Safety Idea by Means of a Poster Campaign—  
Slogans of Interest Get the Attention of the Public by Wide-  
spread Display—Car Cards Also Can Be Used to Advantage

By C. W. Price

Vice-President in Charge of Public Safety,  
Elliott Service Company, New York City

IN THE development of public safety the question which has claimed attention more and more is how to visualize safety, how to keep safety continuously and impressively before the public. The Washington Safety Council's solution of this problem is by the conduct, on an extensive scale, of a continuous poster campaign. The splendid record recently made of reducing accidental deaths 32 per cent is due, so its officers think, in a large measure to the poster campaign.

Each month a new poster is issued bearing a snappy slogan. For instance, the first poster read, "The Reckless Driver Is a Criminal"; the second, "The Jaywalker Is Taking a Short Cut to the Hospital," and the third poster read, "Better Be Careful Than Crippled." These posters are done in different colored inks and paper each month, and are made in three sizes—25 in. x 38 in., 16 in. x 24 in. and 8 in. x 18 in. The largest sized posters are exhibited on 100 permanent metal sign-boards on stanchions located at important street intersections, at gasoline filling stations, and at entrances to industrial plants. They also are posted on vacant billboards. The second sized posters are exhibited on the dashboards of all street cars, and in government and municipal buildings, including school houses. The smallest sized posters are carried on taxicabs, buses and other commercial vehicles.

The display of posters on street cars, taxicabs, buses, trucks and other commercial vehicles, which are constantly moving up and down the streets, gives an enormous distribution of the poster display, considering the

number used. The posters bearing a slogan printed from type in large, bold letters are much less expensive than those done with elaborately colored cartoons, and are found to be more effective. What is needed is a poster that instantly catches the eye and can be read easily at a distance.

A snappy, gripping slogan is much more effective than either a positive or a negative statement. For instance the slogan "The Jaywalker Is Taking a Short Cut to the Hospital" will be noticed and remembered, when "Cross at the Crossing" or "Don't Jay Walk" will scarcely get a passing glance.

The posters issued thus far have received attention on both the editorial and news pages of the press. In the correspondence columns have appeared numbers of letters, some praising, and some in tart language condemning the posters, all of which is evidence that the slogans did get the attention of the public.

Widely distributed as these posters are over the city, it is not possible for a driver or pedestrian to come down into the heart of the city without being reminded a dozen times of the idea of safety; and he is reminded at the very points where the hazards are greatest. The automobile driver may read articles on safety while he sips his breakfast coffee, and by the time he backs his machine out of the garage, he has forgotten. But if on his way down town he is confronted at every dangerous street intersection with the accusing indictment, "The Reckless Driver Is a Criminal," he is compelled to remember safety. During the progress of the campaign a prominent business man said to a friend, "I am a reckless driver; I'll admit it. But those posters on the

\*The fourth of a series of ten articles.



The Month's Slogan Was Displayed on 100 Sidewalk Signs, and on Cars and Vehicles

Copyright Underwood & Underwood, New York

street have got me. Every time I face one going down town I slow up."

Complete material for a poster campaign, including the posters and instructions regarding their application, are now available and on the market.

Defining the cross walks at street intersections with broad white lines is a method of visualizing safety which has been used in many cities with good results. These lines, if kept freshly painted, not only serve to visualize safety, but they help to direct the pedestrians in the "straight and narrow way."

In order to give variety and a bit of color to the crossings, an arrow or a hand, with the finger pointing to the space between the white lines, should be stenciled on the sidewalk—preferably in a color other than white, the color being changed each time the lines are re-painted.

The outdoor advertising companies, if properly approached, can be induced to allow large vacant billboards to be used at a nominal cost for displaying the slogan. For instance, in Washington a space 30 ft. x 40 ft. located on one of the buildings in the business section was available for two months, and on it was displayed the slogan "The Reckless Driver Is a Criminal," illuminated with electric lights.

A striking poster displayed in the cars and changed frequently offers one of the most direct and effective mediums through which electric railways can reach the

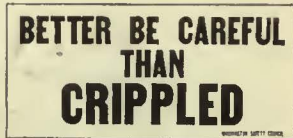
public with safety suggestions bearing on their own particular hazards. The Public Service Railway of New Jersey was one of the first to use this method. This company suspended from the ceiling in the center of each car a frame about 12 in. x 36 in. in size. In these frames were exhibited posters done with cartoons and safety slogans, usually calling attention to the fatal results of carelessness.

That safety can be visualized and that lasting results of benefit to the community can be obtained are shown by the opinions of men who were instrumental in backing the poster campaign in Washington.

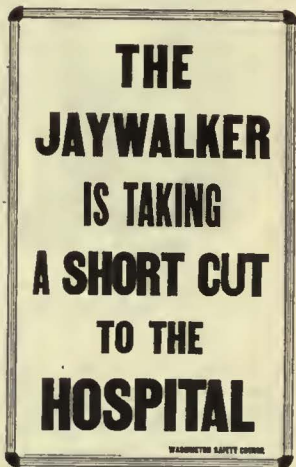
W. F. Ham, president Washington Railway & Electric Company and president Washington Safety Council, says: "The continuous poster campaign conducted in Washington has proved to be one of the most effective means of reaching the public and obtaining their co-operation. It has largely assisted in producing a good accident reduction in the past three months."

J. J. Boobar, vice-president and general manager Yellow Taxicab Company, states: "Results and my personal observation satisfy me that the plain marking in white of street crossings and safety zones and the display of posters with a punch at congested street corners and on street cars, taxicabs and trucks is the most efficient means of minimizing street accidents and carrying a lasting and impressive message to the pedestrians and the drivers."

Major Sullivan, superintendent of the Metropolitan Police, makes this statement: "The safety poster campaign, more than any other single activity, has helped the police department of Washington to curb recklessness and carelessness on our streets, and in two months has assisted in reducing the total number of accidental deaths 32 per cent, traffic deaths 43 per cent, and deaths to children 65 per cent."



Done in Blue Letters on Yellow, This Was Displayed in Vehicles



This Poster Was Displayed on the Sidewalk Signs. It Was Printed in Black on Green



The Traffic Tower at Fifth Avenue and Forty-second Street, New York, Was Used for Poster Display

# A Relay Which Almost Thinks

By the Use of Current and Voltage Windings the Relay Operates with a Delay Which Varies with the Remoteness of a Short Circuit—It Can Be Made Operative with Power in But One Direction

By S. L. GOLDSBOROUGH  
Supply Engineering Department  
Westinghouse Electric & Manufacturing Company,  
East Pittsburgh, Pa.

A RELAY which operates with a degree of promptness depending on the distance of a short circuit from the source of power supply has recently been perfected by the Westinghouse Company. It is intended for the automatic sectionalizing of transmission lines in case of short circuit, under which condition both the excess current and the low voltage are utilized to determine the time delay. It is so designed that the time is directly proportional to the voltage and inversely proportional to the current; hence it is proportional to the quotient of voltage and current, or the impedance, which in turn is proportional to the distance included in the circuit.

Since the tripping time is dependent upon the dis-

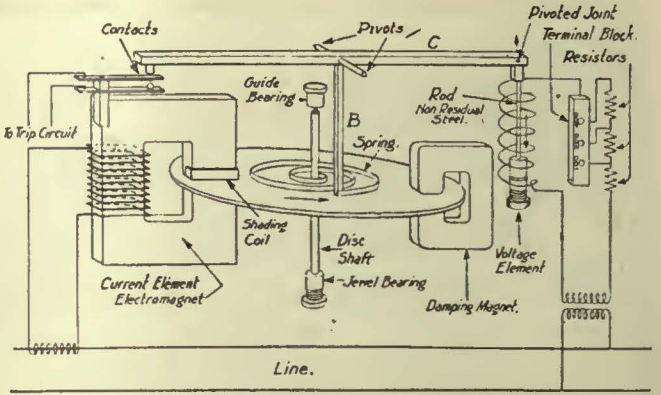


Fig. 2—Schematic Diagram of the Distance Relay

iron case, having a number of ribs cast integral with it, the purpose of which is to keep the temperature of the coil within safe limits.

As the induction disk rotates the spring on the countershaft is tightened and causes a force to be exerted on the lower end of arm B in the direction of the arrow. This force tends to close the contact by rocking the pivoted beam against the pull of the solenoid plunger suspended on the end of arm C. Now for a given position of the damping magnet, the speed of the disk is, within limits, proportional to the current, therefore the time required to travel a given distance is inversely proportional to the time. The distance through which the disk must travel to close the contact is determined by the pull of the voltage coil, which is made directly proportional to the voltage. The time required to close the contact is, then, inversely proportional to the current, directly proportional to the voltage, and, therefore, directly proportional to the distance from the short circuit.

Where the distance relay is to be applied to a ring system or to a line having two or more sources of power, it is necessary to add an additional element to enable the relay to take account of the direction of power flow as well as the location of the trouble. This can be done by equipping the relays with a directional element (see Fig. 3) the contacts of which are in series with the contacts of the distance element and connected so that they close only when the power is flowing away from the busbars. The directional element is similar to the familiar reverse-power relay.

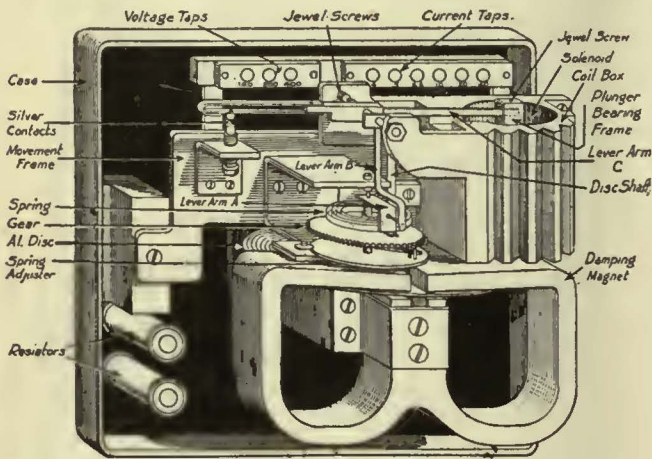


Fig. 1—Sketch Diagram Showing Principal Parts of the New Distance Relay

tance of the relay from the short circuit, the relay nearest the fault will trip first, those farther away automatically increasing their time of operation in order to allow the relay nearest the short circuit to close its contacts and trip its circuit breaker first, thus cutting out only that section of the line which is in trouble.

Figs. 1 and 2 show the principle of the relay. Essentially it consists of two elements, a current element and a voltage element. The former is similar to that used in the standard induction overload relay. An aluminum disk is driven by an electro-magnet against the damping action of the permanent magnet at a speed dependent in part upon the position of the permanent magnet and approximately proportional to the current. A countershaft carries the lever arm A, a spring and a spring adjuster, and is geared to the shaft of the induction disk.

The lever on A is movable on the shaft and carries the outer end of the spring, the inner end of which is fastened to the disk shaft. A rocker arm pivoted in jeweled bearings carries the contact on one end and the core of the voltage element on the other end. This voltage element consists of a solenoid sealed into a cast-

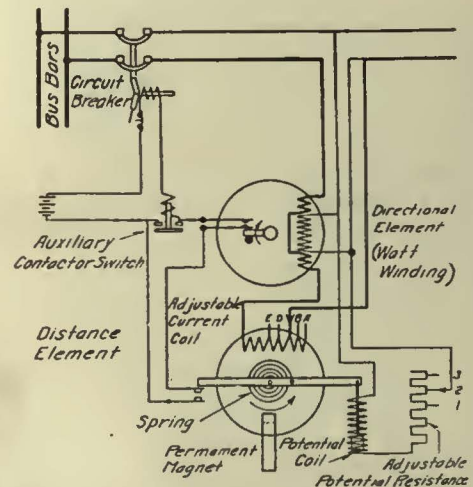


Fig. 3—Internal Connections of the Directional Distance Relay—Distance Element Below, Directional Element Above

# Association News & Discussions

## Transportation as Discussed by Southwestern Association

THE street and interurban railway section of the Southwestern Public Service Association held its first session at the Fort Worth convention on May 16. Alves Dixon, El Paso, Tex., presided.

Dr. Alden Coffey, Fort Worth, read the first paper, which was entitled "Human Maintenance in Industry." An abstract of this will appear in a later issue. Supplementing the paper Dr. Coffey stressed the importance of periodical physical examinations of employees to disclose lowered vitality. He suggested that every large company should provide for the employee who is nervous and irritable, and sometimes melancholy, because of worry over financial or domestic affairs. Each might establish some sort of a "listening post" where employees could explain their troubles. Many of the troubles will prove to be imaginary. At any rate, brooding over them has a tendency to increase labor turnover and decrease production. More attention should be paid to preventive rather than curative medicine.

At the same time, said the speaker, there are certain physical conditions which should determine the fitness of an employee to continue in his present service. Upon the development of any one of the following conditions, either he should be discharged or transferred to some other department where his particular ailment will not unfit him for the position assigned him, or jeopardize his fellow worker: Partial blindness, partial deafness, organic heart defect, hernia, varicose veins, venereal diseases, senility, diseased tonsils, decayed teeth and pyorrhea.

Dr. Coffey urged that every company have made a yearly health survey, stressing the importance of blood pressure tests together with exhaustive urinalysis. Measures to prevent disease increase output, decrease training costs, decrease labor turn-over, stimulate the good will of employees, reduce compensation costs, reduce loss of time due to sickness, protect the public from infectious diseases, remove causes of dissatisfaction, reduce death to a minimum, prevent accidents, protect employees from infection and give the employee an opportunity to discover a disease early enough to combat its deadly work.

In reply to a question as to whether the methods suggested by Dr. Coffey are being followed by any company in Texas he replied that no company, as

far as he knew, had adopted strict rules in this connection, but several companies are following the suggested plans to some extent.

In reply to a query: "Can these examinations be made compulsory, or should they be entirely voluntary?" George H. Clifford, Fort Worth, said that such examinations have been compulsory in his organization (Northern Texas Traction Company) since the beginning. No man can enter the employ of this company unless he passes an acceptable physical examination or, following the recommendation of the examining physician, agrees to correct unacceptable conditions which have been brought out in the examination.

Mr. Clifford also explained a "dollar-per-month plan" for caring for sick and injured employees. This is a co-operative proposition among the employees, each contributing \$1 per month to a sickness and accident fund. The contributions are matched dollar for dollar by the company. The fund thus accumulated is ample for its purpose.

H. S. Mann, Chicago, recommended that the purposes of a physical-examination plan be explained to all employees, to eliminate misunderstanding. Dr. Coffey agreed that the whole proposition is a matter of education and must be thoroughly understood by each employee in order to be effective. It must be diplomatically handled by company officials in order that employees be not offended.

Following Dr. Coffey's paper, N. S. Hunsden, director of the State Board of Industrial Education, spoke on "Educational Opportunities for Industrial Workers." He recommended the establishment of vocational-training classes in every electric railway organization.

In the past, said Mr. Hunsden, there has been no plan for training people vocationally other than the haphazard hit-and-miss practice generally found in big prosperous industries. There had been no consistent training, other than that given the foremen of the different departments, until recent years, or since the World War. He explained that, as a result of the Smith-Hughes law passed in 1917, funds of the national and state boards are dispensed through the state board to the local school. The benefits are not confined to the people in the industries.

The leaders of vocational training classes, he said, should be selected with care from the ranks of employees and should not come from among officials of

the company or heads of departments. Their services should be voluntary.

Mr. Hunsden complimented the Northern Texas Traction Company for sending a representative to take certain training under the State Board of Vocational Training. This leader has since been conducting vocational training classes among the employees of the Northern Texas Traction Company. At a meeting and banquet held in the Texas Hotel on May 15, 1923, certificates of graduation were given the car inspectors of the company who had completed work outlined by the instructor along lines suggested by the state board. The state, he said, has sufficient funds to continue the work during the coming year and he understood that the Legislature plans to supply funds so that vocational training may be carried on indefinitely.

Luke Bradley, Houston, Tex., expressed approval of Mr. Hunsden's work, stating that there is much of personal satisfaction in helping one's fellow men, to which end vocational training not only demands, but deserves serious consideration.

Next on the program was J. T. Porter, Fort Worth, who read a paper on the "Reduction of Maintenance Expense Through Reclamation Work." An abstract is given below.

## Reclamation Work Reduces Maintenance Expense\*

BY J. T. PORTER

Master Mechanic Northern Texas Traction Company, Fort Worth, Tex.

RECLAMATION work begins with the human element. A clean, healthy body and an active mind enable a man to profit by the educational and training programs that are within his reach today as never before. What a man must realize is his duty to himself, to prepare himself for better work tomorrow. The principles of the electric railway business must be kept before our employees and they must be encouraged to develop their knowledge of cost values, accident hazards, etc.

Efficiency is one of the greatest elements in human progress, but men, like materials, may be allowed to go to waste if not reclaimed.

In the broad sense of the word all maintenance is reclamation. Our maintenance costs are reduced and production is speeded up by the application of all practical labor and time-saving devices. Machines that save time and

\*Abstract of paper read before street and interurban railway section of Southwestern Public Service Association, at the nineteenth annual meeting, Fort Worth, Tex., May 15 to 17, 1923.

labor require fewer, though better-trained operators, and the reduction in necessary physical exertion further encourages a higher class of production and a better morale in all sections of the shop.

The possibilities of reclamation work are greatest in the mechanical department. Here the variety of materials is greater, and the number of articles needed is larger than in other departments, but there are opportunities in all departments. In Fort Worth hardly a day passes but that we find some small way of improving the reclamation methods with little increase in overhead expense.

Our reclamation department is housed in a 40-ft.x36-ft. section of the truck shop and is provided with 350 shelves of various sizes, bins for scrap copper and waste, spare controller racks, glass racks, 560 small bolt bins, armature rack for taking care of "O. K." armatures, and a bench with a vise and air connections for use in reclaiming material. This department is in charge of an all-round competent man who has two other men under him.

It is the rule of the shop that nothing is junked or laid aside unless it has been through this room. All material removed from cars, no matter how useless it may appear to be, is carried there for inspection and all requisitions on the general storeroom are issued there. The men are required to turn in an old part before an order for a new one will be issued.

The following statement of maintenance costs for the first three months of 1923, as compared with the same period for 1922, shows the results which we have had in reducing our maintenance expense, a large part of which we are sure was due to our reclamation and educational programs.

During the first quarter of 1922 the company spent for maintenance of car bodies, trucks, and air and electrical equipment of all types of cars a total of \$47,576.69. During the same period of 1923 the amount was \$41,592.14, a decrease of \$5,984.35 or 13 per cent.

During the first quarter of 1922 forty-four cars were put through the carpenter and paint shops for heavy repairs and painting at a total cost of \$10,818.28. In 1923 fifty-six cars were put through at a cost of \$12,052.73. That is 37½ per cent more cars were turned out with only a 10 per cent increase in cost.

Deducting from the totals for the first three months of each year the costs of repairs to cars put through the carpenter and paint shops, there remains a total saving in running repairs of \$7,219, or 20 per cent.

During these two periods the number of employees in the mechanical department remained about the same, namely 153 in 1922 and 150 in 1923. In the first three months in 1922 it was necessary to make 606 changes on all our cars, while in 1923 it was necessary to make only 513 car changes, or a decrease of 93 car changes or 15 per cent over 1922.

## Merchandising Transportation\*

By RICHARD MERIWETHER

Vice-President and General Manager Dallas Railway, Dallas, Tex.

THE term "merchandising transportation" has come into popular usage among members of the street railway fraternity only within the last year or two. It would, therefore, appear that traction managements have recently discovered a new element in their business, and that it is taking a first rank position among the problems of the industry.

Merchandising transportation is the development of the transportation service furnished by street railways along lines which will attract patrons other than those who from necessity must use the street cars. To incite a desire upon the part of the public to use the service at other times than when from necessity they must go to their business and home again by means of the street railway requires true salesmanship. The traction business has become a highly competitive one; and, as in other competitive businesses, the art of salesmanship must be called into play in order to produce the maximum results.

Let us examine this problem of merchandising from the traction manager's standpoint, in order to determine some of the sales factors that enter into it. While the mere fact that there are street cars is a notice to the public that a service exists, the frequency of the service largely determines the number that will ride. The development of the light-weight, one-man safety car, affording a means of giving more frequent service at less expense, has furnished a most excellent means of selling rides.

The speed at which the car travels is another important factor; and every effort should be made to afford the public not only a frequent service but a rapid one. The safety car has enabled street railways to improve their schedule speeds, by reason of the quicker starting and stopping qualities of the car, and the elimination of loss of time in giving signals from the conductor to the motorman.

The appearance of the equipment is another element which figures in the sale of the service. An attractively painted, clean, smooth-running car will certainly invite patronage. Not only should the car be attractive in appearance, but the motorman and conductor, likewise, should be in keeping with their surroundings.

The handling of the car by the motorman and the handling of the passengers by the conductor play a most important part in satisfying the patrons so as to develop future business. The motorman who brings his car to a smooth, easy stop; who accelerates his car gradually, and whose every action assures the

passenger that he is in the hands of a safe, careful operator, helps materially in completing a satisfactory sales transaction. Likewise, the conductor who greets his passengers with a smile, who answers questions pleasantly and in a businesslike manner, and who is willing at all times to assist in every way possible in making his passengers comfortable, promotes an inclination on the part of the patron frequently and continually to buy the service.

Type of equipment is also a potent factor in the merchandising of transportation service. Cars that are easy to enter and to leave; with steps reasonably low; with wide aisles which permit one to move in the car, even though it contains standing passengers, without undue crowding; and with a seating arrangement affording comfort to the rider, will add no little to the patronage of the traction company.

As an indication that traction companies recognize this fact, the side-seat car, which is conceded to be an uncomfortable one to ride in and is not popular with the public, is gradually being superseded. Further, many of the newer types of cars are now built with small wheels, which permit the use of a low step.

In the merchandising phase of the traction business, every official and employee of the company plays his part as a sales medium; and, likewise, every physical element of the property has its bearing as a sales factor. And, finally, a management that has won the good will of the public will receive more patronage than one whose public is antagonistic.

## Convention of Associated Advertising Clubs of the World

THE annual convention of the Associated Advertising Clubs of the World will be held in Atlantic City, June 3-7, and there will be an accompanying large exhibit, including foreign and domestic general advertising, industrial advertising and public utilities advertising. The hotel reservations indicate the largest attendance in the history of the association, and the number of foreign delegates to be in attendance is unprecedented. Among the addresses will be one by Floyd W. Parsons on "What Advertising Has Done and Can Do for Public Utilities," one by Bernard J. Mullaney, Chicago, on "Public Utilities in Connection with Community Advertising" and a committee report on standardization of industrial advertising literature, presented by J. C. McQuiston. The Associated Public Utilities Advertising Association will meet at the St. Charles Hotel, Tuesday morning, Tuesday afternoon and Wednesday morning. The speakers include: Grover C. Maxwell, former secretary Ohio Public Service Commission; W. H. Boyce, general manager Beaver Valley Traction Company; P. H. Gadsden, vice-president United Gas Improvement Company; James O'Shaughnessy, executive secretary American Association of Advertising Agencies; W. S. Vivian,

\*Abstract of paper read before street and interurban railway section of Southwestern Public Service Association, at the nineteenth annual meeting, Fort Worth, Tex., May 15 to 17, 1923.



Middle West Utilities Company; J. C. McQuiston, manager publicity department Westinghouse Electric & Manufacturing Company; Francis H. Sisson, vice-president Guaranty Trust Company of New York; W. H. Hodge, manager advertising department Byllesby Engineering & Management Corporation, and W. B. Strandborg, Portland Railway, Light & Power Company and vice-president Thirteenth District, Associated Advertising Clubs.

As a supplement to the convention, on Friday, June 8, the McGraw-Hill Company will provide a special exhibit of industrial advertising at its building, Tenth Avenue and Thirty-sixth Street, and is arranging for an inspection tour of the offices and a luncheon for the benefit of delegates to the convention. Included in the exhibit will be displays of industrial advertisements, industrial market data and other material of special interest to industrial advertising men. After the inspection trip a selected number of industrial motion pictures will be exhibited.

### C.E.R.A. Car-Braking Tests

A SERIES of car-braking tests have been completed under the auspices of a committee of the Central Electric Railway Association. They were inaugurated following a paper read at the January meeting of the C.E.R.A. by H. C. De Camp, which was abstracted in this paper for Jan. 27, 1923, on page 172. These tests were made May 15, 16, 17 and 18, over the tracks of the Terre Haute, Indianapolis & Eastern Traction Company, between the towns of Lebanon and Crawfordsville, Ind.

The tests were made to determine the most efficient way to stop a car, and the distance required for making the stop. The cars tested included a heavy interurban car, a double-truck city car, and a Birney safety car. The necessary apparatus was installed on each car to get a complete record of the variable elements in making stops under different conditions. Straight air brakes, automatic air brakes, and dynamic braking were employed. It was found that from speeds below 10 m.p.h. the car could be stopped in a shorter distance with dynamic braking than by the use of air, while at higher speeds the air brakes stopped the car in a shorter distance.

The members of the committee on tests of the C.E.R.A. who were present, were S. W. Greenland, H. C. DeCamp, G. K. Jeffries, and Prof. D. D. Ewing of Purdue University, who was in charge of the tests. The executive committee of the American Electric Railway Engineering Association, was represented by Charles H. Clark of Cleveland. The Ohio Public Utilities Commission was represented by T. H. Barke, inspector of safety appliances, and H. M. Evans. The Indiana Public Service Commission was represented by D. E. Mathews, chief inspector. Others in the party were: R. W. Emerson and Terence Scullen, Cleveland Railway;

Harry Coleman, Indiana Service Corporation; C. E. Masterson, Northern Indiana Power Company; S. D. Hutchins, B. H. Hartsock, C. W. Mailphant, H. Wood, L. Wilcox and P. B. McGinnis, Westinghouse Air Brake Company; Charles Ives and E. S. Gunn, General Electric Company; L. E. Earlywine, secretary Central Electric Railway Association; W. L. Galay, W. E. Blowers and Merle Aldrich, Purdue University.

### New Englanders Discuss Education

ON MAY 10, 1923, a joint meeting was held in Providence, R. I., of the United Electric Railways company section of the American Electric Railway Association and the New England Street Railway Club. The program consisted of entertainment, felicitations from a number of prominent visitors, a running fire of wit and humor from the toastmaster, Alonzo Williams, and an address on education by Prof. W. H. Timbie of the faculty of the Massachusetts Institute of Technology.

Prof. Timbie explained that in his attempt to interest the Boston Elevated Railway in co-operative schemes of education he constantly met the question, "What will this do for the men in the employ of the railway?" It was finally agreed that the educational problem is larger than any scheme of co-operation.

The speaker explained further that the problem is one of training every man in the industry to make the most he can of his own ability and to secure the highest position that he is capable of filling. Furthermore, there is the bringing of new blood into the industry, in order that the industry may not get into ruts. The American idea of vocational education is not only to train a worker to give him the greatest possible skill in his present work, but also to train him to progress.

An example cited by Professor Timbie was the course in practical electricity recently completed by 140 employees of the Boston Elevated Railway. At a dinner given by the company at the Harvard Club in Boston, the president of the board of trustees returned to these employees the tuition fee of \$5 each, which they had paid, with these remarks: "We are not giving you a present, we are not giving you any bonus, we are making an investment. I consider the five dollars which we have invested in each of you the best five-dollar investment the company ever made."

In connection with the co-operative efforts which are being made by the Boston Elevated Railway and the M.I.T., one opportunity is afforded the railway employees in the form of evening courses. Men may take a course in engineering four evenings a week. They can, if they so desire, enter the day course with credit for work done in the evening course. It is hoped that scholarships can be arranged to enable the evening-course men to take

the day course as soon as they are prepared for it.

Under a new plan, the Elevated Railway is taking on each year two M.I.T. juniors who have maintained a high standing at the Institute, and giving them an opportunity alternately to work on the railway property and in the Institute. A student works with the railway for three months and then exchanges places with another student who has been engaged on his studies. After three years of this alternating procedure, the student is granted a master's degree. The work is continuous for the three years with the exception of scattered short vacations of a total duration of four or five weeks per year.

While with the railway the student starts in as a motorman or conductor, and goes through the several departments. He learns the practical side of electric railway work, along with the theory, and his theory is translated into the terms of electric railway work. He lives in the atmosphere of the electric railway while he is studying.

While this plan has been in operation only about a year, the results are already very satisfactory. A plan similar in principle has been in operation in co-operation with the General Electric Company for four years, involving about forty men each year.

Professor Timbie explained that the co-operative work between the Boston Elevated and the M.I.T. is the outgrowth of the work of the committee on education of the American Electric Railway Association, of which Edward Dana, general manager of the railway, is chairman. Mr. Dana is not asking other railways to do what he is not willing to do himself. He is trying to follow out the recommendations in the report of the committee presented last year at Chicago.

## American Association News

### Plans for Increasing the Membership

AT A MEETING of the American Association committee on company and associate membership, held in New York City on May 24, plans were laid for an active campaign during the summer. The "prospect list" has been divided among the committee members and individual study will be given the case of each "prospect." A circular, outlining the advantages of membership by pointing out what the association is doing, will be prepared as an aid in the campaign.

The committee members in attendance were: W. H. Sawyer, East St. Louis, Ill., chairman; H. H. Norris, New York City, and E. P. Waller, Schenectady, N. Y. J. W. Welsh, executive secretary, was also present.

# Equipment Maintenance Notes

## Portable Pneumatic Jack Makes Handy Device

WHERE truck overhauling work is done only at infrequent intervals, and the expense of elaborate machinery for raising car bodies is not warranted, the portable pneumatic jack is a handy device. Apparatus of this sort, built by the Buffalo & Lake Erie Traction Company, Erie, N. Y., has proved very



Pneumatic Jacks Easily Moved Anywhere In the Carhouse Are Used for Lifting Car Bodies

useful in one of the carhouses, where there is occasional need to remove a truck.

Each jack consists of a cylinder 18 in. in diameter and 14 in. in height. It is connected by a flexible hose to the compressed air system at any one of many conveniently located outlets, and the flow of air into the cylinder is controlled by an engineer's valve attached thereto. One

jack is put on each side of the track and a section of rail placed on the piston heads of the two cylinders.

Two men are required for this operation, one at each jack. They can by careful observation and proper manipulation of the air valves keep the cross rail very nearly horizontal. After the car body has been raised far enough for the trucks to be pushed from under, the jacks are replaced by horses. From ten to fifteen minutes is required to remove a truck. The operation is reversed in lowering the bodies down upon the trucks after the work has been completed. Heights are then checked by measuring from the underside of sill to the top of the rail.

The portable feature of this apparatus consists of a separate two-wheeled truck, as shown in the accompanying illustration. It works on the same plan as a barrel truck, inasmuch as the edge is inserted beneath the cylinder base, and when the handle is lowered, the cylinder is tipped over and rests in a cradle. The heavy jacks are easily moved from place to place by this means.

## Covered Transfer Table

WHERE open transfer tables are used, stormy weather conditions are likely to interfere with the work, and in the case of moving cars which have been recently painted and are not thoroughly dry there is danger of spotting. This difficulty has been solved in the Harvard shops of the Cleveland Railway by provid-

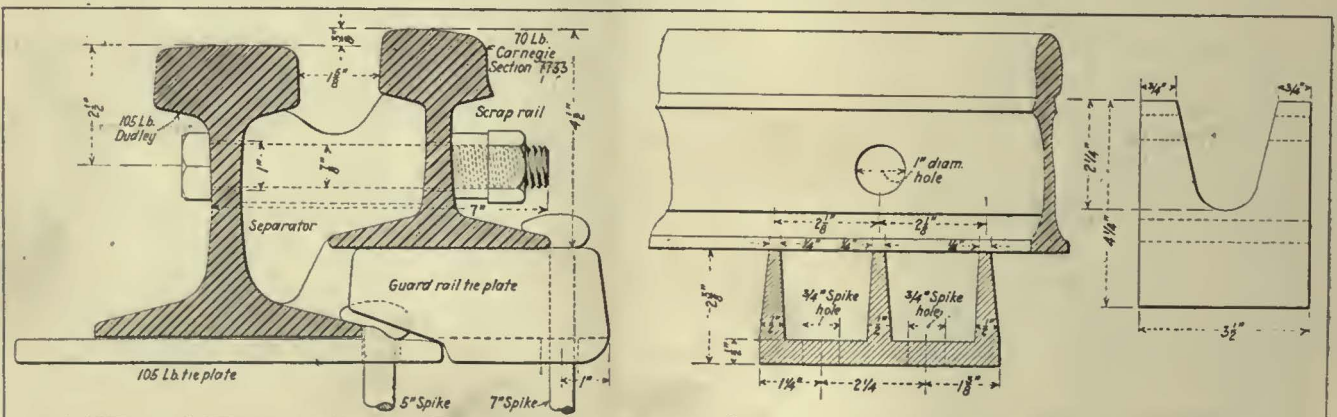


Covered Transfer Table in Harvard Shops of Cleveland Railway

ing a covering for the transfer table. This was added partly to protect the cars and partly as a protection to workmen who are required for shifting the cars during stormy weather conditions.

## Guard Rail with Inside Spiking of Main Rail

AN ACCOMPANYING illustration shows a type of construction used extensively by the Lehigh Valley Transit Company, Allentown, Pa., for T guard rail which permits of inside spiking of the main rail. For the guard, scrap rail is used, but of course only such lengths as have a fairly thick ball and one side in fair condition. With this type of construction it is unnecessary to cut off the inside of the base of the rail in order to give clearance for the installation of the guard. In the construction illustrated, 105-lb. Dudley T-rail is used for the main rail and 70-lb. Carnegie section 7033 for the guard rail. A special guard-rail tie plate is used underneath the guard, a separator of special section being required.



Guard-Rail Construction Used on All Curves Above 4 Deg. In Open and Paved Track of the Lehigh Valley Transit Company At left, cross-section of construction. In center, cross-section of guard-rail tie plate. At right, end view of separator

## Transfer Car Handles Armatures for Baking

BY JOHN S. DEAN

Renewal Parts Engineering, Westinghouse Electric & Manufacturing Company

**I**N CONNECTION with the process of dipping armatures in an insulating varnish and then baking them so as to increase the life of the windings the problem of the most economical method of transferring armatures to and from the oven must be solved for each individual installation. In connection with some ovens a monorail transfer system is used where the armatures are hung on carriers that run on an overhead

This tray collects the excess varnish which runs from the armatures, and thus the floor is kept clean and free from varnish drippings. The wheels of the car are fitted with ball bearings, which make it possible for one man to push the car in and out.

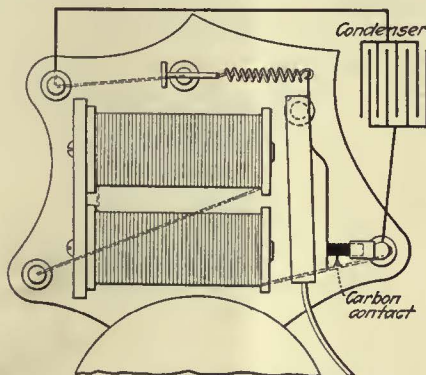
The floor of the car is provided with holes conveniently spaced to hold the maximum number of armatures in an upright position, commutator end up, thus economizing oven space during the baking process. The holes in the car floor are also fitted with short pieces of pipe extending above the bottom of the tray to prevent any excess varnish from draining down on the clean armature shafts.

This design of car has been found to work out very economically in service, as it facilitates the loading, draining, handling and baking of the armatures.

## Eliminating Sparking at Crossing-Bell Contact

**T**HE Portland Railway, Light & Power Company, Portland, Ore., has several crossing bells of ordinary make-and-break type which continually gave trouble due to the burning of the contact. These bells are shunted around 80 ohms resistance.

Experiments were made with spring contacts in order to provide a working contact at the break, but the result was not satisfactory. Finally, a carbon contact was arranged as shown in the accompanying illustration, the carbon being mounted in a brass holder. Results were excellent, but still further to eliminate the arc a telephone condenser, of 1 microfarad capacity, was



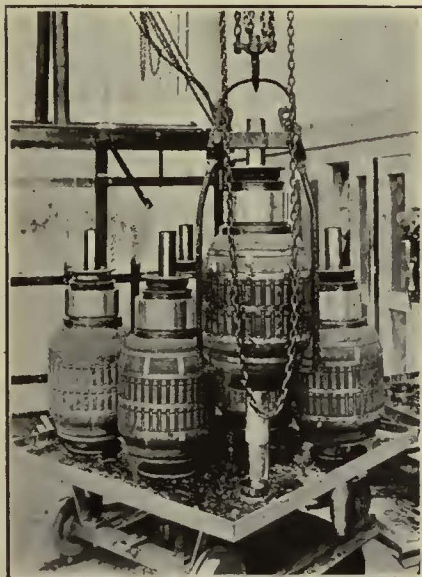
Carbon Crossing-Bell Contact Which Has Proved Effective in Eliminating Blistering

shunted around the contact. Now, there is no blister formed at the contact as formerly, and the wear of the carbon is so slight as to require re-

placement only at long intervals. Contacts of this type have now been in service for more than two years, and no failures have resulted which could be attributed to them.

## Greasing Trolley Wire Reduces Wear

**F**OR several years the Lehigh Valley Transit Company, Allentown, Pa., has been obtaining good results from greasing its trolley wire. Miller trolley shoes are used on a number of the lines, and at one time it was apparent that these were causing considerable wear of the trolley wire, as the roofs of cars showed an accumulation of particles of copper. Greasing the wire was undertaken to remedy this condition



Convenient Car for Handling Armatures While Baking

rail construction. On others, special stands mounted on wheels are used to carry individual armatures. In some cases these armatures are transferred from the stands to racks built in the oven, while on others they run the stand containing the armature into the oven and leave the entire outfit inside the oven during the baking process.

One very common method used is to construct a narrow-gage track running from the dipping tank into the oven, from which are run specially designed cars made to hold a number of armatures in a vertical position commutator end up. A type of truck used by one operator for this work is shown in the accompanying illustration.

The body and floor of the car are constructed in the form of a tray equipped to hold the armatures in a vertical position while draining.



The Grease Reservoir and Piping Are Installed Inside Car

and careful observations indicate that it has done so.

An old double-pole car is used for the greasing. One pole is used for operating the car, while the other is equipped for the greasing operation. Accompanying illustrations show the reservoir, piping and greasing shoe. The grease used is Houghton's L Nos. 3 and 4, manufactured in Philadelphia, Pa. It is placed in a reservoir inside the car and is fed from this by air pressure through piping and hose to the trolley shoe, which greases the wire as it slides along.

The reservoir is 12 in. x 32 in. and has a plugged opening at the top for filling. The air is piped from the air reservoir to a center connection of this grease reservoir. A cut-out cock installed adjacent to the reservoir permits regulation of the air pressure and a gage indicates the pressure employed. The grease is

forced out of the bottom of the reservoir, through a  $\frac{3}{4}$ -in. pipe connection, thence is led to the roof through a  $\frac{3}{4}$ -in. pipe. A cut-out cock is used in this line also for cutting off the supply.

In order to provide for movement of the trolley base, the connection from the roof to the trolley pole is made with flexible hose. A  $\frac{3}{4}$ -in. iron pipe is led along the trolley pole, and



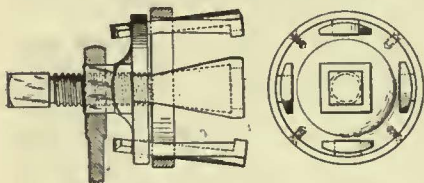
Greasing Shoe and Basket

again at the shoe a hose connection is used. The greasing shoe has a hole drilled through the center for the connection, and the grease is forced through this and oozes out into the shoe. It is thus spread along the groove in the shoe and so greases the trolley wire as the car operates.

In order to catch any particles of grease that might fall from the shoe a sheet-iron basket of about 12 in. x 12 in. is hung under the shoe. At an air pressure from 60 to 80 lb. 9 gal. of grease is distributed on 16 miles of trolley wire. The present practice is to grease the wire at intervals of from three to eight weeks.

### Handy Type Pinion Puller

MANY methods and devices are used in the various shops of electric railways for removing pinions from armature shafts. The old method of driving a wedge between the back of the pinion and the motor housing has been abolished, in most



Convenient Type of Pinion Puller

cases, in favor of some type of pinion puller. The wedge method frequently resulted in damage to the armature bearing collar and motor housing. A convenient type of pinion puller successfully used in the Harvard shops of the Cleveland Railway is shown in the accompanying illustration.

This pinion puller consists of a heavy metal plate with slots in which are inserted four T-shaped dogs. A removable band or ring holds the dogs loosely in place. To remove a pinion the dogs are spread outward so as to pass over the outside of the pinion and are then hooked over the inside face. The ring is then slipped down over them to hold them tightly in place. There is a heavy screw which works in the end plate and presses against the end of the armature shaft. By turning this jackscrew with a long-handled

wrench, pressure is exerted on the pinion teeth from the rear, and this pressure pulls the pinion off. The outside end of the metal plate has a squared portion, so that a wrench can be placed on it to hold it in position while the pinion-pulling operation is taking place. By the use of different-sized rings the same pinion puller can be used to remove pinions of varying sizes. This particular type of pinion puller is the invention of Christian Reinker and has been patented by him.

### Rail Made Positive Pole for Welding in Havana

THE annual report for 1922 of the Havana Electric Railway, Light & Power Company discloses at least one advantage for the double-trolley system used in that city. The statement is made that in track welding from the trolley circuit in Havana the track is made the positive electrode, so that the company gets one advantage of a motor-generator welder without the complications. Since the greater part of the heat in an arc is at the positive electrode there is an advantage in having the rail the positive pole. A puddle of metal will thus be maintained at the welding point, so that the molten metal which is being applied will form a better union with the rail. Where connections are reversed and the rail is connected to the negative side, there is a tendency for the molten metal to fall on a comparatively cold surface, so that an imperfect weld may result. During 1922 the company ordered two more arc welders and now has four. They are being used extensively.

## New Equipment Available

### New Low-Energy Relays

THE Westinghouse Electric & Manufacturing Company has added to its line of relays low-energy instruments, to be known as the low-energy Type CO and low-energy Type CR relays. Each is

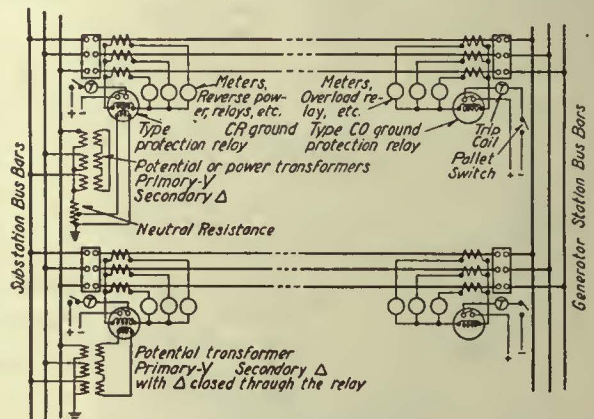


Diagram Showing the Method of Using CO and CR Ground Protection Relays

made in 4 to 12-amp. and  $\frac{1}{2}$  to 2 $\frac{1}{2}$ -amp. ranges.

In the higher range the CO relay is designed for use where low-ratio bushing-type current transformers are the only convenient means for supplying energy to the relay. It should be used for line sectionalizing and the overload protection of power transformers where the low energy type is necessary.

The lower ampere range is intended for the differential protection of generators, large motors, etc., where a sensitive relay is desirable and where the current transformers on both sides of the main winding can be exact duplicates, but it is too sensitive for the differential protection of power transformers.

The low-energy CR relay in the 4 to 12-amp. range is intended for line sectionalizing to protect against short circuits in exactly the same way as the standard CR, except that the low-energy type is necessary where the transformers are of the bushing or any other type that can carry only a small secondary burden. The  $\frac{1}{2}$  to 2 $\frac{1}{2}$ -amp. relay is used as a ground relay for automatic sectionalizing of transmission lines. Only one ground relay is required for each circuit, and short circuits are taken care of by line relays.

# The News of the Industry

## Amended Contract Ready

**Electors of Saginaw on June 25 Will Vote on Fifteen-Year Grant with Ten-Cent Cash Fare**

After a series of conferences between the City Council of Saginaw and Otto Schupp, grantee under the last two street car-bus franchises, a modified contract has been prepared and accepted by the bondowners' protective committees on the defunct Saginaw-Bay City Railway.

Because of the elimination of some of the objectionable features of the last two contracts those who have striven during the last two years to obtain a satisfactory solution of the transportation problem in Saginaw believe that the measure will be approved by the electors on June 25, particularly as it has the support of a friendly city administration.

Since Aug. 10, 1921, the city has depended upon buses of all types to transport the people. Attempts have been made to secure the return of street cars with motor bus extensions, but they have all failed, once through an error of an election inspector and the other time by about 100 votes short of the majority of three-fifths necessary for approval. A franchise for city-wide motor bus operation attracted only a few more votes than the negative vote cast against the railway proposition. These contracts were submitted during the administration of a hostile Council. Since the election on April 2, a new Mayor and two Councilmen chosen on a street car platform have taken the lead in preparing a new contract.

Many believe that the previous grants were defeated on account of the provision fixing the grant at twenty-five years, stipulating the rate of fare for only two years and authorizing the State Public Utilities Commission to settle disputes and adjust the rate of fare on a value fixed after the two-year period, on application of either party.

The franchise now before the electors was drawn with these provisions eliminated. The term of the grant is fifteen years, and fares are to remain unchanged during this entire time. The cash fare is to be 10 cents, with four tickets for 25 cents. Six school tickets will be sold for 25 cents. There will be universal transfers.

Any disputes between the operating company and the City Council will be settled by arbitration, the three members of the board to be citizens of Saginaw. One is to be appointed by the company, one by the City Council, and the other by the Federal Judge of the district of which Saginaw is a part.

Should either party fail to appoint an arbitrator, the other, upon proper written notice, can appoint the third and the decision of the board is final.

Before the franchise can be assigned, the company must deposit \$400,000 for the purpose of rehabilitating the property and certain renewals must be made upon thirty days notice from the Council. The company is relieved of all paving and repaving, but must keep the paving between and 12 in. outside of its tracks in proper repair. Should the company fail to do this work, the city will proceed, charging the cost to the company. To assure payment, the grantee must maintain a revolving fund of \$1,000 for the purpose.

The board of directors is to consist of nine members, and not less than six to be citizens of Saginaw. The directors must be approved by the Mayor and Circuit Court judges.

The present rolling stock of the company will be used, but must first pass inspection by the Council, and before motor buses are purchased the specification must be approved by the Council.

The frequency of service and type of equipment, routes to be traversed, seating capacity, etc., are to be regulated by the City Council.

The city has the right to purchase the property at any time. If the company and the City Council cannot agree upon the price, it is to be fixed by arbitration.

Ninety days are allowed for the organization of the company after acceptance by the city, as it was believed it would take that long to get the property out of the bankruptcy court.

## Wages Increased Three Cents an Hour in Alton

The receivers of the Alton, Granite & St. Louis Traction Company and the employees have arrived at a settlement, whereby wages are to be increased 3 cents an hour, effective May 1, 1923.

On the city lines in Alton, where practically all the cars are of the one-man type, the new wage, in cents per hour, is as follows:

For the first three months.....	45
Next nine months.....	48
One year and thereafter.....	52
Four cents additional for men when operating one-man cars.	

On the interurban lines, the new scale, in cents per hour, is as follows:

For the first three months.....	50
Next nine months.....	53
One year and thereafter.....	56

The East St. Louis & Suburban Railway and the East St. Louis Railway are arbitrating wages, but have agreed on all working conditions.

## Adopts Resolutions

**Spartanburg Chamber of Commerce Makes Requests of City Council—Railway Seeks Abandonment**

The railway problem affecting residents of Spartanburg, S. C., for more than a year appears to be on its way toward a settlement. At a recent conference held at the Chamber of Commerce at which were present officials of the Spartanburg Chamber of Commerce, members of the State Railroad Commission and a number of citizens, two resolutions were passed by the board of directors. The first one, suggested by Charles O. Hearon, a director of the Chamber of Commerce, was in the nature of a request to the City Council of Spartanburg to explain to the people its aim and policies with respect to the South Carolina Gas & Electric Company. The second resolution, offered by John B. Cleveland, was a request to the City Council to protect the railway from the competition of jitneys over the streets on which electric cars are operated.

H. H. Arnold, member of the Railroad Commission, gave the commission's views on the situation. He outlined events from Jan. 10, when the company gave notice that it would cease to operate, and through the time that the commission took over the property. He asked for the hearty co-operation of the citizens of the city, saying that if the local railway was dismantled, junked or sold the entire city would suffer. He announced that the 5-cent fare started some weeks ago at the suggestion of the commission had more than doubled the number of passengers carried, but that, as had been expected, there had not been a corresponding increase in revenue.

B. T. Earle, president of the Bank of Commerce and a director in the South Carolina Gas & Electric Company, spoke in behalf of the railway, saying that the people of Spartanburg rode too much in automobiles.

The meeting was the result of a hearing before the commission on April 27 held at the request of the South Carolina Gas & Electric Company with a view to providing the people of Spartanburg with information as to the progress the railway was making under the direction of the South Carolina Railroad Commission. At the hearing the railway sought permission, in the absence of constructive suggestions, to abandon its urban and suburban electric lines.

Attorney Earle, representing the company, reviewed its recent history. He referred to the destruction of the

dam at Gaston Shoals on Broad River some years ago as a reverse to the company, followed by the trying war-time period. He told then about the appointment of the receiver, the subsequent winding up of the affairs of the old company and the organization of a successor. The new company, he claimed, was paying \$35,000 annually in extra and unnecessary interest, because the city refused to make certain concessions. Further, he brought out the fact that less than 2 per cent of the population of the city of Spartanburg patronized the electric railway cars. So the company felt that the only way was to abandon the local railway system unless the commission was able to work out some scheme whereby the company could operate on a paying basis. He said that the company was willing to try the bus as an experiment, but that the Council would not permit the test.

President Tripp said expenses could not be lowered appreciably if the present service was maintained.

### New York State Men Accept New Scale

New York State Railway employees in Syracuse, Utica and Rochester voted on June 1 to accept a new wage scale offered by the railway calling for 51, 53 and 55 cents an hour, an increase of 5 cents over the present scale. The employees sought 65 cents as top scale.

### Wants Jitneys Barred from Detroit Streets

A move has been made to bar jitneys from the streets of Detroit upon the recommendation of Ross Schram, assistant general manager of the Department of Street Railways. The city's legal department is prepared to proceed with the injunction proceedings and May 31 was set by the judge as the date for hearing arguments in the case. Detroit jitneys have been operating since last fall without licenses. When former Mayor James Couzens sought to bar them from the streets, a temporary injunction was granted.

### Jitney Men May Protest New Birmingham Ordinance

The Jitney Owners & Drivers' Association of Birmingham, Ala., may contest the legality of the agreement recently made between the Birmingham Railway, Light & Power Company and the city regulating the operation of the jitneys after July 1.

The agreement, as explained previously in the *ELECTRIC RAILWAY JOURNAL*, does not interfere with the operation of suburban jitneys, but states that no jitneys will be allowed to operate in the down town section on streets where there are railway lines, or within four squares of a railway line.

The railway, if this ordinance is put into effect on July 1, will reduce cash fares from 8 cents to 7 cents and sell tickets at 6 cents, with an additional charge of 2 cents for transfers, the same as at present.

## Chicago Rapid Transit Report Nearly Due

Some of the Particulars of Major Kelker's Forthcoming Plan Are Made Public— Recommends Co-ordinated System

An extract from the proposed physical transportation plan for this city was submitted on May 21 by Major R. F. Kelker, Jr., consulting engineer for the local transportation committee of the City Council. The full report will probably be ready about June 15.

The plan, involving an estimated expenditure of \$375,833,000, embraces a unified system of surface and elevated lines and subways. In recommending this plan Major Kelker states that it was based on the following general premises:

1. Long-haul traffic should be carried on rapid transit lines.
2. Short-haul traffic should be carried on surface lines so operated as to serve the feeders to the rapid transit lines.
3. Transfers should be permitted and encouraged between surface and rapid transit lines in order to make rapid transit service accessible to all.
4. Existing transportation systems should be unified and operated as a single system, thereby eliminating competition.
5. The transportation system of the city should be planned for the metropolitan area in advance of traffic demand.
6. Existing structures, as far as possible, should be used so as to form a part of a complete rapid transit system, and
7. The transportation system should connect the various outlying commercial centers of the city in such a manner as to provide rapid transit without passing through the congested central business district.

An interesting feature of the recom-

features the Kelker plan does not differ greatly from the All-Chicago Council plan of last year or the Ridgway-Parsons-Arnold report of 1917.

### Inquiry Into Schenectady Strike Scheduled—Eight Cars Operating

The much postponed inquiry into the causes of the Schenectady trolley strike, under the auspices of the State Industrial Commission, was scheduled to start on May 31.

The Schenectady Railway is operating eight heavily screened cars without police guards. So far no disorders have been reported and the cars which have been operated have had few passengers. It is anticipated the next move of the company will be to obtain a court order restraining jitneys from operating in the city of Schenectady. This order will be opposed by the city administration on the ground that complete service has not been restored by the company inasmuch as it has 128 cars in its carhouses.

No attempt has yet been made to operate interurban service. The labor people are organizing a "We Will Walk" club in anticipation of a court ruling which will discontinue jitney service.

With the state police called upon to enforce the provisions of the anti-Klulux-Klan law recently signed by the Governor, it is not anticipated that this body will be sent into Schenectady.

TRACK MILEAGE OF THE UNIFIED TRANSPORTATION SYSTEM—MILES OF SINGLE TRACK

	Existing Systems	First Period of Construction	Second Period of Construction	Construction Period Totals	Unified System Total
Rapid transit subways.....	None	17.6	37.3	54.9	54.9
Elevated railroads.....	162.0	137.0	67.2	204.2	366.2
Total rapid transit lines....	162.0	154.6	104.5	259.1	421.1
Street car subways.....	None	None	2.5	2.5	2.5
Street railways.....	1,060.0	153.0	95.5	248.5	1,308.5
Total mileage.....	1,222.0	307.6	202.5	510.1	1,732.1

mendations is the proposal for the unification of all lines in one system, thus giving passengers a universal transfer from one class of service to another. With a unified system, it is expected that 80 per cent of the traffic will be carried on the rapid transit lines and 20 per cent on the surface lines. At the present time the reverse is true. It is the intention that the surface lines should be the feeders to the rapid transit lines, and thus eliminate the necessity of traveling long distances in street cars. In this manner a large number of through route cars, which pass through the loop, would be discontinued and thus relieve traffic congestion in the central business district.

The construction program has been divided into two periods, as follows: A first period construction, which includes such parts of the plan as are urgently required and can be definitely located at this time, and a second period of construction, which includes the remaining parts of the plan. A considerable extent of elevated track is proposed, as shown in the accompanying table.

It is understood that in its broad

Nor is it expected that there will be any cause for its presence.

It now looks like a long drawn out struggle with thousands of dollars lost to Schenectady merchants, much inconvenience to the public and heavy financial expense to the railway company.

### Seven Traction Bills Signed by New York Governor

Among recent legislation affecting the transit situation in New York Governor Smith signed seven bills. They are as follows:

Johnson bill amending section 93 railroad law, relative to maintenance and repairs of roadways and approaches of bridges over railroads by villages of less than 1,200 population.

Van Wageningen bill amending section 78 railroad law, relative to length of coal jimmies, by extending time within which all cars operated must conform to section, to July 1, 1924, a period of one year. This chapter, 519 of the laws of 1923, affects a number of urban electric as well as steam roads.

Farrell bill directing Coney Island & Brooklyn Railroad, Brooklyn City Railroad and Nassau Electric Railroad companies to restore service on Park Slope line, Brooklyn, and authorizing the Transit Commission to waive issuance of transfers.

Clayton bill authorizing the Transit Commission to extend for one year operation

of the Church Avenue line of the Nassau Electric Railroad, Brooklyn, without exchanging transfers.

Reich bill authorizing the Transit Commission to extend for one year operation of the Park Avenue line, Brooklyn, without exchanging transfers.

Knight bill amending the public service commission law, by increasing the number of officers of corporation required to file reports with commission, who may verify such reports and giving the commission discretionary power to extend the time within which corporations required to file reports may do so.

Sheridan bill amending chapter 788 of the laws of 1917, relative to the removal of the Manhattan Railway structure at Forty-second Street, New York City, by providing for extinguishment of all rights to structure, or to maintain same and assessing cost.

### International Railway Officer Refuses to Act as Witness

Herbert G. Tulley, president of the International Railway, Buffalo, refused to be a witness at the investigation into the causes of the strike of platform men on the local and interurban lines started last July. It was intended to hold the hearing before Bernard L. Schientag of the New York State Industrial Commission. President Tulley refused to answer questions and said the strike was a dead issue and the company was operating cars with trained and efficient employees on normal schedule.

Upon advice of counsel, President Tulley refused to produce the books and records of the traction company and contended from the start of the investigation that the commission had no jurisdiction or power to act in the matter. Among the witnesses at the inquiry were James H. Vahey of Boston, attorney for the Amalgamated Association; William F. Fitzgerald of the organization staff of the Amalgamated and Clarence F. Conroy, business agent of the Buffalo local. Coleman J. Joyce, general counsel for the Mitten interests of Philadelphia and Buffalo; James R. Sweeney of Penney, Killeen & Nye, counsel for the International, and President Tulley also attended the hearing but refused to participate. Mr. Joyce contended:

That the International has a complete organization of permanent employees working under a written agreement between the company and the present employees made Dec. 20, 1922, which provides for the manner and conduct of employment mutually satisfactory.

That the commission has no jurisdiction to make an inquiry into the cause of a strike of former employees which occurred July 1, 1922, because the controversy terminated by the employment of men now under contract and therefore no strike, lock-out or industrial controversy exists or is susceptible of settlement.

Further objections were made by counsel for the railway to producing books and papers on these grounds:

That the commission has no authority to inquire generally into expenditures of the International for strike purposes or to inquire into the expenditures on account of the strike.

That the commission has no authority to inquire into action taken by the protective committee of the International bondholders referred to as reorganization.

That the commission has no authority to inquire into the revenue of the International or financial arrangements made by the company since July 1, 1922, or into the affairs of employees of the Philadelphia Rapid Transit Company, or into the books and papers of the International bondholders' committee or Philadelphia employees with respect to any matter mentioned in the subpoena upon the company's officers.

That no matter mentioned in the subpoena is relevant to the causes of the strike of former employees.

At the adjournment of the hearing, Commissioner Shientag said he would make a ruling later whether or not President Tulley would be compelled to testify at a continuance of the investigation.

### No Agreement in Chicago

Company Is Firm in Its Stand that It Cannot Increase Wage—Mayor Seeking Arbitration

Negotiations between the Chicago Surface Lines and the men ended after a futile conference on May 28. Those attending the conference were Henry A. Blair, president of the Chicago Surface Lines; Guy A. Richardson, vice-president in charge of operation; John M. Roach, vice-president Chicago Railways; William Quinlan, president of the union; William Taber, secretary-treasurer, and J. J. Kehoe, recording secretary of Local No. 241. The 10-cent hourly wage increase demanded by the union was flatly refused and the meeting ended with no announcement of future conferences.

Following the breaking off of negotiations the Mayor conferred with both sides. He is seeking to have the wage controversy settled by arbitration. On May 31 he met Henry A. Blair, president of the Chicago Surface Lines, and Samuel Insull, chairman of the board of directors of the Chicago Elevated Railroads, at separate meetings.

Up to the morning of June 1 no break had come in the deadlock over wages, despite the efforts of the Mayor. Indications then pointed to the calling of a strike vote early in the week. Members of the union will meet on the night of June 4 and if such action is taken by the surface car trainmen a special meeting of the elevated railroad employees will be called immediately for a similar purpose.

The wage agreement entered into last year expired at midnight on May 31. It has been agreed that the old wage scale will be continued pending the outcome of the present controversy.

After the meeting last Monday Mr. Blair said:

We informed the officials of the unions that the Chicago Surface Lines cannot pay the 10 cents an hour increase demanded by the motormen and conductors. Officials of the union replied they are in duty bound to stand pat on the demands of the men. Settlement of the wage controversy is just as far away now as it was when negotiations started a few weeks ago. We have come to a brick wall so far as a settlement is concerned.

Mr. Blair was asked whether another conference would be held. He replied that he saw no logical reason why one should be held. As he expressed the matter:

Both sides have reached a point where an agreement seems improbable. The hearing on the fare finding of the State Commerce Commission has no bearing on the situation. The wage dispute is strictly a matter of business between employees and the employers.

Mr. Quinlan intimated that he is about to send for William D. Mahon, international president of the Amalgamated Association.

## News Notes

**Wages Advanced Five Cents.**—An increase in wages amounting to 5 cents an hour has been granted nine uniform men and track workers of the Northern Massachusetts Street Railway, Athol, Mass. This is practically a 10 per cent advance and restores the scale in force before the cut of April, 1922, was put in effect.

**Ready for Arbitration.**—The fifth arbitrator for the wage issue affecting the employees of the Scranton Railway has been selected in the person of the Rt. Rev. M. J. Hoban, Bishop of the Scranton Diocese. The proceedings were scheduled to start on May 31. The subject to be arbitrated is simply wages, which affect the motormen and conductors, all of the shop crafts and the men in the track department.

**Completes Pleasure Park.**—The Chicago, Ottawa & Peoria Railway, Ottawa, Ill., has just completed the construction of a new pleasure park on Covel Creek, 4 miles south of Ottawa, on the Streator division. It was intended to open the park to the public on Decoration Day. This new park will provide a bathing beach that will accommodate 1,000 people at one time, boating facilities, a dancing pavilion, several riding devices and other buildings.

**Contract Renewed.**—The New Orleans Public Service, Inc., has renewed its contract for one year, beginning June 1, with its 4,500 workers, including conductors and motormen. The 500 other workmen, comprising the electricians, have a contract which may be reopened, by either party, on thirty days' notice. Contracts have been signed with the carpenters, blacksmiths and machinists in the employ of the company on the same hourly rate which is now in force.

**Reorganization Deferred.**—A postponement from June 1 to Sept. 1 in the proposed reorganization of the Pittsburgh Railways has been granted by the commission. The plan for the reorganization of the property, which has been under receivership since 1918, was started two years ago. In seeking the postponement those in charge acting in co-operation with the city of Pittsburgh told the commission that the preliminary proceedings are taking more time than was expected.

**Reward for Loyalty.**—All employees of the Johnstown Traction Company have been granted an increase in pay effective June 1. Those in the service three months or less than one year will be given a 2½-cent advance and those in the service one year will receive a 5-cent raise. This increase will bring the pay of three-month employees or those in the service less than one year up to 52½ cents and all employees of one year or more 55 cents. During the war-time period the hourly rate of pay was 60 cents.

## Foreign News

### A Turn for the Better at Leeds

The accounts of the Leeds (England) City Tramways for the year ended March 31 last show that the total revenue was £961,507, compared with £959,703 in the previous year. The working expenses were £599,983, against £702,250. After paying capital and other fixed charges and allowing for permanent way renewals there is a surplus of £91,491, as compared with a deficit of £43,266 in the previous year.

The Metropolitan Railway has now a bill passing through Parliament without opposition to authorize the raising of £2,000,000 additional capital. It is proposed to spend £790,000 on new rolling stock, £285,000 on the extension of the company's generating station, £168,000 on the electrification of the line from Harrow to Rickmansworth and £228,000 on widening the line.

The London Underground Railways and associated concerns are working on a scheme for facilitating the journeys of regular passengers living in the outer ring of the metropolis. The proposal is to issue combined season tickets available by underground railway tramcar and omnibus. The first trial started at Golder's Green on May 1. From this northern terminus of the Charing Cross & Hempstead Railway tramcars and buses run to and from places farther north and the through season ticket will enable the passengers to travel part of the way by railway and the rest of the way either by bus or tramcar and vice versa. The season ticket rates will work out cheaper than the combined ordinary fares and the passenger will not be restricted in the number of journeys he makes.

### In Situ Rail-Hardening Process

Highly satisfactory tests have been carried out by the London County Council on a stretch of its tramways on the Victoria Embankment with Sandberg's *in situ* process of hardening the tread of rails. The object was to find how far the harder surface would remain free from corrugation, so a flat curve was chosen where the evil was very apparent. For a certain distance the rails were treated and the rest remained untreated. The test began in December, 1920, and was continued till February, 1923. During the period the corrugations on the untreated rails had to be ground out three times, while the treated track did not corrugate at all. The number of cars passing over it during the twenty-six months was 2,092,000. A further test of a more extensive nature is about to be begun. It may be recalled that the treatment consists in alternately heating and cooling the rail head until it is much hardened. A special machine is used to do this and the rails do not need to be disturbed.

It was expected that before the end of May practically all the tramways in Edinburgh will have been electrified. R. S. Pilcher, general manager, calculates that the cost of running the electric cars is about 5d. per car-mile less than the cost of working the old cable cars. When the whole system is electrified, it is estimated that there will be a saving in working expenses of £125,000 per annum.

### Return Ticket Automatic Machines

What for the want of a better term is still described as the "booking" of passengers has been much facilitated at stations on the London Underground Railways by the use of "put your money in the slot" ticket issuing machines. So much has this been so that the companies are now beginning to experiment with return ticket slot machines at terminal stations. If the machines work all right the success of the arrangement is secure, as the trouble of taking a ticket for the return journey is removed.

### English Southern Railway Electrification

It was announced toward the end of March that the work of converting to electric traction part of the suburban lines of the Southeastern section of the Southern Railway would be begun almost immediately. Particulars of the scheme have already appeared in these pages. The company hopes to be able to work forty trains an hour through London Bridge Station during the busy periods of the day. The first stage of the work will include the lines from Charing Cross, Cannon Street, and London Bridge to Dartford, all lines as far as Orpington and the Bromley branch and Mid Kent lines, the routes from Victoria and Holborn Viaduct to Bickley Junction, and the Crystal Palace line. It is proposed at first to have sixty eight-car trains. Probably a number of the cars will be reconstructed from existing rolling stock.

### British Tramway Statistics

The Ministry of Transport has issued its annual return giving statistics of all tramway and light railway undertakings in Great Britain for the year ended Dec. 31, 1921, for companies, and March 31, 1922, for local authorities. The tables show that the total route mileage open for traffic at the end of the year was 2,579 miles, of which 1,756 miles were worked by local authorities and 823 miles by companies. The total gross receipts for 1921-22 were £32,523,339 as compared with £32,692,209 in 1920-21, and the total working expenditure £26,835,292, com-

pared with £28,339,706, leaving net receipts amounting to £5,688,047 or £1,335,544 more than the corresponding figure for the preceding year. The number of passengers carried during the year was 4,256,268,692, a decrease of 413,647,712, or 8.86 per cent as compared with 1920-21. Car-miles run amounted to 332,079,865, a decrease of 13,073,720 or 3.79 per cent. Of the total car-miles run 98.24 per cent were electric car-miles.

### London Tramway Excursions

It was announced at a recent meeting of the London County Council that on application to the tramway offices arrangements could be made for the conveyance of parties of children to the holiday resorts on the tramway routes. The charge for the hire of special cars is 7s. 6d. per car single or 10s. return for each 1d. of the ordinary fare for the journey. Last year 700 parties of children were carried on the cars of the municipal railway system.

### Fascisti Favor Private Operation

Under the new Fascisti Government in Italy considerable progress is being made toward a change from public to private operation of public utilities. It is said that within a few months a good part of the steam railroads of that country will be turned over for operation to private companies, and it is quite possible that the government may sell them outright. The parcel post system is already in the hands of a private contracting company, the telephone system is about to follow, and it is rumored that the same course will be followed with the telegraph. Not many of the electric railway lines in Italy have been operated by the municipalities, but in a few instances this has been the case, notably in Milan. While no announcement has been made that the Milan municipal street railway is to be changed to private operation, there is a rumor that it may be turned back to the company which was formerly operating it, namely, the Milan Edison Company.

### Italy Electrifies More Lines

There have been a number of extensions of electrification in Italy during the past year. One of the most important is the Genoa-Turin line, equipped on the three-phase system. Now, electric operation is in force all the way between Modane (at the Montenis tunnel) and Genoa. Other divisions of the state railroads are being electrified. The line between Rome and Ostia (the harbor of Rome) will soon be put in operation with 2,600 volts direct current. The locomotives will be of the same general type as those on the Torino-Cirié-Lanzo-Ceres line. Another high-voltage direct-current line to be started this summer is that between Domodossola and Locarno in the lake district of northern Italy. This proposed line will use 1,750 volts direct current.



# Financial and Corporate

## Separation Sought

**Bondholders' Committee Seeks Separation of Suburban System from the United Railways of St. Louis**

The separation of the so-called Suburban system from the United Railways, St. Louis, and the independent operation of the former road is not only possible but probable, according to Sam B. Jeffries, one of the attorneys for the committee of bondholders of the Suburban system, who have asked the Missouri Public Service Commission for a valuation of the Suburban properties as an independent unit in the whole of the United Railways system. The committee acting for the bondholders includes Herman C. Stifel, John H. Longmire, A. C. P. Meyer and John L. Johnston. Besides Mr. Jeffries they are represented by Cleveland A. Newton and Marion C. Early, attorneys.

The Suburban lines include the Hodiarnont Line and Fourth Street to the old Suburban Garden, the Kirkwood-Ferguson line and the Florissant line, the Sarah Street and the Union lines and the line to Meramec Highlands from Sarah Street West.

### BONDHOLDERS WANT APPRAISAL

The holders of the \$6,500,000 bonds of the old Suburban company desire to have the property on which they hold a mortgage appraised in order to know what they can expect in the reorganization, said Jeffries. It has been intimated, he said, that the Suburban bondholders may have to take a cut in the par value of their securities in the reorganization which, in view of their present idea of the value of the properties, the bondholders do not feel would be equitable.

There are two issues of Suburban bonds. The underlying securities are of the St. Louis & Suburban Railway consolidated first mortgages amounting to \$4,500,000 issued under a general mortgage. This issue was due April 1, last, and is now in default. There are six months of grace, however, before the foreclosure provision of the mortgage becomes operative.

Mr. Jeffries said that if the Suburban general 5s are not paid at the expiration of the six months period, the bondholders will have the opportunity of foreclosing and forcing a sale. In such event the property might be bought in by an independent company, or by the bondholders themselves.

One of the Suburban bondholders declared that the United Railways seemed to treat the Suburban properties as an "adopted child," and the Suburban bondholders were ready to take over their property and run it themselves. It is expected that the reorganization plans will develop a contest between the Suburban bondholders and the

holders of the \$9,790,000 Transit Company 5s as to which issue shall receive more favorable treatment.

## Treasury Revokes Corporation Tax Income Ruling

The U. S. Treasury on May 21 revoked its decision of two weeks ago declaring exempt from income taxation corporation dividends distributed out of profits of earnings accrued prior to March 1, 1913.

It was said unofficially in Washington that the original decision amending the revenue regulations had resulted from a ruling on one particular case, and that a review of that case had convinced

Operating revenue decreased.....	\$507,156—	9.2 per cent
Operating expenses with taxes decreased.....	190,995—	5.0 per cent
Net income decreased.....	306,711—	21.7 per cent
Car mileage decreased.....	204,754—	2.1 per cent
Revenue passengers decreased.....	2,587,402—	3.5 per cent
Total passengers decreased.....	2,526,491—	2.7 per cent
Operating ratio increased from.....	58.4 to	63.4 per cent

revenue officials that no general application of the determination should have been made.

The ruling now revoked was made on May 11 and was referred to in the ELECTRIC RAILWAY JOURNAL for May 19, page 862. It took the form of an amendment to the income tax regulations. It applied to the distribution to its stockholders by a holding corporation of profits accumulated by subsidiaries prior to March 1, 1913. Under the ruling profits so distributed were held to be non-taxable, though the provision was made that profits accumulated since Feb. 28, 1913, must be distributed.

## \$1,104,991 Net for Capital Traction

**Results for 1922 Satisfactory to Board, Gratifying to Stockholders and Creditable to Employees**

The net income of the Capital Traction Company, Washington, D. C., for the year ended Dec. 31, 1922, was \$1,104,991. The number of passengers carried in 1922 was 3½ per cent less than in 1921, due to increased competition from bus lines and to the more extensive use of private automobiles. Automobile registration in the District of Columbia was more than 25 per cent greater than in 1921. The loss in revenue was greater than the loss in traffic because the rate of fare was, throughout the year, less than in the preceding year.

The following comparisons between the years 1921 and 1922 give a general summary of operations:

On March 1, 1922, by order of the Public Utilities Commission, the rate of token fare was reduced from five tokens for 35 cents to six for 40 cents, the cash fare remaining at 8 cents.

The Public Utilities Commission, after a hearing held Oct. 16, denied an application of the Federation of Citizens' Associations for a reduction in the rate of fare in effect on the lines of the Capital Traction Company, taking the same position held by it heretofore that the rate of fare should be the same on all street car lines operated in the District of Columbia.

Net additions to capital during the year were \$265,669, and consisted chiefly

### SUMMARY OF OPERATIONS OF CAPITAL TRACTION COMPANY, FOR YEAR ENDED DEC. 31, 1922

	1922	1921
Passenger revenue.....	\$4,966,341	\$5,472,924
Special car revenue.....	20	110
Total revenue from transportation.....	4,966,361	5,473,034
Revenue from operation other than transportation.....	27,682	28,165
Railway operating revenue.....	4,994,043	5,501,199
Operating expenses (62.97% of gross revenue).....	3,167,211	3,220,740
Net operating revenue.....	1,826,832	2,280,459
Taxes assignable to railway operation.....	436,093	573,519
Operating income.....	1,390,739	1,706,940
Non-operating income.....	34,906	18,412
Gross income.....	1,425,645	1,725,352

#### DEDUCTIONS FROM GROSS INCOME

Interest on funded debt.....	\$280,300	
Interest on unfunded debt.....	22,433	
Miscellaneous rents.....	1,309	
Rent for leased roads.....	12,604	
Miscellaneous debits.....	4,008	
Total deductions.....	320,654	313,648
Net income.....	1,104,991	1,411,704

#### PROFIT AND LOSS STATEMENT

Credits:		
Balance beginning of year.....	\$1,089,585	
Net income for year.....	1,104,991	
	2,194,577	
Debits:		
Dividends.....	840,000	
Miscellaneous.....	10	
	840,010	
Credit balance at close of year.....	\$1,354,567	\$1,089,586

## CAR-MILE AND REVENUE AND TRANSFER STATISTICS OF CAPITAL TRACTION COMPANY

	CAR-MILES			
	1922	1921	1920	1919
City lines.....	8,582,366	8,818,335	8,894,931	8,558,385
Chevy Chase line.....	815,819	785,367	764,993	755,149
Washington and Maryland line.....	153,177	152,414	149,347	147,544
Total all lines.....	9,551,362	9,756,116	9,809,271	9,461,078

	REVENUE AND TRANSFER PASSENGERS	
	1922	1921
Number of passengers carried at 8 cents.....	15,303,295	13,719,351
Number of passengers carried at 7½ cents.....	9,263,546	38,820,788
Number of passengers carried at 7 cents.....	45,025,583	19,609,398
Number of passengers carried at 6½ cents.....	972,779	984,369
Number of passengers carried at 5 cents.....	321,724	340,423
Number of passengers carried at 3 cents.....		
Total revenue passengers.....	70,886,927	73,474,329
Other passengers:		
1-cent inter-company transfer passengers.....	2,636,136	2,438,628
2-cent bus transfer passengers.....	1,009	
Free bus transfer passengers.....	202	
Capital Traction Company free transfer passengers.....	18,182,305	18,256,680
Other free passengers:		
Employees.....	883,835	951,395
Police and firemen.....	* 82,496	78,369
Total passengers.....	92,672,910	95,199,401

\* Exclusive of policemen and firemen riding free while in uniform.

of betterments to track, additions to the conduit and cable system, the substitution of modern type stokers in four of the boilers at the Georgetown Power Station, and final payment on substation No. 4 building and equipment. This figure is net after deducting \$111,137, the value of equipment abandoned at the Georgetown and Chevy Chase power stations.

The net increase in depreciation reserve for the year was \$238,437, bringing the total reserve at the end of the year to \$1,419,658, of which \$690,000 is invested in government securities, \$86,430 is held on deposit bearing interest, and \$643,227 has been advanced for capital expenditures.

Tax accruals in 1922 amounted to \$436,093, a decrease of \$137,426 from the preceding year due to smaller revenues and the elimination of the excess profits tax.

It is interesting to note that the company now has in the service 126 employees (10.6 per cent of the total) who have been with the company twenty years or more.

It is explained that competition from the buses has had a tendency to increase, numerous applications being filed by the Washington Rapid Transit Company and others for the operation of bus lines, some of them paralleling the railway tracks. The commission has expressed its policy not to grant such parallel service. The Capital Traction Company joined with the Washington Railway & Electric Company in an application for permission to operate a bus line through Cleveland Park connecting with Capital Traction lines at Connecticut Avenue and Woodley Road and with the Washington Railway & Electric Company lines on Wisconsin Avenue and at Connecticut Avenue and Columbia Road. This application was granted and operation began in December. Transfers selling for 2 cents each are issued to the lines of both companies, and the loss or profit from operation shared equally.

Insurance policies on the principal properties of the company expiring June 22, 1922, were renewed for a period of three years at a slightly reduced rate. Fire insurance is now carried on the

company's various properties in the sum of \$4,822,900.

### Ford Makes Short-Term Loan to Detroit

The City Council of Detroit, Mich., on May 22 authorized the comptroller to negotiate a short term loan to enable the street railway department to commence at once its work on extensions.

The Municipal Railway has outlined its building program for the summer, including some important extensions. In order that the department may not be delayed the money will be raised for this work at once.

The Street Railway Commission requested a loan of \$2,500,000, but the Council decided not to borrow more than \$1,000,000 until the increase in the city's assessed valuation is ascertained next month.

It has since been announced that Henry Ford has agreed to advance a short-term loan of \$500,000 to the city at 4 per cent and that he is prepared to offer further to finance the city to the extent of as much as \$10,000,000 at decidedly favorable interest rates.

The Legislature has increased the bonding limit to enable the expenditure for subways, but this matter is subject to further consideration before loans based upon increased valuations can be negotiated.

### Receives Permission to Issue Bonds

The Public Service Commission of Alabama has granted authority to the Mobile Light & Railroad Company to issue 6 per cent mortgage bonds to the amount of \$245,000 to refund bonds which have become due. The new bonds will mature on May 1, 1950. An operating statement presented to the commission showed a net income of \$1,697 for April, after caring for all obligations and allowing for the sinking fund account. The total revenue of the company for April was \$67,471 and the surplus after all operating expenses had been deducted was \$3,781. A total of \$2,083 was credited to the sinking fund account.

### North American Company Increases Its Wisconsin Holdings

Control of the Wisconsin Traction, Light, Heat & Power Company has passed into the hands of the North American Company, through the purchase by the latter of the stock in the Wisconsin company held by John I. Beggs, Charles F. Pfister and Fred Vogel, Jr., Milwaukee.

The deal, according to Mr. Beggs, means only that the North American Company is extending its holdings of public utility properties in Wisconsin. Mr. Beggs said:

The North American Company has been a stockholder in the Wisconsin Traction, Light, Heat & Power Company. It has been the second largest owner, and with the acquisition of the interests held in Milwaukee gains a controlling interest. It means merely the extension of the North American Company holdings in Wisconsin.

The company operates railway lines in Appleton, Neenah and Menasha, with 21.24 miles of track, and also operates motor bus lines. Its properties are valued at about \$7,000,000 and annual revenues are about \$1,500,000. The management of the property will remain unchanged.

**Auction Sales in New York.**—At the public auction rooms in New York there were no sales of electric railway securities this week.

**Reorganization of Suburban Lines Being Arranged.**—Le Roy T. Harkness of the New York Transit Commission, has announced that plans are being formulated for the reorganization and readjustment of the Long Island Traction Company and the Long Island Electric Railroad, both owned jointly by the Interborough Rapid Transit Company and the Long Island Railroad, and operating in Queens and Nassau Counties.

**Will Subscribe to New Stock.**—Stockholders of record of April 24 of the Washington Water Power Company, Spokane, Wash., have the right to subscribe to new 10 per cent stock at par. Payment for new stock will be due by June 15. The company has reported for the first quarter of 1923 net earnings of \$499,378, equal to 2.72 per cent on the \$18,330,200 capital stock outstanding. In the first quarter of 1922 net earnings amounted to \$429,153, equal to 2.41 per cent on the \$17,779,800 capital stock outstanding.

**Bonds Offered.**—R. L. Day & Company, Estabrook & Company, Harris, Forbes & Company and Merrill, Oldham & Company are offering at 98 and interest yielding about 6.25 per cent \$3,000,000 of the Boston Elevated Railway 6 per cent ten-year gold bonds. The bonds are due on June 1, 1933 without option of prior payment. Of the proceeds of this issue of bonds, \$700,000 will be used to reimburse the company for money used to pay at maturity on Jan. 1, 1923, a like amount of West End Street Railway debenture 4½ per cent bonds. The balance will be used to provide for extensions to the company's power station in South Boston, for new shops in Everett and for the George Street storehouses in Somerville.

## Traffic and Transportation

samples of them soon will be forwarded to companies as a part of the regular service of the Advertising Section.

### Council Will Pass Over Mayor's Veto in Seattle

The Seattle City Council will pass over the veto of Mayor E. J. Brown the ordinance providing for increasing fares on the Seattle Municipal Railway lines from 5 cents to 10 cents cash, or three tokens for 25 cents. The veto causes a delay in placing the ordinance in effect, as thirty days is required to pass after the bill has been vetoed before it is placed in effect, which means that the increased fare will not become effective before July 5. The delay in passing the carfare ordinance complicates further the railway's financial situation, in that it makes necessary a return to the warrant basis for supplies, and a possible issuance of warrants for the June 10 pay day of trainmen.

Mayor Brown in his veto message expressed the opinion that the time has arrived to solve the question for all time of the rewriting of the "impossible" \$15,000,000 purchase contract, and that terms, conditions and methods for its solution should be agreed upon before any increase of charges for street car fare is made.

No plan has been decided upon by the special committee appointed to formulate a proposal for the rewriting of the contract. Councilman E. L. Blaine suggests that the proposal to pay \$1,000,000 yearly for a period of nineteen years and six months from the date of purchase, based upon an interest rate of 4 per cent, should be telegraphed to the bondholders, but this action has not been agreed upon. In the meantime, Mayor Brown would shift the entire responsibility to the City Council members, expressing a willingness to cooperate in any possible way with them.

Another plan proposed by the city utilities committee for possible increase of revenue is the installation of the \$1 weekly pass plan, providing for the issuance of transfer to the lines of the Seattle & Rainier Valley Railway on the same basis as to municipal lines. Walter M. Brown, general manager of the Rainier lines, states that his company would be willing to accept the proposition should the city agree to remit the payment of the annual franchise tax of \$11,000 and would agree to pay the company on the same basis now paid the municipal lines for carrying police and firemen, amounting to \$4,000 yearly.

### Bus and Trollibus Rights Granted

Two ordinances were passed recently by the City Council of Philadelphia granting subsidiaries of the Philadelphia Rapid Transit Company franchises for operating a bus line on Roosevelt Boulevard and a trackless trolley line on Oregon Avenue. When the ordinances were finally placed before the Mayor he vetoed them, but the Council over-rode the veto. The Mayor objected to a provision for a 10-cent fare. Repre-

### Extra Pay for Politeness in Muskegon

The Muskegon Traction & Lighting Company, Muskegon, Mich., is going to make it pay to be polite. It has introduced a bonus plan for conductors and motormen based on the success of the platform men in being courteous and polite to customers. Under the plan the year is divided into two periods, the first bonus of \$30 being payable on July 1 and the second on Jan. 1. The plan is retroactive to Jan. 1, 1923.

Every employee starts with a credit of 1,000 points, and all who have 800 points to their credit at the end of the six months period are to receive the full bonus. The company has prepared a special rule book. Deductions are made for the violation of certain rules. In addition extra points will be awarded for any outstanding acts of courtesy, loyalty or safety. Plans will be made for paying an additional sum over the regular bonus to employees who maintain the full 1,000 points at the end of the period.

The bulletin states that it is the purpose of the company not only to provide for the safety and comfort of the public, but also to see that the public receives courteous treatment. Further, that the employees are expected to treat the public politely and show the public consideration. As for the employees themselves, they must maintain a neat personal appearance while on duty.

George Steinwedel, president and general manager, said he believed that 90 per cent of the employees would earn the full bonus. Remarking that the purpose was twofold, Mr. Steinwedel said:

We wanted some way to reward those employees who give us a little more than the full service. Under the old system we had no way to reward them. The bonus plan will provide a means. In the second place we wanted to impress on the public and the men that our aim is to give service.

The plan was well received by most of the employees. The company had been working out details since Jan. 1, and it was considered a part of the plan of the company started two years ago to win the popular approval of the public in operation of the street cars and the management of the company.

### Buses Will Replace Railway in Brattleboro

W. A. Buttrick, vice-president of the Twin States Gas & Electric Company, has announced that motor buses will replace trolley cars in Brattleboro, Vt., soon and that tracks will be torn up. He says the company cannot be expected to operate the railway at a loss and claims that it may substitute bus service under the recent law putting

bus lines under supervision of the Public Service Commission. A 10-cent fare for buses is proposed.

### Safety Enters Amid a Great Din

Through the efforts of Barron Collier, Special Deputy Police Commissioner of Greater New York in charge of safety, Friday, May 25, was observed as safety day in the metropolis. Safety hour, beginning at 3 p.m., when schools are dismissed, and ending at 4 p.m., also was observed for the first time, and will continue to be observed every day throughout the remainder of the present school year.

At 3 o'clock on May 25 New York heard safety hour ushered in with a din



Auntie J. Walker as Shown in the Placards

such as it seldom has experienced. For one minute factory, ferry and steamboat whistles blew, church bells rang, taxicab, truck and other motor vehicle horns honked and other loud noises were made from Yonkers to the Battery. This din will be repeated every day now at 2:59 o'clock in the afternoon until June 29.

The outstanding feature of the day was the introduction of "Auntie J. Walker," a woman figure whose special mission in life is to break folks of the habit of jay-walking, or crossing streets at places other than the regular crossings. Auntie J. Walker was introduced to New York through the medium of posters, car cards and an animated figure who appeared at prominent points throughout the city with Mr. Collier while the Commissioner was addressing the crowds.

Auntie J. Walker proved such a striking feature and impressed the jay-walking lesson so strongly on the New York public that the Advertising Section of the American Electric Railway Association has arranged with Mr. Collier to use the figure in a series of window signs and posters for the benefit of the entire electric railway industry. The signs are now being made and

sentatives of the Philadelphia Rapid Transit Company said that the buses, for which the Roosevelt Boulevard grant provides, would be running before the end of the year. In Oregon Avenue, where the trackless type of trolley car will be used, preparations for its installation probably will proceed at once.

### Beeler Organization Will Study Charleston Situation

The Charleston Consolidated Railway & Lighting Company has employed the Beeler organization of New York City to make a study and report on the street railway conditions in the city of Charleston, S. C., with a view to determining, if possible, some solution of the present serious financial difficulties with which the company is confronted.

This company says that its railway revenues for the first four months of 1923 were practically \$40,000 less than for the first four months of the previous year, while the cost of operation has not fallen in anything like this proportion, with the result that the company is experiencing substantial losses every month. The revenue for the first four months of 1923 has failed by \$13,749 to meet actual operating expenses, exclusive of depreciation and interest on the value of the street railway properties, it is stated.

Just what changes will be made are at present problematical, and it is likely that no changes will be made until the Beeler organization has completed its investigation and made its report. The company already uses the one-man car and is attempting to apply other operating economies. The use of the automobile, the reduction of the force of men at the Charleston Navy Yard, the loss to Charleston of the destroyer fleet during the winter and other similar influences have brought about a shrinking of traffic with a consequent reduction of revenues, amounting to more than the savings effected by the economies.

### One-Man Cars Allowed in Johnstown

One-man cars, prohibited in the city of Johnstown, Pa., by ordinance, can now be operated. The City Council at a recent special meeting passed a repealer of the old ordinance that provided that every car should be manned by a motorman and conductor. Efforts to pass the repealer have been under way for the past year. The repealer was put through by a vote of three to two, Mayor Joseph Cauffiel, who previously opposed one-man cars, voting in favor. The ordinance repealed was signed on March 19, 1921, and allowed only "trailers" with one man in charge.

One-man cars will be added to the Johnstown Traction Company equipment gradually, according to Lee T. Shannon, general manager. In presenting an appeal for the ordinance repealer Mr. Shannon stressed the safety measures as applied to one-man cars and stated that the reduced revenues

of the company made the curtailment of men necessary.

Carrying out the agreement with the City Council the company announced a tariff of rates effective May 24, the new tariff pertaining to school children only. The tariff makes decreases in existing rates and provides a special rate of fare of 5 cents per passenger for all children actually going to and coming from school on all days when the schools are in session. The rate of fare is applicable, however, only between the hours of 8 a.m. and 5 p.m. Tickets are to be sold children in packages of 20 for \$1 upon proper identification. The rate of fare is reduced from 7 to 5 cents for school pupils on all the city lines. On the Windber line, the new tariff reduced the fare from 10 cents to 5 cents on each zone.

### Single and Double Deck Buses for Louisville Railway

The Louisville Railway will start a bus service during June. Announcement to this effect was made recently by J. P. Barnes, president of the company. Twenty-four buses will be put in service immediately and the plans of the company call for additions to this original fleet as rapidly as public demand justifies such action. Of the twenty-four cars twelve will be single-deck vehicles, costing approximately \$7,500 each, being built in Cleveland, and twelve double-deck, costing about \$9,000 each, which will be supplied by the Yellow Coach Company, Chicago. The former will seat twenty-five persons, while the double-deck buses will seat sixty-eight.

The single-deck buses will be upholstered in leather, finished in mahogany, with pneumatic tires, and will be painted royal blue. They will have Bender bodies mounted on White chassis. They will be operated on a ten-minute schedule. There will be one operator on the single-deck cars, and two on the double deck. The fare will be 10 cents.

At the start of the service the twenty-four buses will be divided between two lines. One will run from the center of Louisville out into the southern district, where jitney traffic in the past has been the most active. The other will run through the southeastern section of Louisville. Neither line will traverse streets over which cars of the Louisville Railway are operated.

The Kentucky Transportation Company has been organized to operate the buses. All of its capital stock of \$200,000 is held by the Louisville Railway.

Transfers Cost Two Cents.—On payment of the usual 6-cent fare on any car of the Arkansas Central Power Company in Little Rock, Ark., an extra 2-cent fare carries with it a transfer to any line in North Little Rock. This rule applies also to passengers boarding cars in North Little Rock for the city of Little Rock.

Extends Pass Plan.—The Tacoma Railway & Power Company has been given permission by the State Department of Public Works to extend for three months the \$1 weekly pass on its lines in the city of Tacoma. The period will end Aug. 26, 1923.

Proposal Made to Operate Radial Lines.—A proposal has been made by Sir Henry Thornton to operate certain radial lines in the Niagara Peninsula in conjunction with the National Railways. The Canadian *Financial Post* points out that this proposal really means that where electric lines can be operated to advantage the National Railways will meet the situation.

Investigates Right of Buses.—General Manager R. A. Leussler of the Omaha & Council Bluffs Street Railway has stated that the company counsel is investigating the question whether buses have a legal right to operate on the city streets. The Boulevard Transit Company recently took out a permit to operate two buses on the streets of Omaha, charging a 10-cent fare.

Big Excursion Business Being Done.—The electric railways in the Central Electric Railway Association territory are conducting an extensive excursion business, particularly in the states of Indiana and Ohio. Tariffs covering these movements are issued by the association, the fare for the round trip on the certificate plan being in all cases one-and-one-half times the one-way fare.

Loop Plan in Late August.—The United Electric Railways, Providence, R. I., will not be able to put its looping plan into effect until late in August or early September because of the special work that will be required to make the necessary track connections. This eight-loop plan cutting all crosstown railway lines was referred to in the *ELECTRIC RAILWAY JOURNAL*, issue of May 12. The plan, it is believed, will relieve much of the congestion in the city center.

Will Test One-Man Cars.—The Chicago, Ottawa & Peoria Railway, Joliet, Ill., is considering the possibility of trying out the one-man interurban cars on its property. The company will test the cars on the division of 18 miles between Streator and Ottawa, and if successful, similar service will be put into effect on the entire property of 107 miles. Arrangements are also being made to operate the city service of four cars in La Salle and Peru with one-man cars.

Rerouting to Improve Service.—In the interest of better service to its patrons the Dallas Railway on April 15 put into operation its first crosstown service, the old Main line passed out of existence and two new stretches of track were opened up. The new crosstown line and the rerouting of the Mount Auburn-Park View lines were the major changes. Other changes consisted of rearranging the linking up of various lines. The changes took place without any serious difficulties.

## Personal Items

### J. C. Smith Heads Quebec Company

Shawinigan Company Executive Elected to Succeed E. A. Robert as Head of Quebec Railway, Light, Heat & Power Company

Julian C. Smith, who has been elected president of the Quebec Railway, Light, Heat & Power Company, has been a prominent figure in Canadian hydro-electric developments during the past few years.

Mr. Smith was born in Elmira, N. Y., in 1878 and was graduated from Cornell University in 1900. He began his business career as draftsman with Wallace C. Johnson, consulting engineer at Niagara Falls, N. Y. Later he went to



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J. C. Smith

Shawinigan Falls, Quebec, as assistant engineer to Mr. Johnson. In 1903 he allied himself with the Shawinigan Water & Power Company of Montreal as superintendent, and three years later was advanced to general superintendent. Subsequently, he became general superintendent and chief engineer and in 1913 he was made vice-president. At present, in addition to his position of vice-president and general manager of the Shawinigan company, he is executive of all of the subsidiary companies.

Mr. Smith has taken an active interest in engineering societies—American, Canadian and British—and has made many important contributions to technical literature.

Besides occupying the chief executive's office of the Quebec company, Mr. Smith is vice-president and general manager of the Shawinigan Water & Power Company, president of the Public Service Corporation, Quebec, president of the Canada Carbide Company, vice-president of the Dominion Engineering Works, Ltd., and director of the Dominion Bridge Company and

president of the Canadian Electro-Products Company and North Shore Power Company, Three Rivers.

### George A. Iler Joins Pennsylvania-Ohio Electric Organization

George A. Iler has been appointed electrical engineer of the Pennsylvania-Ohio Electric Company, New Castle, Pa., and has assumed the duties of his new position, coming to the company from Atlanta, Ga., where for the last year he was radio engineer for the *Atlanta Journal*, constructing and operating its big broadcasting plant.

Mr. Iler succeeds C. A. Harrington in the Pennsylvania-Ohio organization. After serving in the Sixteenth Regiment of Pennsylvania Infantry in the Spanish-American war Mr. Iler joined the U. S. Navy as first-class electrician and was promoted to chief electrician. Following his naval service he devoted his energies to electrical work in various parts of the country in charge of construction and operation of power generating plants, transmission systems and general electrical engineering work, completing his education with a post-graduate course at the Georgia Institute of Technology.

Among other important work in which Mr. Iler has been engaged was the building and operating of the power transmission lines in the New River coal district, West Virginia, and the early application of electrical power to mining projects there. He was also chief operator in connection with the construction of the 100,000 hp. hydro-electric power plant for the Georgia Railway & Power Company at Tallulah Falls.

E. J. Nash has been acting general manager of the Butte Electric Railway since the death on March 19 of J. R. Wharton, who was general manager.

Rodney J. Selby of Des Moines has been appointed assistant director of the Iowa Committee on Public Utility Information. Mr. Selby goes to this committee from the Des Moines *Capital*, with which he has been associated for a number of years. He is a graduate of Drake University and has had many years' experience in the newspaper business.

Elbert G. Allen, formerly chief engineer of the Philadelphia Rapid Transit Company, is now in the Boston office of Stone & Webster, Inc., as consulting engineer. It is not the first time that Mr. Allen has been associated with Stone & Webster. In 1901 he entered their employ, remaining there continuously for twenty years. Early in 1922 Mr. Allen was appointed chief engineer of the Philadelphia Rapid Transit Com-

### C. H. Dahl Advanced

Merits of Work of Research Engineer Recognized by His Appointment to Assistant to Vice-President at Winnipeg

C. H. Dahl, statistician for the Winnipeg Electric Railway for the last three and one-half years, has been advanced to be one of the assistants to the vice-president, A. W. McLimont.

The promotion of Mr. Dahl is recognition of his services as statistician, in which capacity he has made a number of investigations into various problems of the company arising in the operation of its electric, gas and railway properties. He has figured prominently in the adjustment of rates and fares, wage negotiations and general operating efficiencies.

Prior to his connection with the Winnipeg Electric Railway Mr. Dahl was a case investigator for the Wisconsin Railroad Commission, and as such his work consisted in analyzing and review-



C. H. Dahl

ing testimony and evidence submitted in rate cases in appeals for changes in rates as well as drafting decisions in connection with such applications. The experience gained there has no doubt been very helpful to him in the performance of his work in Winnipeg.

Mr. Dahl prepared himself for public utility work while a student at the University of Wisconsin. He is a graduate of the college of letters and science of that university, and while there he took the course provided by that institution in railway transportation, public utilities, statistics, money and banking and kindred subjects in political economy.

George I. Plummer, superintendent of traffic of the Dallas Railway, was elected chairman of the electric railway section for the 1924 meeting of the Southwest Public Service Association at the recent convention held in Fort Worth. W. R. Burns, assistant secretary-treasurer of the Dallas Railway, was re-elected secretary of the section for the ensuing year. Both Mr. Plummer and Mr. Burns have long been active in the affairs of the association.

### Safety Manager in Providence

Harrah K. Bennett has been appointed safety manager of the United Electric Railways, Providence, R. I. He has already assumed his new duties.

Previous to joining the railway at Providence he had a long period of experience in electric railway business. He entered railway work with the Fitchburg & Leominster Street Railway in December, 1898, as carhouse foreman. He advanced gradually and was appointed claim agent for the company in 1905 and held this position until September, 1917, when he resigned to



H. K. Bennett

go with the Bay State Street Railway, Boston, afterward the Eastern Massachusetts Street Railway.

Mr. Bennett was successively superintendent of employment of the Bay State Street Railway, Boston District claim agent and general claim agent. When the latter office was abolished in 1920, he was appointed manager of the Melrose-Woburn division, remaining there until this division was consolidated with the Chelsea division.

He then went into the claim department of the Liberty Mutual Insurance Company at Boston, where he was chief examiner of claims in the branch office, supervision department. He continued with this company until his appointment to the United Electric Railways.

Mr. Bennett has been interested in safety work for many years, and while in Fitchburg gave several talks in the public schools and before other organizations along the line of prevention of accidents. While with the Eastern Massachusetts Street Railway he continued his interest in this phase of railway work and was responsible for that part of the standardized form of breaking in "blue uniform" men by the company which dealt with the instruction of new men from the safety standpoint. In 1911 he was president of the American Electric Railway Claims Association.

John J. O'Connor, superintendent of transportation for the Muskegon Traction & Lighting Company for the last three years, has resigned. The resignation was reluctantly accepted by George

Steinwedel, president of the company. The retiring official was forced to give up his work because of ill health. Mr. O'Connor, formerly a conductor, was promoted by Mr. Steinwedel from the ranks at the time of the reorganization. He is given credit for aiding greatly in the re-establishing of the Muskegon company. Roy Strevo, a dispatcher and a former conductor of the company at Muskegon, is acting as superintendent.

### Joe Gill Heads Southwestern Public Service Association

Joe H. Gill, assistant general manager of the Dallas Power & Light Company, Dallas, Tex., was elected president of the Southwestern Public Service Association at the annual meeting at Fort Worth on May 17. Mr. Gill was born on Sept. 25, 1886, at Kerrville, Tex. He received his elementary education in the public schools of Paris, Tex., and was graduated from the University of Texas at Austin in June, 1910, with the degree of electrical engineer.

Immediately after receiving his degree Mr. Gill entered the employ of the General Electric Company at Schenectady. He remained with that company until December, 1912, when he entered the employ of the Texas Power & Light Company of Dallas as resident engineer. He was engaged with the company at Dallas until October, 1917.

From October, 1917, to April, 1918, Mr. Gill was with Stone & Webster as electrical engineer on the design of the American Ordnance Base Depot in

France and in April, 1918, he enlisted with the United States Army as a private in Battery B, Third Trench Mortar Battalion, Fort Crockett, Tex. On July 4, 1918, he entered the officers' training camp at Fort Monroe, Va., and was commissioned Second Lieutenant of the Coast Artillery on Sept. 25, 1918. He served as instructor in the Coast Artillery Training Center until Dec. 7, 1918, at which time he was discharged from the army.

Mr. Gill returned at once to Dallas and on Feb. 1, 1919, re-entered the employ of the Dallas Power & Light Com-



J. H. Gill

pany as power salesman. He was successively promoted from power salesman to chief engineer and from chief engineer to assistant to the general manager and then to assistant general manager.

## Obituary

Elisha H. Talbot, retired publisher and founder of the *Railway Age* and other periodicals, died recently at his home in New York. He was eighty-three years old. Mr. Talbot was born in Ohio. When he was nineteen he established a weekly newspaper in Winterset, Ia. Besides the *Railway Age* he founded the *Interurban Railway Journal* at Indianapolis, Ind., during the period when interurban railway construction was at its height.

William A. Geoghegan, forty-four years old, a member of the Cincinnati Rapid Transit Commission, died at his home in that city on May 20, as the result of heart disease. Mr. Geoghegan had been a member of the Rapid Transit Commission since 1919, when he was appointed by the late Mayor John Galvin. He was reappointed by Mayor George P. Carrel in 1921. From 1913 to his appointment on the Rapid Transit Commission, Mr. Geoghegan was one of the presiding judges in the Hamilton County Common Pleas Court.

John E. Sickels, long an attorney of the Interborough Rapid Transit Company, New York, N. Y., died on April 14. Mr. Sickels became connected

with the law department of the traction company many years before the lease of the Manhattan Railway to the Interborough was effected. After being admitted to the bar, in Florida, he became a member of the firm of Henderson & Sickels in Tallahassee. Later he was admitted to the bar in the State of New York, and about December, 1897, he entered the law department of the Manhattan Railway.

Capt. Alexander B. Guigon, sixty-five years of age, for more than thirty years prominently identified with the traction business in Virginia, died recently in his home at Richmond. Captain Guigon was one of the original incorporators of the Richmond Traction Company, now an integral part of the Virginia Railway & Power Company in Richmond, and at the time of his death was general counsel for the company. Captain Guigon was prominent in the merger of the Richmond Traction with the Virginia Railway & Power Company. His pallbearers included E. Randolph Williams, vice-president of the Company; George H. Ingles, A. H. Herrmann and G. B. Williams, all officials of the railway.

# Manufactures and the Markets

News of and for Manufacturers—Market and Trade Conditions  
A Department Open to Railways and Manufacturers  
for Discussion of Manufacturing and Sales Matters

## English Electric Has Many Important Railway Contracts

At the annual general meeting of the English Electric Company held in London on April 25, Sir Charles Ellis, the chairman, said that the past year was one of the worst the engineering trade had ever experienced, so that he thought it was a satisfactory result to show a balance on profit and loss account of £318,264 as compared with £363,659 for the previous year.

The orders received during the year were in value one and three-quarter times those received in the previous year, and in the first three months of this year the improvement had been more than maintained. There had been a most encouraging revival in the application of their standard manufactures to steel works, coal mines, and other industries. Improvements in designs and the development of new lines of machinery had been actively continued, and had assisted the company in obtaining contracts, particularly in electric railway and water power work. Glancing at contracts of special interest he was glad to say that entire satisfaction had been given by the electric locomotives now in regular operation in the Pyrenees service of the Midi Railway of France.

After a prolonged inquiry the Japanese Government Railways had decided to adopt the high-tension direct-current system, and had placed with the English Electric Company an order for thirty-four electric locomotives, the largest order of the kind ever executed entirely by British manufacturers. More recently the contract had been secured from the Great Indian Peninsula Railway for electrical equipments for the suburban lines in and near Bombay.

## Foreign Trade Is Returning to Pre-War Condition

The volume of export trade in many commodities used in large quantities by electric railways decreased to a marked extent in 1922. This is shown by the recently published report of the U. S. Chamber of Commerce. Coal, coke, etc., at the head of the list, with 31,161,384,000 lb., was nevertheless 21.4 per cent below the pre-war average and 44.6 per cent below the figures for 1921. Steel rails with 625,166,000 lb. were 29.5 per cent below pre-war, and 13.3 per cent below 1921. Copper, on the other hand, with 652,667,000 lb. was 11.8 below pre-war figures but showed an increased export of 9.5 per cent over the preceding year. The export of hydraulic cement was heavily curtailed as the total quantity 424,070,000 lb. was 59.3 per cent less than the pre-war

quantity and 4.5 per cent below 1921. In spite of the fact that coal occupies first place by weight in the list of exports, it does not play so prominent a part when value is considered, being seventh at \$95,630,000, or 2.5 per cent of the total. Copper is ninth at \$89,030,000. The decline in value of the coal exported coincided almost exactly with the reduction in quantity noted in the preceding paragraph, but the export of copper increased 19 per cent in value.

Electrical apparatus was an important part of the export trade. Telephone, telegraph and signal devices had a value of \$3,398,000 last year. Electric motors, controllers, etc., exported were valued at \$7,444,000. Switches, meters and other transmission and distribution apparatus had a \$6,911,000 valuation, and transforming and converting devices were valued at \$6,273,000.

The relative rank of foreign customers showed little change in 1922 from the year before. Great Britain, Canada, and Germany head the list in the order named. France is now fourth, having displaced Japan. South America continues to make a poor showing, with only 5.9 per cent of the total exports being consigned there.

Increased imports of such commodities as coal and hydraulic cement coin-

cide with the decreased export, with the influence of the coal strike plainly discernable in the first case. The total imports for the year show an increase of 24 per cent over 1921 as compared with a decrease of 14.6 per cent in exports. The present trend appears from this to be toward a smaller export balance as in pre-war days.

## Detroit May Purchase Generating Equipment

Although the Detroit City Council, which recently voted to award contracts for four 20,000-kw. turbo-generators, has rescinded this action, it is said to be likely that the city will eventually buy two, or possibly three, turbines to generate the 35,000 kw. or 40,000 kw. additional energy that it needs for lighting and pumping purposes and in the operation of the municipal railway. At present the city is generating about 19,000 kw. for these purposes and purchasing the rest from the Detroit Edison Company. It is the plan of the city administration eventually to generate all the power needed for municipal uses, but not to compete with the central-station company in the supply of private customers.

## Employment and Wages Gain in April

A preliminary report of the Bureau of Labor Statistics of the U. S. Department of Labor covering over 5,000 representative industrial establishments shows in April an increase over March of 0.5 per cent in the number of employees, an increase of 1.4 per cent in the total amount paid in wages, and an

### ELECTRIC RAILWAY MATERIAL PRICES—MAY 31, 1923

Metals—New York		Paints, Putty and Glass—New York	
Copper, electrolytic, cents per lb.	14.75	Linseed oil (5 bbl. lots), per gal.	\$1.16
Lead, cents per lb.	7.25	White lead (100 lb. keg), cents per lb.	13.125
Nickel, cents per lb.	28.50	Turpentine (bbl. lots), per gal.	\$1.07
Zinc, cents per lb.	6.70	Car window glass, (single strength), first three brackets, A quality, discount*	84.0%
Tin Straits, cents per lb.	42.25	Car window glass, (single strength), first three brackets, B quality, discount*	86.0%
Aluminum, 98 to 99 per cent, cents per lb.	27.25	Car window glass, (double strength) all sizes, A quality, discount*	85.0%
Babbitt metal, warehouse, cents per lb.	65.00	Putty, 100 lb. tins, cents per lb.	4.75
Fair grade	40.00	*These prices are f.o.b. works, boxing charges extra.	
Commercial	40.00	Wire—New York	
Bituminous Coal		Copper wire base, cents per lb.	18.375
Smokeless mine run, f.o.b. vessel, Hampton Roads	\$6.25	Rubber-covered wire, No. 14, per 1,000 ft.	\$7.75
Somerset mine run, Boston	3.175	Weatherproof wire base, cents per lb.	19.00
Pittsburgh mine run, Pittsburgh	2.00	Paving Materials	
Franklin, Ill., screenings, Chicago	1.95	Paving stone, granite, 4x8x4, f.o.b. Chicago, dressed, per sq. yd.	\$3.50
Centrl, Ill., screenings, Chicago	1.575	Common, per sq. yd.	3.10
Kansas screenings, Kansas City	2.625	Wood block paving 3½, 16 treatment, N. Y., per sq. yd.	3.19
Track Materials—Pittsburgh		Paving brick 3½x8½x4, N. Y., per 1,000 in carload lots	54.00
Standard Bessemer steel rails, gross ton	\$43.00	Crushed stone, ½-in., carload lots, N. Y., per cu. yd.	1.75
Standard open hearth rails, gross ton	43.00	Cement, Chicago consumers net prices, without bags	2.20
Railroad spikes, drive, Pittsburgh base, cents per lb.	3.15	Gravel, ½-in., cu. yd., N. Y.	2.25
Tie plates (flat type), cents per lb.	2.675	Sand, cu. yd., N. Y.	1.25
Angle bars, cents per lb.	2.75	Old Metals—New York	
Rail bolts and nuts, Pittsburgh base, cents, lb.	4.375	Heavy copper, cents per lb.	12.50
Steel bars, cents per lb.	2.40	Light copper, cents per lb.	10.625
Ties, white oak, Chicago, 6 in. x 8 in. x 8½ ft.	\$1.50	Heavy brass, cents per lb.	6.50
Hardware—Pittsburgh		Zinc, old scrap, cents per lb.	4.375
Wire nails, base per keg	3.00	Yellow brass, cents per lb. (heavy)	6.50
Sheet iron (28 gage), cents per lb.	3.85	Lead, heavy, cents per lb.	6.00
Sheet iron, galvanized (28 gage), cents per lb.	5.25	Steel car axles, Chicago, net ton	\$21.75
Galvanized barbed wire, cents per lb.	3.80	Old car wheels, Chicago, gross ton	22.75
Galvanized wire, ordinary, cents per lb.	3.35	Rails (short), Chicago, gross ton	22.25
Waste—New York		Rails, (relaying), Chicago, gross ton	33.50
Waste, wool, cents per lb.	12-16	Machine turnings, Chicago, net ton	17.75
Waste, cotton (100 lb. bale), cents per lb.:			
White	11-13.50		
Colored	8-13		

increase of 0.9 per cent in the average weekly earnings. Identical establishments report 2,139,053 persons employed in April compared with 2,128,816 in March, and weekly payrolls of \$55,353,000 compared with \$54,573,958.

**Rolling Stock**

Beech Grove Traction Company, Beech Grove, Ind., has placed an order with the Cincinnati Car Company for two one-man Birney safety cars. The order was placed in April, and delivery is expected in July. The seating capacity of the car is thirty-two persons.

Columbia Railway, Gas & Electric Company, Columbia, S. C. placed an order with the J. G. Brill Company of Philadelphia for six one-man cars of the standard Birney safety type. Additional equipment of this type is contemplated, but no orders have been placed.

Memphis Street Railway, as was reported in the ELECTRIC RAILWAY JOURNAL, issue of May 12, has placed an order for forty new cars. They are described as follows:

Date order was placed.....	May 18, 1923
Date of delivery.....	December, 1923
Builder of car body.....	St. Louis Car Company
Type of car.....	Low-level, light-weight passenger
Seating capacity.....	48
Total weight.....	33,400 lb.
Bolster centers, length.....	22 ft. 0 in.
Length over all.....	45 ft. 2 in.
Truck wheelbase.....	5 ft. 10 in.
Width over all.....	8 ft. 4 1/2 in.
Body.....	Steel
Interior trim.....	Birch
Headlining.....	Agasote
Roof, arch or monitor.....	Arch
Alr brakes.....	General Electric C. P. 27
Control.....	K-35
Couplers.....	Hoovey
Curtain fixtures.....	Curtain Supply Company
Designation signs.....	Hunter
Door-operating mechanism.....	Memphis Street Railway standard
Fare boxes.....	Johnson
Fenders or wheelguards.....	Memphis Street Railway standard
Gears and pinions.....	General Electric
Hand brakes.....	St. Louis Car Company
Heater equipment.....	Consolidated
Headlights.....	Golden Glow
Journal boxes.....	M. C. B.
Lightning arresters.....	General Electric
Motors, type and number.....	40-G. E.-265
Motors, outside or inside hung.....	Inside
Paint, varnish or enamel.....	St. Louis paint and surfacer
Registers.....	International No. 5
Sanders.....	St. Louis Car Company
Sash fixtures.....	Dayton Manufacturing Company
Seats.....	Hale & Kilburn
Seating material.....	Wood
Step treads.....	Feralun
Trolley catchers or retrievers.....	Ideal
Trolley base.....	U. S. No. 13
Trolley wheels or shoes.....	4 in. wheels
Trucks.....	Brill 76 E.
Ventilators.....	Nichols-Lintern
Wheels (type and size).....	Cast Iron, 26 in.

Indianapolis & Cincinnati Traction Company, Indianapolis, Ind., in connection with its change from single-phase operation to d.c. operation has purchased the following equipment: Twelve new all steel passenger cars from the Cincinnati Car Company; forty-eight Westinghouse type 548-C-7 field control 105 hp. motors at 600 volts for the passenger cars; sixteen Westinghouse 557-A-7 field control 145 hp. motors for freight service; Westinghouse standard HLF pneumatically operated control to permit train operation. The gear ratio on the passenger cars will be 21/68

and Nuttall helical gears will be used. The gear ratio for the freight cars will be 16/61 and helical gears will also be used here.

**Track and Roadway**

Brantford Municipal Railway, Brantford, Ont., expects to build 1,000 ft. of new track on Oxford Street.

Chicago, Ottawa & Peoria Railway, Joliet, Ill., is replacing some 60-lb. rails in La Salle and Peru with 100-lb. A. R. A. rails.

Bristol & Plainville Electric Company, Bristol, Conn., expects to replace at once 1 mile of track for new paving. Supplies are all on hand.

United Electric Railways, Providence, R. I., has ordered the necessary material for its track work in connection with the loop plan to be put into effect in the early fall. Deliveries on the orders are expected in about two months.

Los Angeles Railway has applied for franchises to permit construction of track on Vermont, Evergreen, Melrose and Central Avenues, Rampart Boulevard, South Main, West Eighth and West Forty-eighth Streets.

Rochester & Syracuse Railroad will spend \$75,000 this year making improvements to the right-of-way, T. C. Cherry, vice-president and general manager, has announced. A large part of the line will be reconstructed with 25,000 new ties and new ballast. The work is already under way near Lyons.

Johnstown, Pa.—A petition to grant the Johnstown Traction Company a franchise to operate cars on Ohio Street, from Moxham, Johnstown, to the borough of Lorain, has been filed with the Johnstown City Council. The petition is signed by residents of Lorain Borough, who want an extension. The franchise is being held for consideration by the Johnstown Council.

**Power Houses, Shops and Buildings**

Boston Elevated Railway has awarded to Simpson Brothers Corporation the contract for constructing the superstructure of four buildings constituting the first unit of the new shops at Everett, Mass.

Electric Depot Company, Cleveland, is completing a new warehouse which will be the largest building of its kind that the company owns. The freight traffic on the interurban roads surrounding Cleveland has been increasing greatly, particularly on the Northern Ohio line, and this line will be among those served by the warehouse. Its area will be approximately 160 ft. x 44 ft., and it is served by three tracks on one side and a driveway on the other.

Boston, Mass.—Plans for the enlargement of the sheltered area at the Everett terminal of the Boston Elevated

Railway were submitted recently to the Public Utilities Commission. The plans call for the relocation of the waiting room in the station so that it will be placed on the easterly side of the terminal, between the outbound surface tracks and Broadway. The relocation will make possible an extension of the sheltered area 75 ft. long and 25 ft. wide. A prepayment entrance, at the corner of Broadway and Bowdoin Street, will also be installed.

Indianapolis & Cincinnati Traction Company, Indianapolis, Ind., in connection with its change over to d.c. operation has placed orders with the Westinghouse Electric & Manufacturing Company for equipment for ten automatic substations. These will consist of five 300 kw. and three 500 kw. full automatic substations, and one 500 kw. semi-automatic substation. The 300 kw. automatics will be installed at Martin on the Cincinnati division and at New Bethel, Fairland, Prescott and Adams on the Shelbyville division. The 500 kw. automatics will be installed at Hoffman, Reedville and Gwynneville on the Cincinnati division. The one semi-automatic station will be located at Rushville, which is the location of the present power plant. Each of the automatic stations will be equipped with one 600 volt d.c. six phase 60 cycle compound wound rotary converter, one three-phase 33,000 volt transformer and automatic switching equipment. There will also be high tension switching equipment for sectionalizing, which will probably be of the out-door type. The tenth automatic equipment will be of 500 kw. capacity for installation on one of the present cars for use as a portable substation.

**Trade Notes**

General Electric Company will move its Omaha offices from the Electric Building to the City National Bank Building.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., announces that C. H. Long, formerly manager of the contract section of the railway department, has been appointed a section manager of the light traction division of the railway department and is responsible for international negotiations and also for stocks and production schedules of the light traction division. R. W. Soady has been appointed manager of the contract section to succeed Mr. Long.

T. M. Grindley Company is the new name of the organization handling the sale of the products of the Conveyors Corporation of America, Chicago, in the Province of British Columbia. The address of the Grindley Company is 1158 Homer Street, Vancouver. The Grindley Company was the western office of Gormans Limited, Edmonton, and operated under that name up to May 1, but after that date Mr. Grindley took over the business. organized his own company and enlarged his selling staff.



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Baseball fans, picnic parties, amusement seekers of all kinds come piling on your cars. You want them to, of course, for every added rider raises revenues.

But with this extra riding comes added liability. As your riding increases, so does your responsibility for safety.

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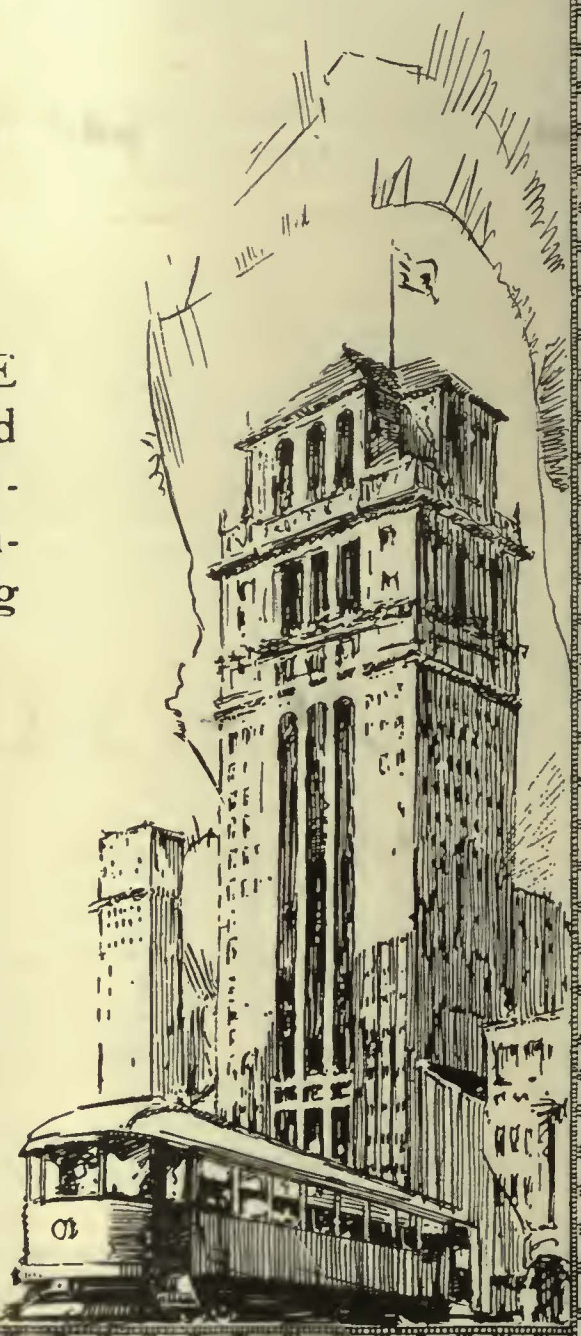
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**T**HE purchase of 81 White Model 50 busses by the Pacific Electric Railway Company and the Los Angeles Railway Company shows the growing importance of bus transportation as a supplement to electric railway service.

The order, by far the largest ever placed by an electric railway for motor busses, reflects the outstanding preference for White equipment among leading electric railways of the country.

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# To overhaul motors this summer you'll need Irvington Insulation

Irv-O-Slot for core insulation saves the armature winder's time because it enables him to put both fibre and varnished cambric into the slot at one operation.

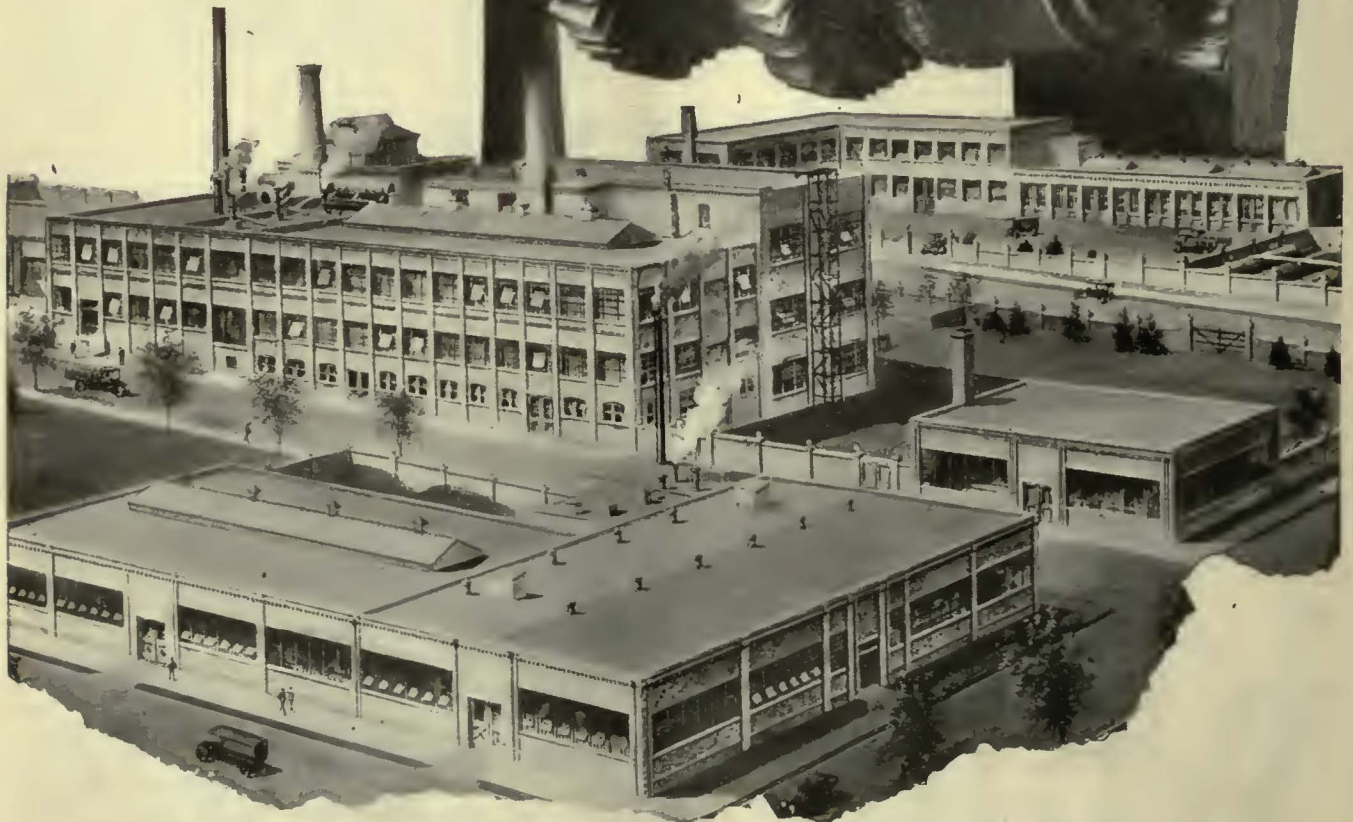
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Read these recent statements of way engineers who have tested Thermanit Welds in service:

From Illinois:

"The welding we did on switches and mates is holding up very well; in fact we have no cause for complaint on any of the Thermanit welding we have done." (This same Engineer reports having experienced some very sudden temperature changes last winter which caused a lot of broken rails and joints on his system, but none occurred on the section which was Thermanit welded last summer.)

From Maine:

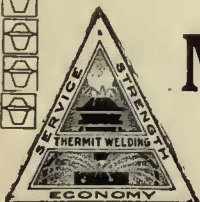
"I am deeply interested in Thermanit rail welding. We have installed a number of Thermanit welded compromise joints, and I find them so satisfactory that I am desirous this coming season, provided I can obtain an authorization, to install at least a short stretch of track with all joints Thermanit welded."

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"We have had some trouble with the rail breaking at the fillet connecting the web with the rail head in the rail in our Lorain Section 95-400 and our Lorain Section 91-375. We found this condition prevailed where the rail has cast welded joints and also where angle bars were used. This failure usually went along under the head of the rail and to the first or second bolt hole. These rails have been in service for about fifteen years. Where we used Thermanit joints we have experienced no trouble."

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## *Pittsburgh Folk Will Like These Car Interiors*

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The above photographs illustrate one of forty cars built recently by the Pressed Steel Car Company with HASKELITE upper deck linings. Seventy-five similar cars are being constructed with complete HASKELITE linings by the St. Louis Car Co.

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Because of their hard, smooth surface, HASKELITE linings are easily brought to a finish of automobile brilliance. For ease of application there is no material that equals HASKELITE — for either headlining, roofs and bulkheads. Built for airplane use, HASKELITE has astonishing strength with light weight.

PLYMETL, a smaller product, is used for wainscoting and vestibule linings. The Indianapolis St. Railways have reported complete satisfaction with a large installation of PLYMETL vestibule linings.

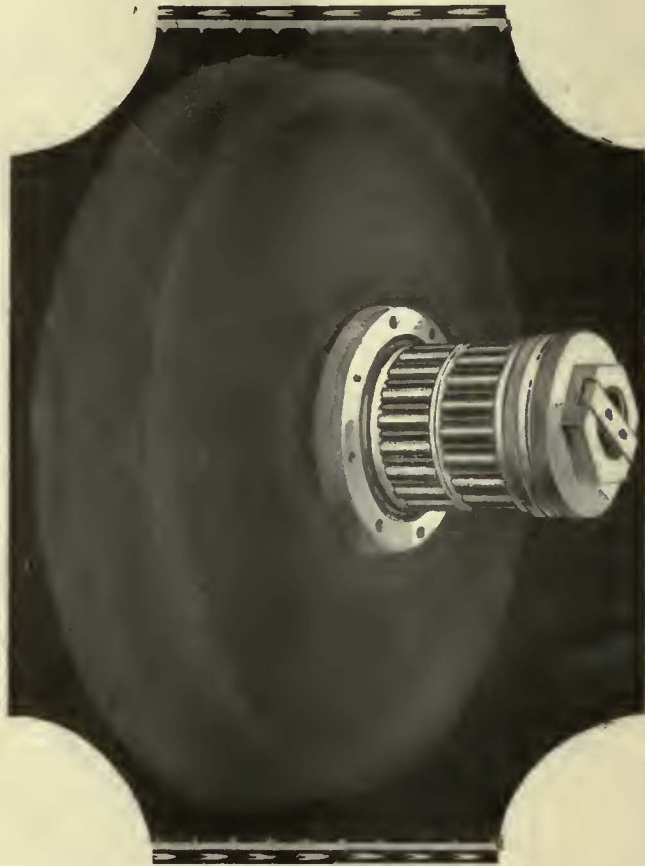
You should have samples of HASKELITE and PLYMETL.

*A valuable set of blue  
prints dealing with  
headlining and roof  
construction will be  
sent free on request.*

### **Haskelite Manufacturing Corporation**

**133 W. Washington Street  
CHICAGO, ILLINOIS**

# STAGGERING



Staggering makes it possible for the Stafford Roller Bearing for Car Trucks to reduce journal friction 90% and to easily carry the heaviest bearing loads for years under severest conditions.

The Stafford Roller Bearing has a double row of staggered rollers. This exclusive—and revolutionary—feature of design prevents the weight of the car from being constantly lowered and raised as each roller approaches and passes the crown of the journal, as is the case with ordinary roller bearings.

Let us show you the Stafford Roller Bearing so you can prove the truth of this statement yourself.

*Stafford—guaranteed three years*

**STAFFORD ROLLER BEARING**

**CAR TRUCK CORPORATION**

LAWTON MICHIGAN

*"IT ROLLS THE FRICTION AWAY"*



**ELEVATED TRAINS  
NOW IN NEW DRESS**

“Goldenrod Special” Introduces  
Color Scheme With I. R. T.  
Officers Aboard.

**HAS PASSENGERS’ APPROVAL**

Three Newly Painted Trains to Be  
Commissioned Each Week—Cost,  
With Stations, \$2,000,000.

The “Goldenrod Special,” the first of the Interborough Rapid Transit Company’s elevated trains to be decorated in the new, orange and black color scheme, made its appearance yesterday on the Sixth Avenue line. The train, which consisted of eight cars left the Rector Street station at 11:36 A. M. and proceeded to the end of the line at West 155th Street, after which it continued on a regular schedule all day.

Announcement of the decorative scheme had been made in advance in the newspapers, and regular elevated railroad passengers, who were on the watch for “seemed to regard its vivid coloring

Clipping from the New York Times, April 24, 1923.

## Have Faith in Paint!

Why does the management of New York’s Elevated lines appropriate \$2,000,000 to “dress up” its cars in fresh, bright paint? Did you ever ask why the taxi people adorn their cabs in vivid hues—and keep them freshly painted all the while? Have you ever noticed how a United Cigar Store with its characteristic glowing red signs attracts your attention?

Paint attracts attention—and by attracting attention paint draws patronage. Paint will help to sell transportation.

*Better business begins with better paint*

## BECKWITH-CHANDLER

**offers expert service together with highest quality paints and varnishes.**

Users of Beckwith-Chandler car finishes include many of the leading steam and electric railways of America. Companies in the three largest cities, New York, Chicago and Philadelphia are among our best customers. Both quality and price must be right to keep these customers.

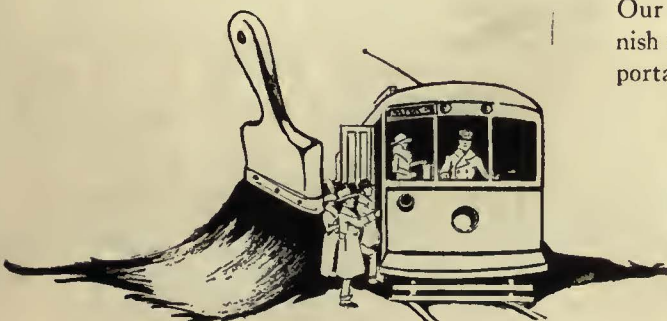
Our wide experience among such a clientele, enables us to furnish expert advice on the proper use of car finishes to “sell transportation” and still obtain durability and economy.

*Write for further information.*

**The Beckwith-Chandler Company**

193-211 Emmett St., Newark, N. J.

320 Fifth Ave., New York





*Better Because It's Boyerized*

## The McArthur Turnbuckle

You won't have to re-fit the brake rigging with new turnbuckles, if you specify McArthur Turnbuckles in the first place. They will last as long as the truck itself.

More than that—the old style jam-nut idea has been scrapped, and an efficient spring-equipped split-clamp principle has been substituted. Now it only takes a pocket-wrench and a moment's time to make an adjustment, and tighten it up to stay.

*Send for Sample to try.*



## The ninth inning need not be the end of the game!

Patrons of the National sport like to see the game tied in the ninth—they get more for their money.

Boyerized Parts give you extra innings also,—many of them in fact,—for they wear from three to four times as long as ordinary untreated steel.

### The Long-Life List They are BOYERIZED Parts

Brake Pins	Spring Posts
Brake Hangers	Bolster and Transom Chafing Plates
Brake Levers	McArthur Turnbuckles
Pedestal Gibs	Manganese Brake Heads
Brake Fulcrums	Manganese Truck Parts
Center Bearings	Bushings
Side Bearings	Bronze Bearings
Spring Post Bushings	

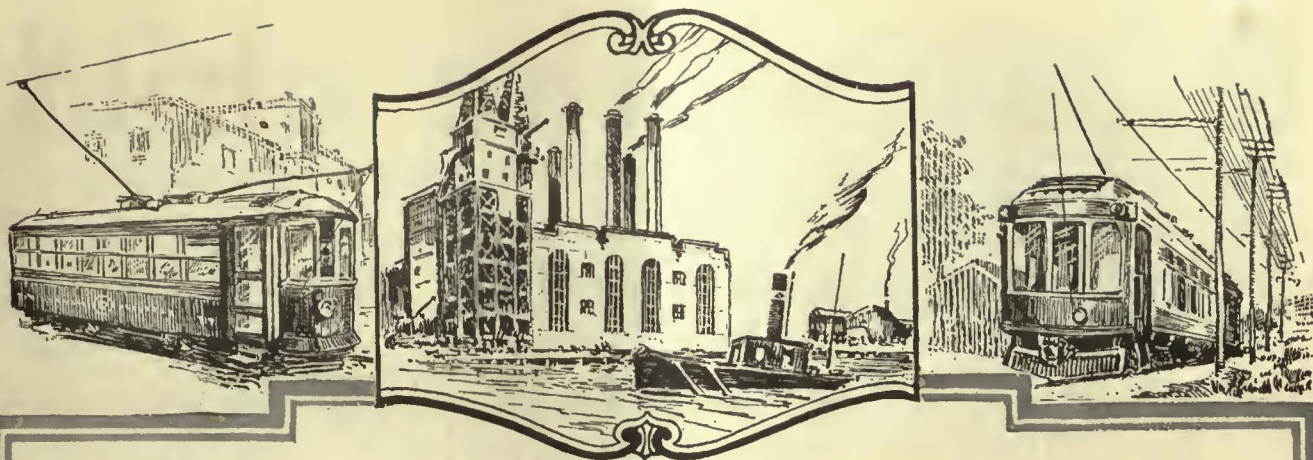
*Boyerized Parts cost slightly more because they last three or four times as long as parts of ordinary untreated steel. Let us quote you on your requirements.*

## Bemis Car Truck Company

*Electric Railway Supplies*  
**SPRINGFIELD, MASS.**

#### Representatives:

Economy Electric Devices Co., Old Colony Bldg., Chicago, Ill.  
F. F. Bodler, 903 Monadnock Bldg., San Francisco, Cal.  
W. F. McKenney, 54 First Street, Portland, Ore.  
J. H. Denton, 1328 Broadway, New York City, N. Y.  
A. W. Arlin, 772 Pacific Electric Bldg., Los Angeles, Cal.



# “Like a Motorman’s Glove!”

No need to tell you men why that phrase exists—  
or what condition it implies.

**B**UT while a motorman’s glove cannot be expected to remain as immaculate as that of the doorman at the Ritz-Carlton, there’s no need for that glove to be full of oil.

No need because when the motorman’s valve is lubricated with Texaco Transmission Lubricant, there won’t be any oil on the glove.

—For this lubricant does not creep up the stem.

The cleanliness in this ONE place is only an indication of the value of Texaco Transmission Lubricant when used in other places on the cars.

For instance, when used on:

- Car-door engine
- Controller Fingers
- Pneumatic and Magnetic Controls
- Brake Cylinders

this excellent Lubricant does its work—does it well—lubricating efficiently without creeping, dripping or spattering.

Texaco Transmission Lubricant does not form any undesirable deposits.

We repeat: It is a well made, clean effective lubricant.

Let us tell you more about this Texaco product. Let us tell you why it is being adopted by more and more lines throughout the country.

Many of these lines are buying it, in addition to their barrel orders, in the handy 5-lb. screw top can, which is clean and convenient and ready for instant use in the barns or shops.



Electric Street Railway men like it because ONE lubricant, Texaco Transmission Lubricant, is so efficient for so many purposes. It avoids waste and mistakes.

***There Is A Texaco Lubricant For Every Purpose***

and they are unexcelled for the Lubrication of Street Railways,  
on Rolling Stock, in Power Plant or Shop.



**THE TEXAS COMPANY**

DEPT. R-J · 17 BATTERY PLACE · NEW YORK CITY

HOUSTON · CHICAGO · NEW YORK

OFFICES IN PRINCIPAL CITIES



# It saved the child!

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## *Some satisfaction, that!*

How good it feels to know that you have specified the best, when news like this comes in.

Are you not glad that you did not put on a guard merely to cover the law, but rather one with years of experience behind it, and positive proof of its life-saving record. Such a life-saving record is made possible only by well constructed, positive and instantaneously working parts.

**Don't experiment — use the Life Guard which has a long life-saving record and of sound construction — economical to maintain, as manufactured by**

**THE CONSOLIDATED CAR FENDER CO.**

Providence, R. I.

*General Sales Agents*

**Wendell & MacDuffie**

110 East 42nd St., New York, N. Y.

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# The H. B. LIFE GUARD

— a new Library  
for  
electrical workers



# Electrical Maintenance and Repair—

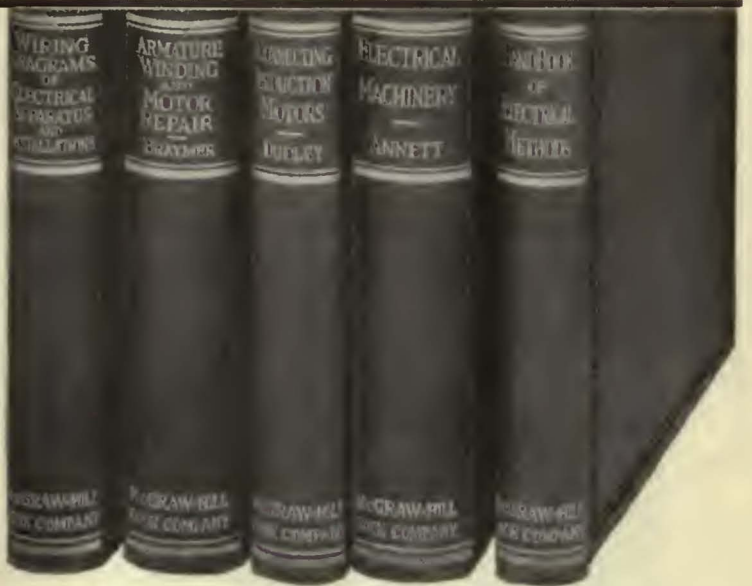
5 volumes—1736 pages—1818 illustrations—library binding

**T**HIS library contains the largest collection of practical methods for electrical repair and maintenance men that has ever been put together in book form.

Here you will find the best modern practice in repair work. The authors have drawn not only from their own extensive experience, but from the experience of electrical repairmen in large and small repair shops and manufacturing plants throughout the country.

The library of Electrical Maintenance and Repair has been planned to give the electrical worker a practical and thoroughly rounded-out course on his work. In it he gets both the "how" and the "why"—the fundamental laws and rules and their practical application.

The man who is equipped with these five practical books will have a most valuable asset—one that will enable him to step ahead in his work more rapidly than most electrical workers.



## Seven reasons why you should have these books

1. The five books in this library discuss actual repair jobs and show you step by step what to do when anything goes wrong.
2. They show you how to locate and remedy motor and generator troubles.
3. They show you how to reconnect motors to meet any condition of voltage, phase, frequency and speed.
4. They give you suggestions for preventing electrical machinery troubles.
5. They cover fully the rewinding of motors.
6. They present information that will help you get better service out of your electrical equipment.
7. They give you tables, data, kinks that you will find of priceless value every day on every job.

### These books tell you

- How to replace commutator segments—
- How to connect an induction motor winding to meet any condition of voltage, phase, frequency and speed—
- How to check this reconnection to know if the motor will operate under the new condition—
- How to draw a diagram for any winding—
- Ten most common defects in windings—
- How to locate defects—
- How to figure a new winding for an old core—
- How frequency affects winding and r.p.m.—
- How performance is affected by a change in winding—
- How to find out what the trouble is when a motor or generator will not run—
- How to remedy the trouble—
- How to keep electrical machines in first-class operating condition—
- How to re-arrange a three-wire system to reduce voltage fluctuations—
- How to test meters—
- How to turn down a commutator—
- How to insert spare transformer in star-delta group—
- How to remove defective field coils—

And hundreds of other practical methods and kinks

**Free examination**  
**Pay only \$2.00**  
**in ten days**  
**and \$2.00 a**  
**month.**

You can secure the use of these five great books on electrical repair work for ten days' free examination. When you have seen for yourself what these books are and how much they could help you, send us your first remittance of \$2.00. The balance may be paid in monthly instalments of \$2.00 until the price of the library—\$14.00—is paid. Send for the books today. Fill in and mail the enclosed card. No money down—no agents. You simply agree to return the books, postpaid, in ten days or remit for them on our convenient monthly payment plan.

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370 Seventh Ave.,  
New York

## Free Examination Coupon

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Gentlemen:

Send me the **LIBRARY OF ELECTRICAL MAINTENANCE AND REPAIR** (shipping charges prepaid), for 10 days' free examination. If satisfactory, I will send \$2.00 in ten days and \$2 per month until the special price of \$14.00 has been paid. If not wanted, I will write you for return shipping instructions. (Write plainly and fill in all lines.)

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Employed By .....

Occupation .....

# 50

## Delivery Points



**CHILLED IRON WHEELS**  
for railway and street car service. Capacity 20,000 per day. 25,000,000 in service.

**ASSOCIATION OF MANUFACTURERS OF CHILLED CAR WHEELS**  
1847 McCormick Bldg., Chicago

**T**HE map above shows the location of the 50 foundries in the United States and Canada, represented by the Association of Manufacturers of Chilled Car Wheels.

- |                   |                    |
|-------------------|--------------------|
| Chicago, 4        | Sayre, Pa.         |
| St. Louis, 2      | Berwick, Pa.       |
| Buffalo, 4        | Albany             |
| Pittsburgh, 2     | Toronto            |
| Cleveland, 2      | New Glasgow, N. S. |
| Amherst, N. S.    | Madison, Ill.      |
| Montreal, N. S.   | Huntington, W. Va. |
| Mich. City, Ind.  | Wilmington, Del.   |
| Louisville        | Houston, Tex.      |
| Mt. Vernon, Ill.  | Hannibal, Mo.      |
| Ft. Wayne, Ind.   | Reading, Pa.       |
| Birmingham        | Baltimore          |
| Atlanta           | Richmond, Va.      |
| Savannah          | Ft. William, Ont.  |
| Boston            | St. Thomas         |
| Detroit           | Hamilton           |
| St. Paul          | Ramapo, N. Y.      |
| Kansas City, Kan. | Marshall, Tex.     |
| Denver            | Los Angeles        |
| Tacoma            | Council Bluffs     |
| Rochester, N. Y.  |                    |

**American Railroad Association Standards**

- 650 lb. wheel for 60,000 Capacity Cars
- 700 lb. wheel for 80,000 Capacity Cars
- 750 lb. wheel for 100,000 Capacity Cars
- 850 lb. wheel for 140,000 Capacity Cars

*The Standard Wheel for Seventy-Two Years*

# CHILLED IRON WHEELS



# Bates Steel Poles

Will  
Help  
Sell  
Your Securities

Use Bates Steel Poles with your other first-class equipment and the whole installation will be permanent and an inducement for your security buyers.

Bates Pole installations are easily maintained. All surfaces are exterior, therefore are quickly and cheaply painted. Bates Pole prices are surprisingly low.

**B**ates **E**xpanded **S**teel **T**russ **C**o.

ILLINOIS MERCHANTS BANK BLDG.,  
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*Have you your Bates Treatise on  
Steel Poles?*

**BATES** ONE PIECE **EXPANDED** STEEL **POLES**

# ANDERSON LINE MATERIAL

*with*

## Aetna Insulation

For over twenty years, Anderson Line Material has been a leader in the field because of its eminently satisfactory and long service. Aetna Insulation has helped to make this reputation for it.

Aetna Insulation is our own special compound. Developed years ago, it has continued ever since to meet the exacting requirements of electric railroad line service.

*—Let us send our catalog—*



## Albert & J. M. Anderson Mfg. Co.

Established 1877

289-293 A St., Boston, Mass.

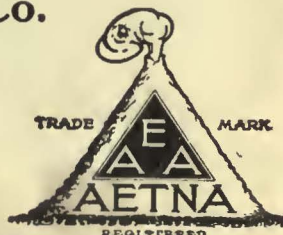
Branches—New York, 135 Broadway. Philadelphia, 429 Real Estate Trust Bldg. Chicago, 105 So. Dearborn St. London, E. C. 4, 38-39 Upper Thames St.

TRADE



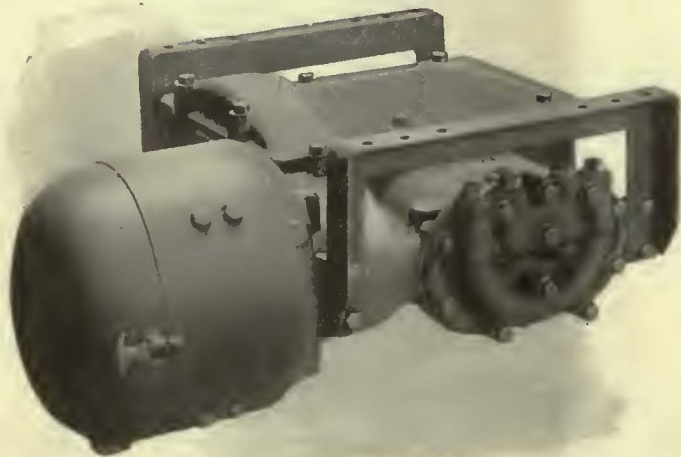
Reg. U. S. Pat. Off.

MARK



# ALLIS-CHALMERS

## AA-7B Air Compressor



Compressor for Street Car Mounting

A single acting duplex compressor with crank case and cylinders integral. One-piece cylinder-head for both cylinders contains suction and discharge valves. Trunk pistons operated by connecting rods with bushings provided for taking up wear.

Heavily designed crankshaft of high-grade steel turns in journal bearings of ample proportions to insure minimum wear.

Herringbone Gears transmit power from motor shaft to crankshaft with practically silent operation.

Lubrication is positive and efficient. Connecting rods dip into the oil and splash reaches all working parts. Gears run in oil.

Send for Bulletin

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MILWAUKEE, WIS. U.S.A.

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Especially Designed for  
One Man Safety Cars



Lightest  
Weight  
Stationary  
Steel Seat

**Lightest  
Strongest  
Simplest  
Neatest**



Lightest  
Weight  
Walkover  
Steel Seat

*No higher in price than others  
Write for particulars*

### Hale & Kilburn Corporation

American Motor Body Company, Successors  
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R. H.  
**TAYLOR REDUCED HEIGHT TRUCK**  
 WITH  
 S. A.  
**TAYLOR STRAIGHT ACTION BRAKE**



**SMOOTH RIDING**  
**LOW MAINTENANCE COST—Absolute Safety**

Center Plate Height 22¾ in. with 26 in. Diam. Wheels

For Modern Low Level Double Truck Cars, the Taylor R. H. Truck, equipped with Taylor S. A. Brake, with large diameter hard steel pins, will provide the best possible service results from every standpoint.

**TAYLOR ELECTRIC TRUCK CO., TROY, N. Y.**

SPECIFICATIONS ON REQUEST

Established 1892

SEND FOR PORTFOLIO

*10 seconds to change wheels!*

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## Detachable Trolley Harps

Trolley wheel mileage can be increased and service interruptions reduced when Bayonet Trolley Harps are used. They permit removal of wheel and harp for inspection, lubrication, adjustment or repair. The change is made in a fraction of a minute—no tools needed.

With Bayonet Detachable Harps, there is no need or incentive for running a wheel which needs some minor repair. That's the kind of business which shortens the life of equipment. Bayonet Equipment helps you to prolong its life.



**Wheels**  
**Sleet Cutters**  
**Bases with Detachable Pole Clamps**

**Bayonet Trolley Harp Co., Springfield, Ohio**

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**T**HE publisher of a business paper should dedicate his best efforts to the cause of Business and Social Service, and to this end should pledge himself—

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6. To solicit subscriptions and advertising solely upon the merits of the publication.
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8. To co-operate with all organizations and individuals engaged in creative advertising work.
9. To avoid unfair competition.
10. To determine what is the highest and largest function of the field which he serves, and then to strive in every legitimate way to promote that function.

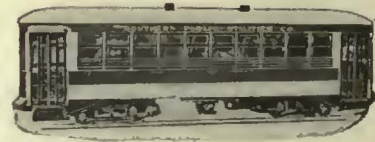
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**THE ASSOCIATED  
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220 West 42nd St., New York

## Our Cars Cost Less To Maintain



*Safety First*



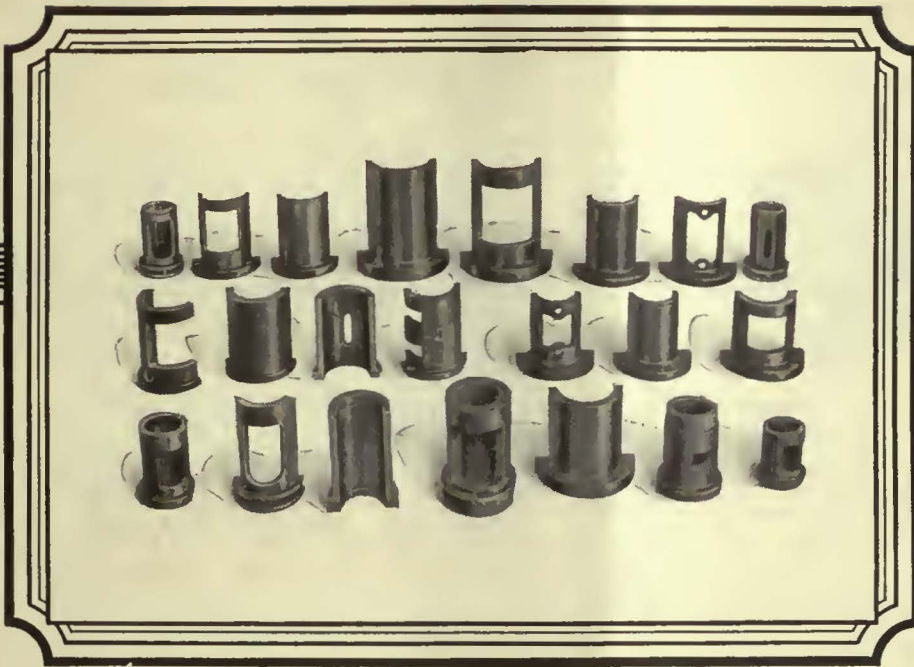
**Cars of All Types  
From  
Birney One-Man Safety  
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Sash, Doors, Interior Finish and Framing, Curtains, Ventilators and Car Trimmings, Brakes, Gongs, Door and Step Mechanism.

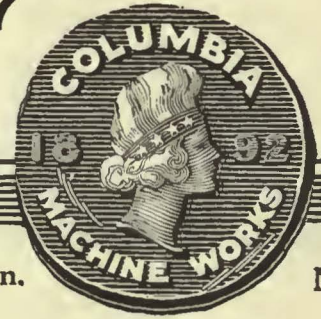
**"We Satisfy"  
Give Us A Trial**

**Perley A. Thomas Car Works**  
High Point, N. C.



The  
**COLUMBIA**  
 Armature,  
 Axle and  
 Journal Bearings

—have been adopted by many roads as standard  
 because of their long wearing quality



3313 Atlantic Ave., Brooklyn.

N. Y.

—then they ordered twenty-five (25) more!  
**St. Louis Quality Cars**



So satisfactory was the service of this type of car on the lines of the Los Angeles Railway that they placed a repeat order, making a hundred and fifty in all.

*Let Us Figure on Your New Cars*

**St. Louis Car Company**

St. Louis, Mo.

*"The Birthplace of the Safety Car"*

**The Engineer Speaks:**



Nachod Headway Recorders are certainly a big step towards higher efficiency in the operation of Electric Railways. Against the competition of both jitney and private automobiles, the real deterrent is *fast service* with cars the railway company can afford to run on *short headway*.

**Exact Operation to Time Points**

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**Nachod Headway Recorders**

No. 2



**AIMco** Electric Railway Automatic Signals

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**INSULATING**  
**MACHINERY**  
**COMPANY**

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Sales Agents:  
 Electric Service Supplies Co.  
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**ROME WIRE**

BARE AND INSULATED

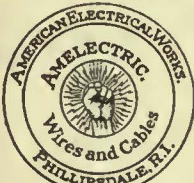
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**ROME WIRE COMPANY**

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BARE COPPER WIRE AND CABLE

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**AMERICAN ELECTRICAL WORKS  
 PHILLIPSDALE, R. I.**

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**We are prepared**

to handle any high grade proposition where

**VARNISHED CAMBRIC**

Wires and Cables

are required.

When using *quality* Wires and Cables use *quality* Tapes.

"MANSON" Tape, "OKONITE" Tape, "DUNDEE" Tapes

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Incorporated 1884



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**U. S. ELECTRIC  
 AUTOMATIC SIGNAL**

for single track block signal protection

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Manufacturers of

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*Send for new  
Rail Bond Book*

**American Steel & Wire  
Company**  
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## The Baker Wood Preserving Company CREOSOTERS

Washington Court House, Ohio

Cross Ties                      Bridge Timbers  
Lumber                              Posts  
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*Treated and Untreated*

*We solicit your inquiries*

Creosoting Plant located  
Washington Court House, Ohio  
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## ELRECO TUBULAR POLES



THE "WIRE LOCK"      THE CHAMFERED JOINT

COMBINE

Lowest Cost                      Lightest Weight  
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## International Creosoting & Construction Co. Galveston, Texas

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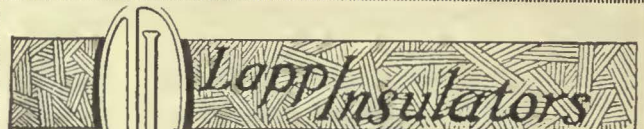
### MONEY SAVERS TO RAILWAYS

Treated railway ties, poles, piling,  
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*See our full page advertisement  
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## Chapman Automatic Signals

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Established 1881

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Successor

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Automatic Return Switch Stands for Passing Sidings  
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Manganese Construction—Tee Rail Special Work

## Peirce Forged Steel Pins with Drawn Separable Thimbles

Your best insurance against insulator breakage

**Hubbard & Company**  
PITTSBURGH, PA.

## FERALITE

An up-to-date and most economical process for the Aluminothermic welding of rail joints. Makes the joint stronger than the rail itself.



Feralite Welded Joint

Special advantages — (1) Rail ends are butted together and easily aligned, no inserts needed to fill in or adjust. (2) Smaller portions of material used. (3) Grinding reduced to the min-

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The Feralite Rail Welding Process eliminates rail joints at a lower cost than any other process. Write for full details.

**ALUMINO-THERMIC CORPORATION**  
Roselle Park, New Jersey

## SPECIALISTS

in the  
**Design and Manufacture**  
of  
**Standard—Insulated—and  
Compromise Rail Joints**

**The Rail Joint Company**  
61 Broadway, New York City

## BARBOUR-STOCKWELL CO.

205 Broadway, Cambridgeport, Mass.  
Established 1858

Manufacturers of  
**Special Work for Street Railways**  
Frogs, Crossings, Switches and Mates  
Turnouts and Cross Connections  
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*Electrically Welded Joints*

**THE LORAIN STEEL COMPANY**  
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Sales Offices:  
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## W H A R T O N

Special Trackwork  
*For Street and Steam Railways*

Steel Castings Gas Cylinders

ORIGINATORS OF  
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**WM. WHARTON JR. & CO., Inc.**

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*Other Plants:*

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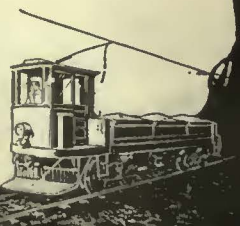
SWITCHES—MATES—FROGS—CROSSINGS  
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An automatic dump car, an electric locomotive, a snow plow, and a freight car—all in one. Big savings shown in track construction and maintenance, paving work, coal hauling, ash disposal, snow removal, and freight transportation.

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## Series Type

**Arc Welding and Bonding  
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Rugged series resistance coil  
Indestructible Mica insulation  
Normal welding current at half voltage

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# THE BABCOCK & WILCOX COMPANY

85 LIBERTY STREET, NEW YORK

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Water Tube Boilers  
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Makers of Steam Superheaters  
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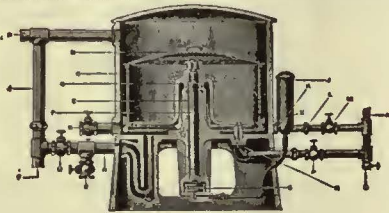
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**BRANCH OFFICES**

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NEW ORLEANS, 521-5 Baronne Street  
HOUSTON, TEXAS, Southern Pacific Building  
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Don't throw  
the oily  
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## Save Money By Reclaiming It!

This oil extracting machine is reclaiming hundreds of gallons of perfectly good lubricating oil and many pounds of waste for the Milwaukee Electric Railway & Light Co. as well as many other companies. It will do the same for you. It is widely used as a real economy producing equipment.

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Service and economy are direct results  
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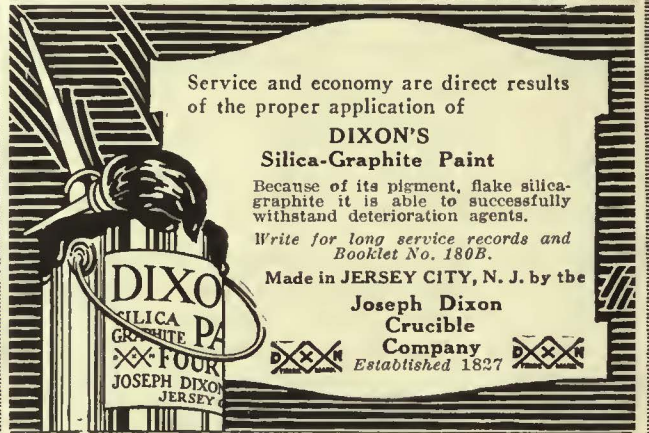
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Because of its pigment, flake silica-graphite it is able to successfully withstand deterioration agents.

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Adapted to all types  
of rails and  
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Proven by  
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Write for Illustrated  
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The Buckeye Jack Mfg. Co.  
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Standard in the Electric Industries  
for 35 years

**Henry M. Shaw**

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One-Piece Gear Cases  
Seamless—Rivetless—Light Weight  
Best for Service—Durability and  
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Chillingworth Mfg. Co.  
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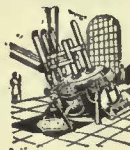


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MAKE YOUR OWN STEEL AND IRON CASTINGS  
WHEN AND AS YOU NEED THEM

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CORPORATION**

Largest Maker of Arc Furnaces in the World  
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## A Single Segment or a Complete Commutator

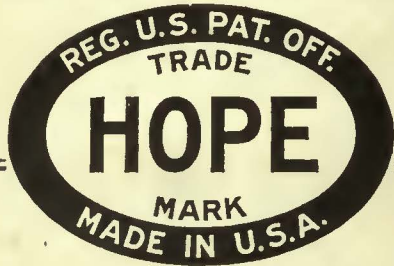
is turned out with equal care in our shops. The orders we fill differ only in magnitude; small orders command our utmost care and skill just as do large orders. CAMERON quality applies to every coil or segment that we can make, as well as to every commutator we build. That's why so many electric railway men rely absolutely on our name.

Cameron Electrical Mfg. Co., Ansonia, Connecticut

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A Chain Hoist that excels in every feature. It has Planetary Gears, Steel Parts, 3 1/2 to 1 factor of Safety. It's the only block that carries a five-year guarantee.

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Second and Diamond Sts., Philadelphia



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The precise and delicate requirements of manufacturers of dynamos, magnetos and other electrical apparatus prescribe the use of electric tape that is known to be of constant high quality.

Quality is the sum total of good basic materials and careful manufacture—the best grades of yarn plus painstaking, skilled workmanship.

That is why thickness, width, weave, finish and absorption are uniformly correct in HOPE tapes. That is why, for 40 years, manufacturers of electrical apparatus have found HOPE products to be the Standard of Quality.

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## HOPE Electric Tape

HOPE WEBBING COMPANY, INC.  
 PROVIDENCE - RHODE ISLAND  
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## Car Seat and Snow Sweeper Rattan

For 60 years we have been the largest importers of rattan from the Far East. It is therefore to be expected that when Rattan is thought of our name, "Heywood-Wakefield," instantly comes to mind.

Follow that impulse and write us when in the market for:

High Grade close woven Rattan Car Seat Webbing, canvas lined and unlined, in widths from 12 in. to 48 in.

High Grade Snow Sweeper Rattan in Natural and Cut Lengths.

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Factory: Wakefield, Mass.

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Progressive Inspection of Cars, Rails, Track Fastenings, etc., from the raw material to the finished product. Our Bulletin No. 26 tells the story—*write for your copy.*

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## ELECTRIC RAILWAY LUBRICATION

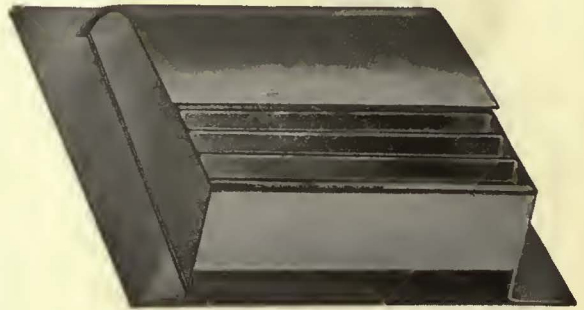
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 Cleveland, Ohio

*Safety cars  
make  
safer dividends  
when equipped with  
"Tool Steel" gears + pinions*

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CINCINNATI, O.**

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**T**HE N-L New Style Type C Ventilator is absolutely weatherproof, lies low on roof, looks well and meets every requirement of ventilation.

*More than seven thousand N-L Ventilators  
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*N-L Products manufactured and sold in Canada by  
Railway and Power Engineering Corporation, Ltd.,  
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*Gets Every Fare*  
**PEREY TURNSTILES  
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Use them in your Prepayment Areas and  
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Drew Line Material & Railway Specialties	Garland Ventilators
Feasible Drop Brake Staffs	E-Z Car Control Corp. Safety Devices
Genesco Paint Oils	Lind Aluminum Field Colls
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**100 New Users in the Last Nine Months**  
**KASS SAFETY TREADS**  
**HIGH**  
in efficiency and lasting qualities  
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in weight, initial and upkeep costs  
**Morton Manufacturing Co., Chicago**



See the Crank of the  
**CREAGHEAD DESTINATION SIGN**

By means of it, conductor or motorman can change sign without leaving platform. All that has to be done is to turn the crank. Better investigate.

**CREAGHEAD ENGINEERING CO., CINCINNATI, O.**

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We have given more than a quarter of a century to the study of fare collection problems and to designing mechanical methods for proper registration.

Thousands of International Registers designed and manufactured over twenty years ago are still in use and are today giving good service.

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Type R-10 Single Register

## The International Register Co.

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General Selling Agents for HEEREN Enamel Badges



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Selling electric railway transportation according to correct business methods requires the indication and registration of the exact amount of each sale.

OHMER FARE REGISTERS indicate and register each transportation sale. They are made in many types and sizes adapted to electric railways, motorbuses and taxicabs.

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## HIGH SPEED MONEY CHANGERS

1923 model  
—without rivets—  
ready for delivery



Supplied in one or four tube Combinations

Essential wherever the rapid and accurate handling of change is required. Now included in the standard equipment of largest Traction Companies because conductors demand them.

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Exclusive Manufacturer's Selling Agent



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## The fewness of working parts of Cleveland Fare Boxes

together with selected materials and careful manufacture, practically eliminate fare box failures.

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75% of the electric railways

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## B-V Punches



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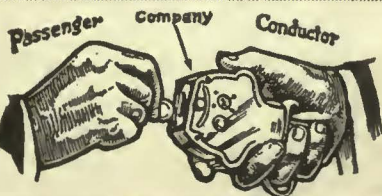
BONNEY-VEHSLAGE TOOL CO., Newark, N. J.



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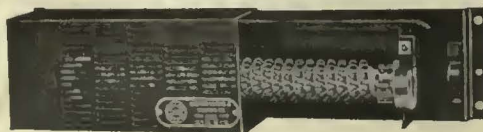
are two of the winter problems that you must settle without delay. We can show you how to take care of both, with one equipment. Now is the time to get your cars ready for next winter. Write for details.

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Direct Automatic Registration  
By the Passengers  
Rooke Automatic Register Co.  
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THE BEST TRUSS PLANK ELECTRIC HEATER EVER PRODUCED



No. 478E

GOLD CAR HEATING & LIGHTING CO., BROOKLYN, N. Y.

**POSITIONS VACANT**

**MASTER** mechanic wanted to supervise shop for property operating 40 cars. State age, experience and give references in first reply. Also whether married or single. P-561, Elec. Ry. Journal, Old Colony Bldg., Chicago, Ill.

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**WORKING** shop foreman wanted, familiar with brakes, car wiring and controllers. State age, experience, references and salary expected in first letter. P-554, Electric Railway Journal, 10th Ave. at 36th St., New York.

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**ACCOUNTING** executive, thoroughly experienced in all branches of large properties: street railway, light, power and gas utility, open for engagement. Capable of assuming full control of all accounting work. PW-543, Elec. Ry. Journal, Old Colony Bldg., Chicago, Ill.

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**SUPERINTENDENT** of transportation with a successful record of 19 years on large properties, desires a change, and solicits correspondence with managers that are in need of a capable, progressive superintendent who knows how to get results and has a record as an economical operator. At present with large property. Personal reasons for making a change. High grade references as to character and ability. PW-559, Elec. Ry. Journal, Real Estate Trust Bldg., Phila., Pa.

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**Sales Representative Wanted**  
Individual or firm, to sell dust guards for journal boxes, to railway companies. Address International Railway Specialties, 43 Drexel Building, Philadelphia, Pa.

**Armature Coils—Field Coils and Commutators**

for 49B-38B and 12A Railway Motors for sale at practically scrap price.

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One Electric Railway Improvement Co.'s

**Rail Bonding Car**

This car is in good workable condition. Inquiries to be made of Purchasing Department.

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**ROTARY CONVERTER**

1—300-kw., 25-cy. West. Will sell or trade for 60-cy. Converter of same capacity.

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**20—Peter Witt Cars**

Weight Complete, 33,000 lbs.

Seat 53, 4—G. E. No. 258-C Motors. K-12-H Control, West. Air Taylor Trucks. R.H. Type. Complete.

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Commonwealth Bldg., Philadelphia, Pa.

**FOR SALE**

18 K 34

**CONTROLLERS**

**TRANSIT EQUIPMENT CO.**  
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**25-cy. Motors, Transformers, Motor Generator Sets**

Over 1200-25 cycle motors, three-phase, totalling 15,000 hp. in sizes from 1 to 750 hp., various speeds.

Single- and three-phase 25 cycle transformers, from 1 to 200 kw. Frequency Changer Sets 25 to 60 cycle.

- 1— 500 kva. G. E. . . . . \$ 6,300
- 2—1250 kva. Westinghouse . . . . . 11,800

Prices quoted F. O. B. cars Kansas City, Mo.

All 6600 volt on 25 cycle end and 4150 volt or can be reconnected 2400 volt on the 60 cycle end.

Prices subject to change without notice and subject to prior sale. Many items almost new and all were in operating condition when removed from service.

This equipment on hand due to a recent change from 25 to 60 cycle distribution.

*For details and prices, address*

**Kansas City Power & Light Company, Kansas City, Mo.**

Attention: W. C. BLAIR, Industrial Engineer

**Power Station to be Dismantled**

*Entire equipment offered for immediate sale, as and where is, to be moved in 60 days.*

**BOILERS**

- 3—215 hp. Babcock & Wilcox, 140 lbs. allowed pressure, 108—4-in. x 18-ft. tubes, 7-ft. x 7-ft. 6-in. Reagan Grates.
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- 2—500 hp. Green-Tandem Compound Engines, 17-in. x 33-in. x 48-in., 104 r.p.m., Driving Wheels 16-ft. dia. x 49-in. face. Belted to—
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- 1—Wainwright Tubular, 102—1½-in. x 84-in. Tubes.
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**MISCELLANEOUS EQUIPMENT**

- Air Pump
- Oil Pumps
- Centrifugal Pump
- Damper Regulator
- Oil Filters
- Pipe, Valves and Fittings
- Switchboard and Fittings
- Wire and Cables.

*Address, Purchasing Department*

**EASTERN MASSACHUSETTS STREET RAILWAY COMPANY**  
No. 1 Beacon Street, BOSTON, MASS.

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Equipment, Apparatus and Supplies Used by the Electric Railway Industry with  
Names of Manufacturers and Distributors Advertising in this Issue

- Advertising, Street Car  
Collier, Inc., Barron G.
- Air Receivers, Aftercoolers  
Ingersoll-Rand Co.
- Anchors, Guy  
Electric Service Supplies Co.  
Ohio Brass Co.  
Westinghouse Elec. & M. Co.
- Armature Shop Tools  
Elec. Service Supplies Co.
- Automatic Return Switch  
Stand  
Ramapo Ajax Corp.
- Automatic Safety Switch  
Stands  
Ramapo Ajax Corp.
- Autos & Buses  
White Co., The
- Axles  
St. Louis Car Co.  
Axle Straighteners  
Columbia M. W. & M. I. Co.
- Axles, Car Wheel  
Bemis Car Truck Co.  
Brill Co., The J. G.  
Carnegie Steel Co.  
Taylor Electric Truck Co.  
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(See Wires and Cables)
- Cambrie Tapes, Yellow &  
Black Varnish  
Irvington Varnish & Ins. Co.
- Carbon Brushes  
(See Brushes, Carbon)
- Car Lighting Apparatus  
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Co.  
Westinghouse Elec. & M. Co.
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Differential Steel Car Co.,  
Inc.
- Cars, Gas Rail  
St. Louis Car Co.
- Cars, Passenger, Freight  
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Brill Co., The J. G.  
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J. M.  
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Wharton, Jr. & Co., Inc.,  
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- Castings, Gray Iron and Steel  
American Bridge Co.  
Bemis Car Truck Co.  
Columbia M. W. & M. I. Co.  
Wharton, Jr., & Co., Inc.,  
Wm.
- Castings, Malleable and Brass  
Amer. Brake Shoe & Fdry.  
Co.  
Bemis Car Truck Co.  
Columbia M. W. & M. I. Co.  
Le Grand, Inc., Nic
- Catchers and Retrievers,  
Trolley  
Electric Service Sup. Co.  
Ohio Brass Co.  
Wood Co., Chas. N.
- Catenary Construction  
Archbold-Brady Co.
- Ceilings, Plywood Panels  
Haskelite Mfg. Corp.
- Change Carriers  
Cleveland Fare Box Co.  
Galef, J. L.
- Circuit Breakers  
General Electric Co.  
Westinghouse Elec. & M. Co.
- Clamps and Connectors for  
Wires and Cables  
Anderson Mfg. Co., A. M. &  
J. M.  
Electric Railway Equip. Co.  
Elec. Service Supplies Co.  
General Electric Co.  
Hubbard & Co.  
Westinghouse Elec. & M. Co.
- Cleaners and Scrapers, Track  
(See also Snow-Plows,  
Sweepers and Brooms)  
Brill Co., The J. G.  
Ohio Brass Co.
- Clusters and Sockets  
General Electric Co.
- Coal and Ash Handling  
(See Conveying and Holst-  
ing Machinery)
- Coil Banding and Winding  
Machines  
Columbia M. W. & M. I. Co.  
Electric Service Sup. Co.
- Coils, Armature and Field  
Columbia M. W. & M. I. Co.  
General Electric Co.  
Rome Wire Co.  
Westinghouse Elec. & M. Co.
- Coils, Choke and Kieking  
Electric Service Supplies Co.  
General Electric Co.
- Westinghouse Elec. & M. Co.
- Coin-Counting Machines  
Cleveland Fare Box Co.  
Galef, J. L.
- International Register Co.  
The
- Coin Sorting Machines  
Cleveland Fare Box Co.  
Galef, J. L.
- Coin Wrappers  
Cleveland Fare Box Co.  
Galef, J. L.
- Commutator Slotters  
Electric Service Supplies Co.  
General Electric Co.  
Westinghouse Elec. & M. Co.
- Commutator Truing Devices  
General Electric Co.
- Commutators or Parts  
Cameron Elec'l Mfg. Co.  
Columbia M. W. & M. I. Co.  
General Electric Co.  
Westinghouse Elec. & M. Co.
- Compressors, Air  
Allis-Chalmers Mfg. Co.  
General Electric Co.  
Ingersoll-Rand Co.  
Westinghouse Tr. Br. Co.
- Compressors, Air, Portable  
Ingersoll-Rand Co.
- Compressors, Gas  
Ingersoll-Rand Co.
- Condensers  
General Electric Co.  
Ingersoll Rand Co.  
Westinghouse Elec. & M. Co.
- Condenser Papers  
Irvington Varnish & Ins. Co.
- Conduits, Underground  
Std. Underground Cable Co.
- Connectors, Solderless  
Westinghouse Elec. & M. Co.
- Connectors, Trailer Car  
Consolidated Car Heating Co.  
Elec. Service Supplies Co.  
Ohio Brass Co.
- Controllers or Parts  
Columbia M. W. & M. I. Co.  
General Electric Co.  
Westinghouse Elec. & M. Co.
- Controller Regulators  
Electric Service Supplies Co.
- Controlling Systems  
General Electric Co.  
Westinghouse Elec. & M. Co.
- Converters, Rotary  
General Electric Co.  
Westinghouse Elec. & M. Co.
- Conveying and Hoisting  
Machinery  
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- Copper Wire  
Anaconda Copper Mining Co.  
Cord Adjusters  
Nat'l Vulcanized Fibre Co.
- Cord, Bell, Trolley, Register,  
etc.  
Brill Co., The J. G.  
Electric Service Supplies Co.  
International Register Co.,  
The  
Roebblings Sons Co., John A.  
Samson Cordage Works
- Cord Connectors and Couplers  
Electric Service Supplies Co.  
Samson Cordage Works  
Wood Co., Chas. N.
- Couplers, Car  
Brill Co., The J. G.  
Ohio Brass Co.  
Westinghouse Tr. Br. Co.
- Cross Arms (See Brackets)
- Crossings  
Ramapo Ajax Corp.
- Crossing Foundations  
International Steel Tie Co.
- Crossing Frets and Switches  
Ramapo Ajax Corp.
- Wharton, Jr., & Co., Inc., Wm.
- Crossings, Manganese  
Indianapolis Switch & Frog  
Co.
- Ramapo Ajax Corp.
- Crossing Signals (See Track,  
als, Crossing)
- Crossings, Track. (See Track,  
Special Work)
- Crossings, Trolley  
Ohio Brass Co.
- Curtains and Curtain Fix-  
tures  
Brill Co., The J. G.  
Edward Co. Inc. The O. M.  
Electric Service Supplies Co.  
Morton Mfg. Co.
- Dealers' Machinery  
Electric Equipment Co.  
Transit Equipment Co.
- Derailing Switches, Tee Rail  
Ramapo Ajax Corp.
- Destination Signs  
Columbia M. W. & M. I. Co.  
Craghead Eng. Co.  
Electric Service Supplies Co.
- Detective Service  
Wish Service, P. Edward
- Door Operating Devices  
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Co.
- National Pneumatic Co., Inc.
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Brill Co., The J. G.  
Edwards & Co., Inc., The  
O. M.  
General Electric Co.  
Hale & Kilburn Corp.  
Safety Car Devices Co.
- Doors, Folding Vestibule  
National Pneumatic Co.,  
Inc.
- Draft Rigging, (See Coup-  
lers)
- Drills, Rock  
Ingersoll-Rand Co.
- Drills, Track  
American Steel & Wire Co.  
Electric Service Supplies Co.  
Ingersoll-Rand Co.  
Ohio Brass Co.
- Dryers, Sand  
Electric Service Supplies Co.
- Ears  
Ohio Brass Co.
- Electric Grinders  
Railway Track-work Co.
- Electrodes, Carbon  
Indianapolis Switch & Frog  
Co.  
Railway Track-work Co.
- Electrodes, Steel  
Indianapolis Switch & Frog  
Co.  
Railway Track-work Co.
- Electrical Wires and Cables  
American Elec. Works  
Roebblings Sons Co., J. A.
- Enamels  
Beckwith-Chandler Co.
- Engineers, Consulting, Con-  
tracting and Operating  
Allison & Co., J. E.  
Andrew, Sangster & Co.  
Archbold-Brady Co.  
Arnold Co., The  
Beeler, John A.  
Bibbings, J. Rowland  
Byllesby & Co., H. M.  
Day & Zimmerman, Inc.  
Drum & Co., A. L.  
Feustel, Robert M.  
Ford, Bacon & Davis  
Hemphill & Wells  
Holst, Engelhardt W.  
Jackson, Walter  
Kelly, Cooke & Co.  
Ong, Jee R.  
Parsons, Klapp, Brickerhoff  
& Douglas  
Richey, Albert S.  
Robinson & Co., Dwight P.  
Sanderson & Porter  
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Stones & Webster  
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Wm.
- Extension Platform Trap  
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Edwards & Co., Inc., The  
O. M.
- Fare Boxes  
Cleveland Fare Box Co.  
Galef, J. L.
- Nat'l Ry. Appliance Co.
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- Fences, Woven Wire and  
Fence Posts  
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- Fenders and Wheel Guards  
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Consolidated Car Fender Co.  
Electric Service Sup. Co.  
Le Grand, Inc., Nic.  
Star Brass Works
- Flhee and Fibre Taping  
Nat'l Vulcanized Fibre Co.  
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- Flangeway Guards  
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- Flaxinum Insulation  
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- Floodlights  
Electric Service Sup. Co.
- Forgings  
Carnegie Steel Co.  
Columbia M. W. & M. I. Co.
- Frogs & Crossings, Tee Rail  
Ramapo Ajax Corp.
- Frogs, Track. (See Track  
Work)
- Frogs, Trolley  
Ohio Brass Co.
- Furnaces, Electric  
Pittsburgh Electric  
Furnace Corp.
- Furniture, Metal Office  
Edwards & Co., Inc., The  
O. M.
- Fuses and Fuse Boxes  
Columbia M. W. & M. I. Co.  
Consolidated Car Heating  
Co.  
General Electric Co.  
Westinghouse Elec. & M. Co.
- Fuses, Refillable  
Columbia M. W. & M. I. Co.  
General Electric Co.
- Gaskets  
Westinghouse Tr. Br. Co.
- Gas-Electric Cars  
General Electric Co.
- Gas Producers  
Westinghouse Elec. & M. Co.
- Gates, Car  
Brill Co., The J. G.
- Gear Blanks  
Carnegie Steel Co.
- Gear Cases  
Chillingworth Mfg. Co.  
Columbia M. W. & M. I. Co.  
Electric Service Supplies Co.  
Westinghouse Elec. & M. Co.
- Gears and Pinions  
Ackley Brake & Sup. Corp.  
Bemis Car Truck Co.  
Columbia M. W. & M. I. Co.  
Electric Service Supplies Co.  
General Electric Co.  
Nat'l Ry. Appliance Co.  
Nuttall Co., R. D.  
Tool Steel Gear & Pinion  
Co.
- Generating Sets, Gas-Electric  
General Electric Co.
- Generators  
English Electric Co.  
General Electric Co.  
Westinghouse Elec. & M. Co.
- Grider Rails  
Lorain Steel Co., The
- Goggles, Safety  
Indianapolis Switch & Frog  
Co.
- Gongs (See Bells and Gongs)
- Graphite  
Morganite Brush Co.
- Greases (See Lubricants)
- Grinders and Grinding  
Supplies  
Indianapolis Switch & Frog  
Co.
- Metal & Themit Corp.  
Railway Track-work Co.
- Grinders, Portable  
Railway Track-work Co.
- Grinders, Portable Electric  
Railway Track-work Co.
- Grinding Blocks and Wheels  
Railway Track-work Co.  
Seymour Rail Grinder Co.,  
E. P.
- Guard Rail Clamps  
Ramapo Ajax Corp.
- Guard Rails, Tee Rail &  
Manganese  
Ramapo Ajax Corp.
- Guards, Cattle  
American Bridge Co.
- Guards, Trolley  
Electric Service Sup. Co.  
Ohio Brass Co.
- Hammers, Pneumatic  
Ingersoll-Rand Co.
- Harps, Trolley  
Anderson M. Co., A. & J. M.  
Bayonet Trolley Harp Co.  
Electric Service Sup. Co.  
Nuttall Co., R. D.  
Star Brass Works  
Thornion Trolley Wheel Co.
- Headlights  
Electric Service Sup. Co.  
General Electric Co.  
Ohio Brass Co.
- Headlining  
Haskelite Mfg. Corp.
- Heaters, Car (Electric)  
Consolidated Car Heating  
Co.  
Gold Car Heating & Light-  
ing Co.  
Nat'l Ry. Appliance Co.  
Smith Heater Co., Peter
- Heaters, Car, Hot Air and  
Water  
Electric Service Sup. Co.  
Smith Heater Co., Peter
- Helmets, Welding  
Indianapolis Switch & Frog  
Co.
- Railway Track-Work Co.
- Hints and Lifts  
Columbia M. W. & M. I. Co.
- Ford Chain-Block Co.
- Holists, Portable  
Ingersoll-Rand Co.
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Ohio Brass Co.
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*Bulletin No. 3430*

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Craghead Engineering Co.  
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Shaw, Henry M.
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Electric Service Sup. Co.  
General Electric Co.  
Ohio Brass Co.  
Westinghouse Elec. & M. Co.
- Line Material (See also Brackets, Insulators, Wires, Etc.)  
Anderson M. Co., A. & J. M.  
Archbold-Brady Co.  
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Craghead Mfg. Co.  
Electric Ry. Equipment Co.  
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English Electric Co.  
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Hubbard & Co.  
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- Machinists Tools  
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- Mauganese Steel Guard Rails  
Ramapo Ajax Corp.
- Manganese Steel, Special Track Work  
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Wharton, Jr. & Co., Inc., Wm.
- Manganese Steel Switches, Frogs and Crossings  
Ramapo Ajax Corp.
- Motor Bases (See Bases, Motor)
- Motorists' Seats  
Brill Co., The J. G.  
Electric Service Sup. Co.  
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Wood Co., Chas. N.
- Motors, Electric  
General Electric Co.  
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- Motor and Generator Sets  
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Godwin Co., Inc., W. S.
- Paving Material  
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Electric Service Sup. Co.  
Ohio Brass Co.
- Pinion Pullers  
Columbia M. W. & M. I. Co.  
Electric Service Sup. Co.  
General Electric Co.  
Wood Co., Chas. N.
- Pinions (See Gears)
- Pins, Case Hardened, Wood and Iron  
Bemis Car Truck Co.  
Electric Service Sup. Co.  
Ohio Brass Co.  
Westinghouse Tr. Br. Co.
- Pipe  
National Tube Co.
- Pipe Fittings  
Westinghouse Tr. Br. Co.
- Planers (See Machine Tools)
- Plates for Tee Rail Switches  
Ramapo Ajax Corp.
- Pliers, Rubber Insulated  
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Ingersoll-Rand Co.
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- Rail Joints  
Carnegie Steel Co.
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Metal & Thermit Corp.
- Rail Grinders (See Grinders)
- Railway Paving Guards  
Steel  
Godwin Co., Inc., W. S.
- Railway Safety Switches  
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Westinghouse Elec. & M. Co.
- Rail Welding (See Welding Processes)  
Metal & Thermit Corp.  
Ry. Track-work Co.
- Rattan  
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Electric Service Sup. Co.
- Hale & Kilburn Corp.  
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International Reg. Co., The  
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- Repair Shop Appliances (See also Coil Banding and Winding Machines)  
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Electric Service Sup. Co.
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- Replacers, Car  
Columbia M. W. & M. I. Co.  
Electric Service Sup. Co.
- Resistance, Grid  
Columbia M. W. & M. I. Co.
- Resistance, Wire and Tube  
General Electric Co.  
Westinghouse Elec. & M. Co.
- Resistances  
Consolidated Car Heating Co.
- Retrievers, Trolley (See Catchers and Retrievers, Trolley)
- Rheostats  
General Electric Co.  
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- Roofs  
Haskelite Mfg. Corp.
- Roller Bearings  
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- Sanders, Track  
Brill Co., The J. G.  
Columbia M. W. & M. I. Co.  
Electric Service Sup. Co.  
Nichols-Lintern Co.  
Ohio Brass Co.
- Sash Balances  
Edwards & Co., Inc., The O. M.
- Sash Fixtures, Car  
Brill Co., The J. G.  
Edwards & Co., Inc., The O. M.
- Sash, Metal, Car Window  
Edwards & Co., Inc., The O. M.  
Hale & Kilburn Corp.
- Scrapers, Track (See Cleaners and Scrapers, Track)
- Screw Drivers, Rubber Insulated  
Electric Service Sup. Co.
- Seating Materials  
Brill Co., The J. G.
- Seats, Bus  
St. Louis Car Co.
- Seats, Car (See also Rattan)  
Brill Co., The J. G.  
Hale & Kilburn Corp.  
Heywood-Wakefield Corp.  
St. Louis Car Co.
- Second-Hand Equipment  
Electric Equipment Co.
- Shades, Vestibule  
Brill Co., The J. G.
- Shovels  
Hubbard & Co.
- Shovels, Power  
Brill Co., The J. G.
- Signals, Car Starting  
Consolidated Car Heating Co.  
Electric Service Sup. Co.  
Nat'l Pneumatic Co., Inc.
- Signals, Indicating  
Nichols-Lintern Co.
- Signal Systems, Block  
Electric Service Sup. Co.  
Nachod Signal Co., Inc.  
Union Switch & Signal Co.  
U. S. Electric Signal Co.  
Wood Co., Chas. N.
- Signal Systems, Highway Crossing  
Nachod Signal Co., Inc.  
U. S. Electric Signal Co.
- Slack Adjusters (See Brake Adjusters)
- Slag  
Carnegie Steel Co.
- Sleet Wheels and Cutters  
Anderson M. Co., A. & J. M.  
Bayonet Trolley Harp Co.  
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Electric Ry. Equip. Co.  
Electric Service Sup. Co.  
Nuttall Co., R. D.
- Smokestacks, Car  
Nichols-Lintern Co.
- Snow-Plows, Sweepers and Brooms  
Brill Co., The J. G.  
McGuire Cummings Mfg. Co.  
Columbia M. W. & M. I. Co.  
Consolidated Car Fender Co.
- Soldering and Brazing (See Welding Processes and Apparatus)
- Spikes  
Amer. Steel & Wire Co.
- Special Adhesive Papers  
Irvington Varnish & Ins. Co.
- Special Trackwork  
Lorain Steel Co., The
- Splicing Compounds  
Westinghouse Elec. & M. Co.
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McGuire-Cummings Mfg. Co.
- Steel and Steel Products  
Morton Mfg. Co.
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Morton Mfg. Co.
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Babcock & Wilcox Co.  
Westinghouse Elec. & M. Co.
- Storage Batteries (See Batteries, Storage)
- Strain Insulators  
Ohio Brass Co.
- Strand  
Roebbling's Sons Co., J. A.
- Superheaters  
Babcock & Wilcox Co.
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- Switch Stands  
Indianapolis Switch & Frog Co.  
Ramapo Ajax Corp.  
Switches, Selector  
Nichols-Lintern Co.
- Switches, Tee Rail  
Ramapo Ajax Corp.
- Switches, Track (See Track, Special Work)
- Switches and Switchboards  
Anderson M. Co., A. & J. M.  
Electric Service Sup. Co.  
General Electric Co.  
Westinghouse Elec. & M. Co.
- Tampers, Tie  
Ingersoll-Rand Co.  
Railway Track-work Co.
- Tapes and Cloths (See Insulating Cloth, Paper and Tape)
- Tee Rail, Special Track Work  
Rampo Ajax Corp.
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Electric Service Sup. Co.
- Terminals Cables  
Standard Underground Cable Co.
- Testing Instruments (See Instruments, Electrical Measuring, Testing, etc.)
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Consolidated Car Heating Co.  
Gold Car Heating & Lighting Co.  
Railway Utility Co.  
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- Ticket Choppers and Destroyers  
Electric Service Sup. Co.
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American Bridge Co.  
Barbour-Stockwell Co.  
Carnegie Steel Co.  
International Steel Tie Co.
- Ties, Wood Cross (See Poles, Ties, Posts, etc.)
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- Tool Steel  
Carnegie Steel Co.
- Tools, Track and Misc.  
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Electric Service Sup. Co.  
Hubbard & Co.  
Railway Track-work Co.
- Towers and Transmission Structures  
American Bridge Co.  
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Bates Expanded Steel Truss Co.  
Westinghouse Elec. & M. Co.
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Railway Track-work Co.
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Ohmer Fare Register Co.
- Transfer Tables  
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Westinghouse Elec. & M. Co.
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Morton Mfg. Co.
- Trolley Bases  
Ackley Brake & Sup. Corp.  
Anderson M. Co., A. & J. M.  
Electric Service Sup. Co.  
General Electric Co.  
Nat'l Ry. Appliance Co.  
Nuttall Co., R. D.  
Ohio Brass Co.
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Ohio Brass Co.
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Ford Chain-Block Co.
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White Co., The
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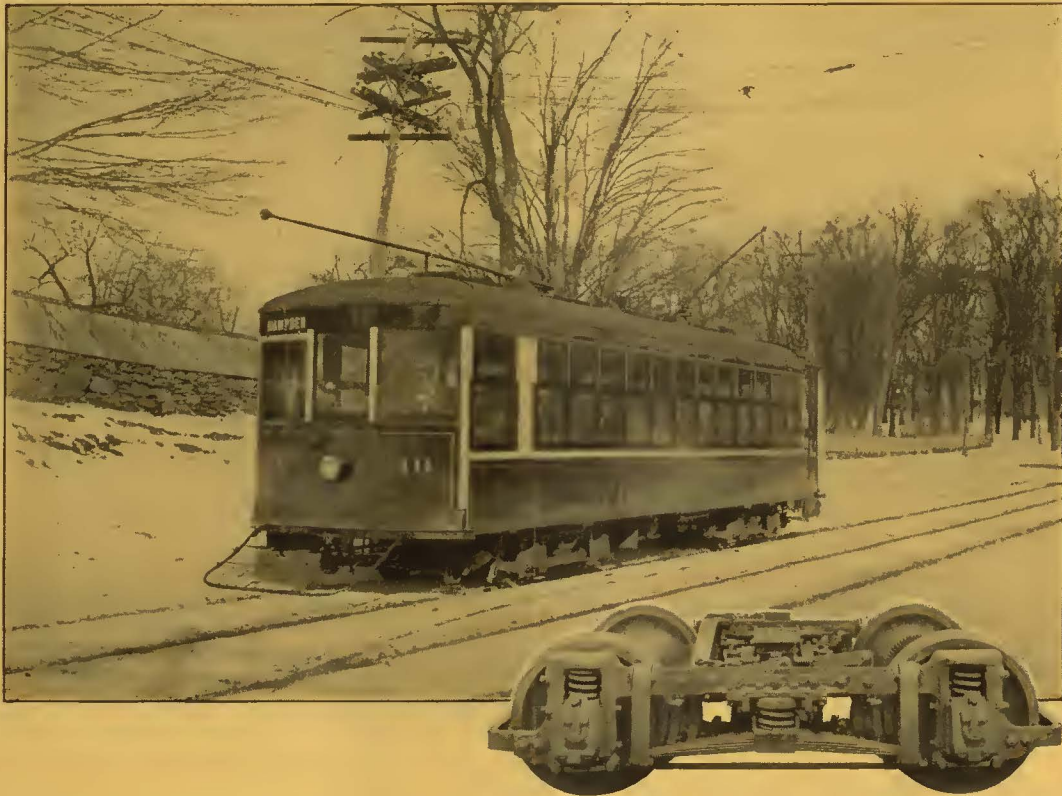
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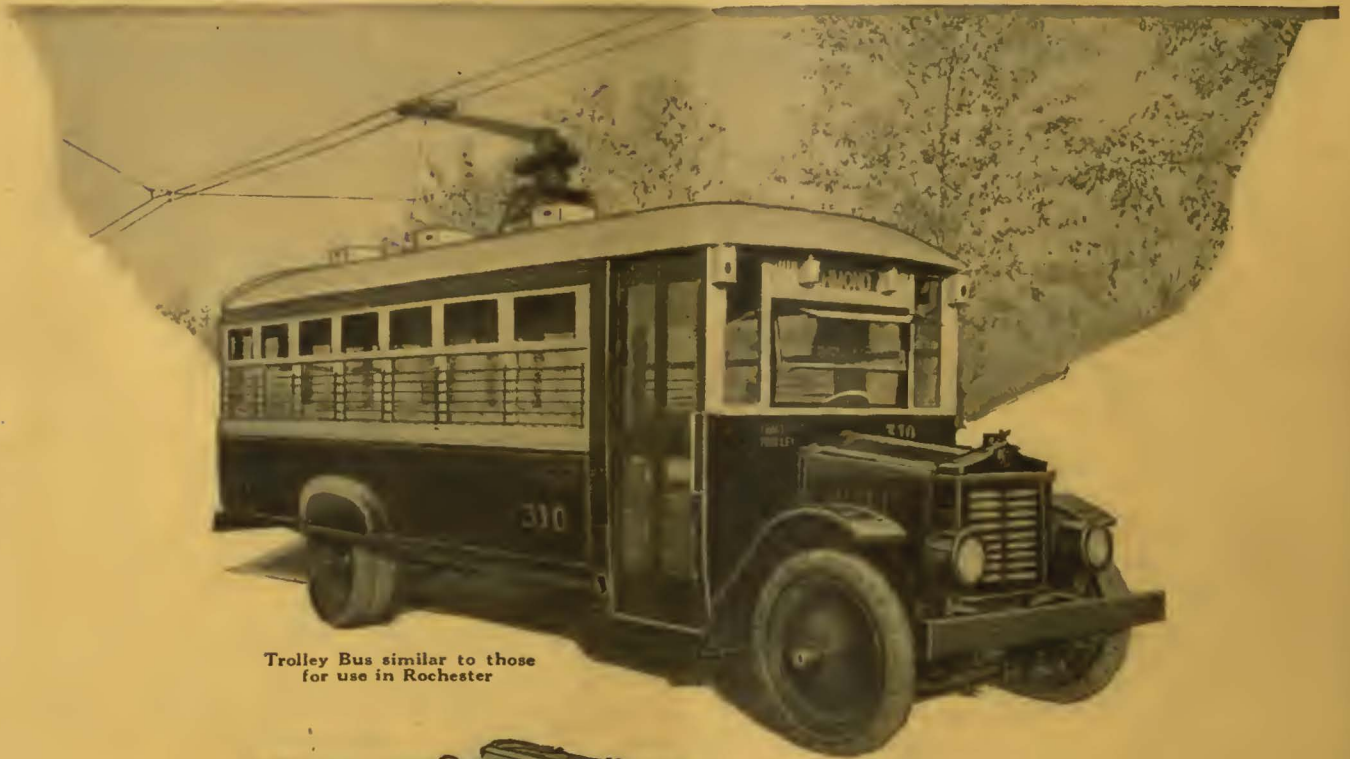
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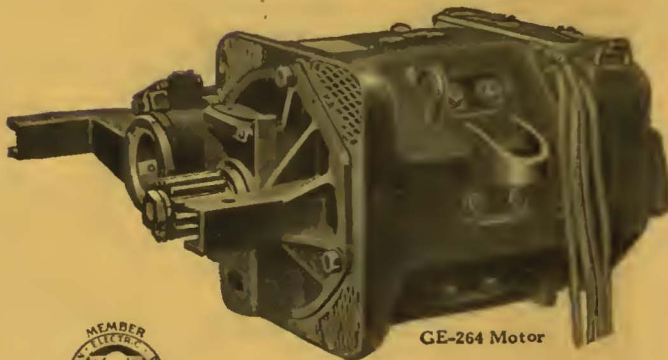
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