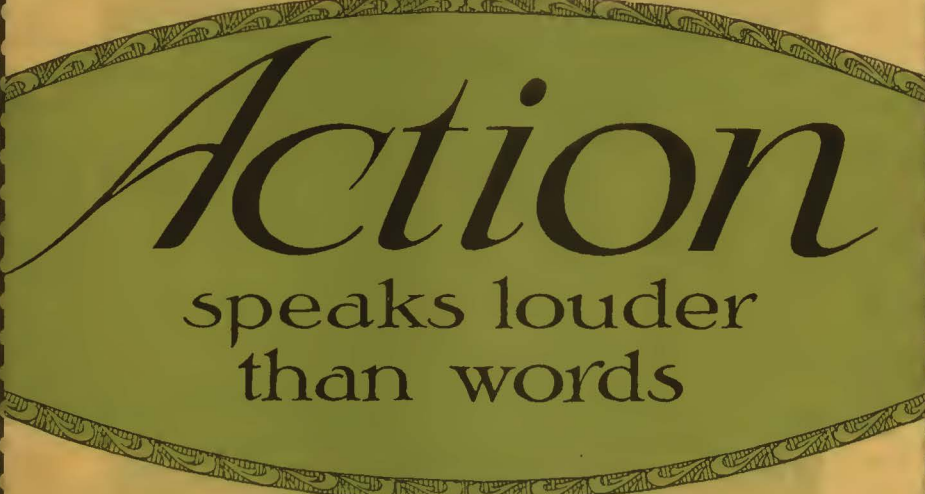


ELECTRIC RAILWAY JOURNAL



Action

speaks louder
than words

MUCH has been written here and in the editorial pages of this and other journals about the economy of Steel Twin Ties.

BUT words are weak and many read who run—therefore **ACTION**—fifteen hundred feet—thirty minutes of swift flowing story of track construction—methods—men—materials—tools in a motion picture film we want to show to **YOU**.

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ACTION'S the word.

The International Steel Tie Co.
CLEVELAND



Alternating-Current Electrification

Many of the most important railroads in the United States have adopted the alternating-current system. The electrifications illustrated below are representative of every type of service.



Pennsylvania System

The main-line electrification of the Pennsylvania System at Philadelphia is an example of heavy multiple-unit service which has solved the problem of terminal congestion.



Norfolk & Western Railway

The Norfolk & Western Electrification presents an example of the alternating-current locomotive employed successfully to handle heavy freight trains at the maximum speed on mountain grades.



New York, New Haven & Hartford Railroad

High-speed freight and passenger service is maintained economically on the main line of the N.Y., N.H. & H. R.R. by use of the alternating current system.



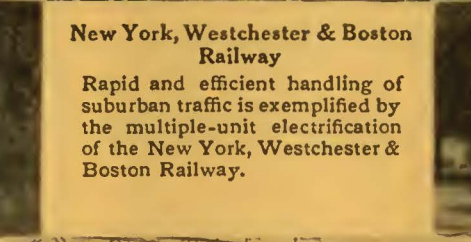
Boston & Maine R. R.—Hoosac Tunnel

The alternating locomotive has been used advantageously by the Boston & Maine R. R. in overcoming the smoke conditions and increased traffic demands in the second largest tunnel in the world.



Erie Railroad

High-class interurban service is maintained under the severe weather conditions of the lake regions by the multiple-unit trains of the Erie Railroad.



New York, Westchester & Boston Railway

Rapid and efficient handling of suburban traffic is exemplified by the multiple-unit electrification of the New York, Westchester & Boston Railway.



Grand Trunk Railway

The alternating-current electrification in the St. Claire Tunnel links Canada and the United States with through-train service.



Westinghouse Electric & Manufacturing Company
East Pittsburgh, Pa.

Westinghouse

ELECTRIC RAILWAY JOURNAL

HENRY W. BLAKE, Editor

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An Educational Institution

THERE is no one thing that brings a greater return to an electric railway than effective effort put forth on educational work; that is, education in its broadest sense—enlightenment of the heads of departments and their supervisory staffs in the matter of service and friendly dealing with the public, in the knowledge of maintaining equipment more efficiently, in all the manifold ramifications of good transportation. The Committee on Education of the A. E. R. A. has been doing good work in urging definite planned educational work among the railway personnel. Some executives have turned their thoughts constructively toward bettering the knowledge and consequent efficiency of their employees; many have done little in this direction, partly because they have not grasped the full significance of such a course, or perhaps have not known how best to accomplish something worth while with limited time and means.

There are several ways of working toward the desired end. Some men learn most by hearing, some by reading and still others by actual contact and practice. Much can be done by arranging for association and discussion among men interested in common problems and in the inter-relations of company business through company organizations, by arranging for supervisory men to have opportunity for contact and discussion at conventions and group meetings and by encouraging visitation of other properties. But the continuous, every-week source of inspiration, ideas, news and detailed knowledge of important developments throughout the whole industry is the *Electric Railway Journal*. It is really an institution of learning placed right in the lap of the men who fill or some day will fill the posts of responsibility.

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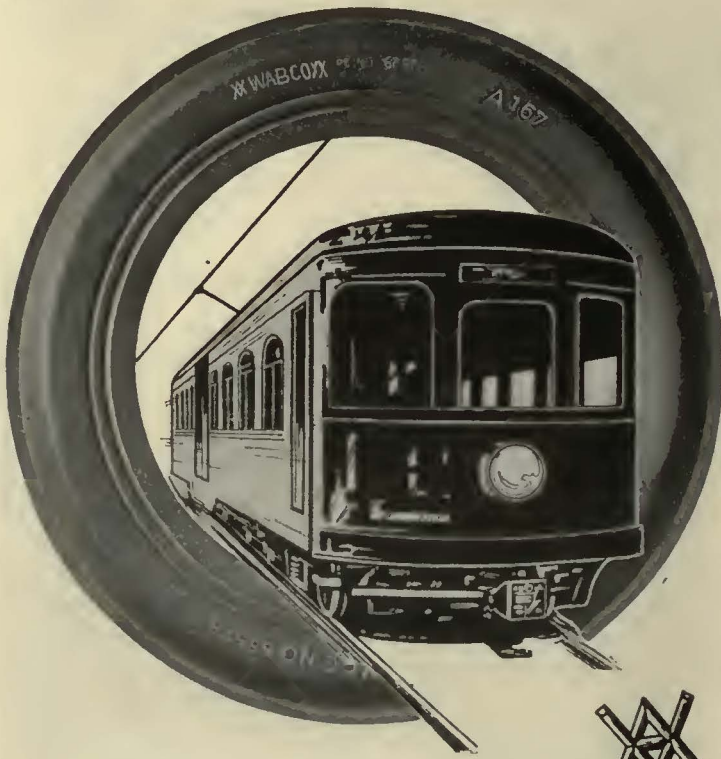


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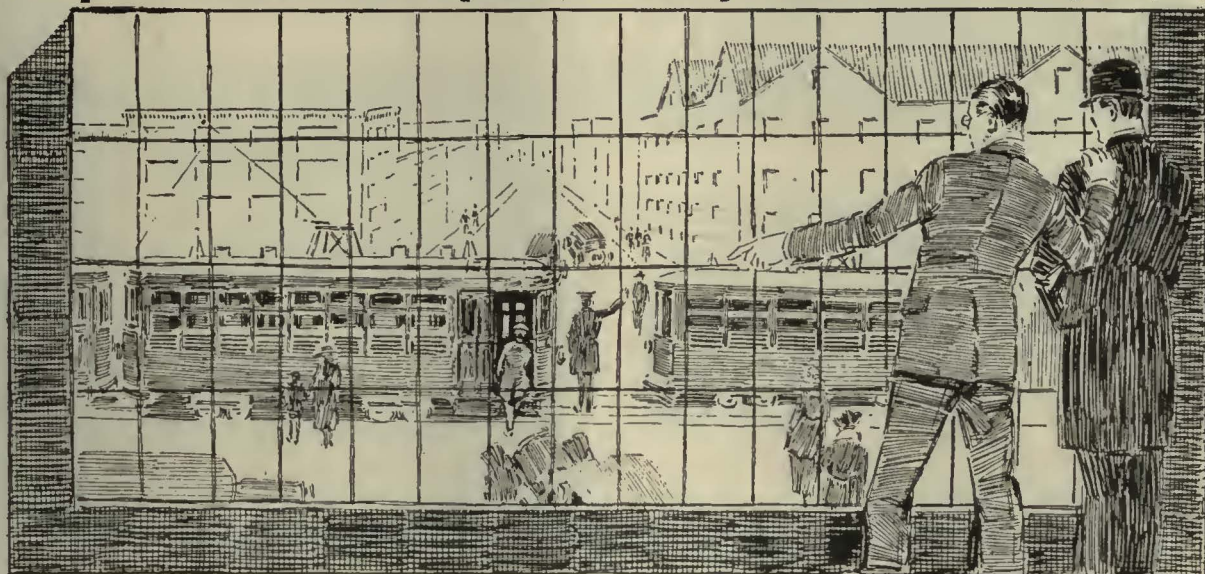
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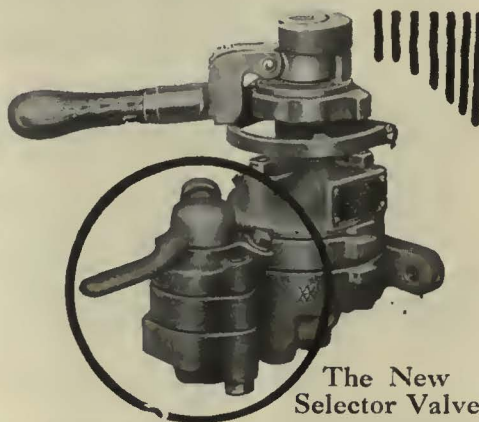
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The New Selector Valve

The above illustration shows the new Selector Valve (outlined in the black circle) as incorporated in the pipe bracket of the standard M-28 Safety Car Brake Valve.

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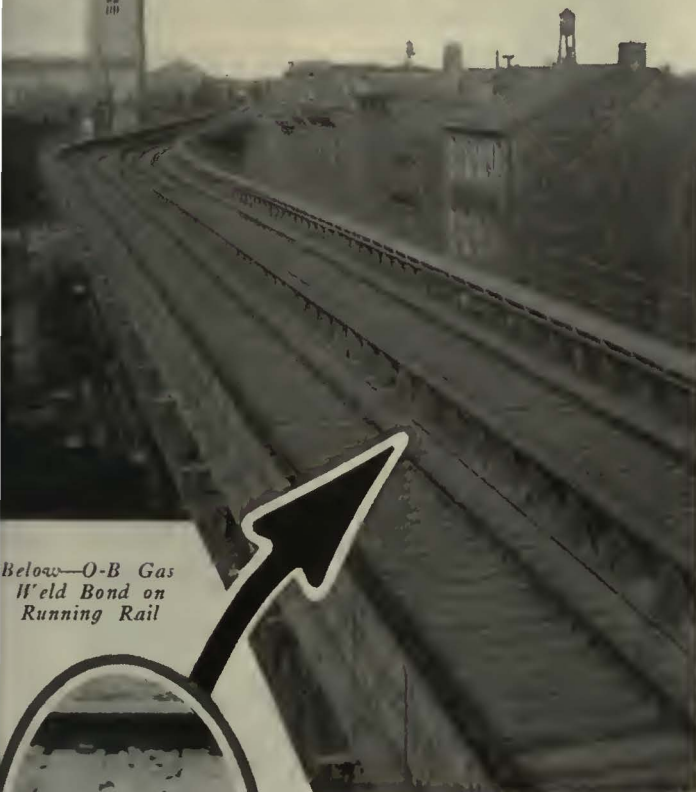
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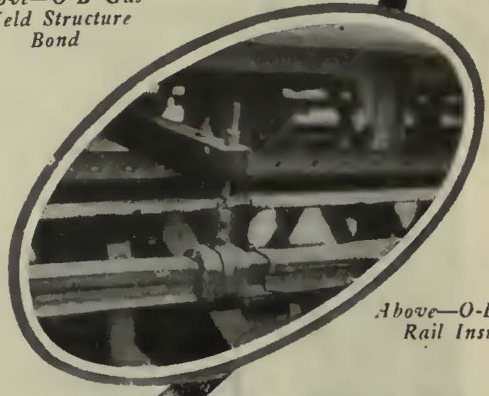
Philadelphia's New Elevated



*Below—O-B Gas
Weld Bond on
Running Rail*



*Above—O-B Gas
Weld Structure
Bond*



*Above—O-B Third
Rail Insulator*



*Above right—O-B Signal
Bond on Running Rail*



Above—O-B Stud Terminal Bond on Third Rail

Uses O-B Track Material

The Frankford Elevated was built by the City and is being operated by the Philadelphia Rapid Transit Company. The Department of City Transit directed the construction of this newest extension to Philadelphia's transportation system and made it

measure up to the highest standards. O-B Bonds and O-B Third Rail Insulators were used exclusively and installed by M. and J. B. McHugh, Contractors, who laid the track in the yards and installed the third rail both in the yards and on the structure.



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New York Philadelphia Pittsburgh Charleston, W. Va. Chicago Los Angeles San Francisco Paris, France
Products: Trolley Material, Rail Bonds, Electric Railway Car Equipment, High Tension Porcelain Insulators, Third Rail Insulators

Phono-Electric

The Answer to Why, is WEAR!



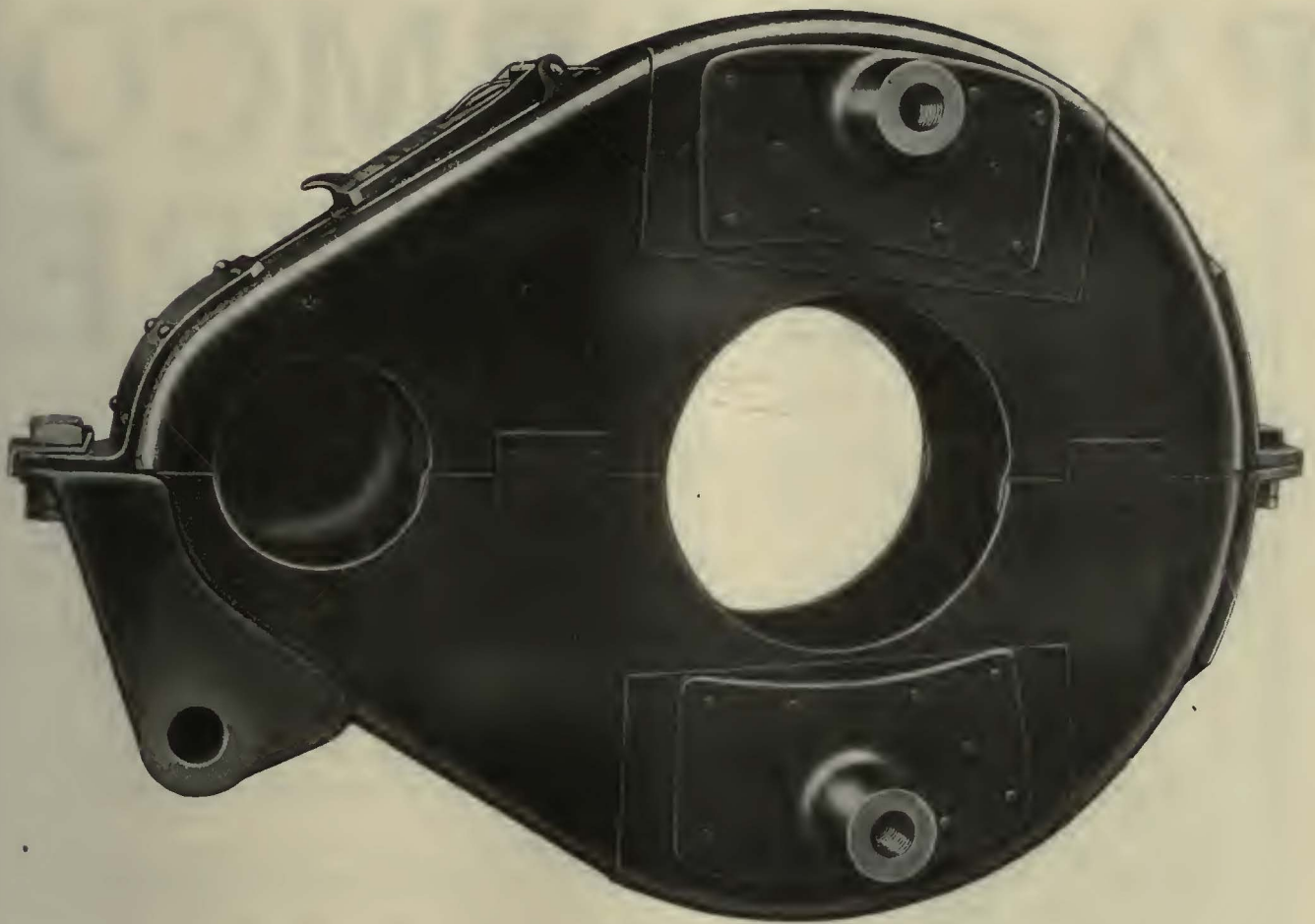
In December, 1913, Phono-Electric 2/0 trolley wire was installed in Bridgeport at Main Street and Fairfield Avenue, the heaviest "traffic" corner in all New England. At this corner there has been a daily average of over 2500 cars pass under Phono-Electric for the past seven years—

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Bridgeport Brass Company
Bridgeport **Connecticut**



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Here's a case that requires your attention—once—now! For now is the time to think about gear defense—not two months from now when frost, ice and snow have begun to distort your roadbed.

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*Try a Keystone Steel Gear Case on any type of car.
Write for data sheets.*



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Microphotograph of Page-Armco Wire, showing dense, pure metal.



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Bridgeport, Conn.



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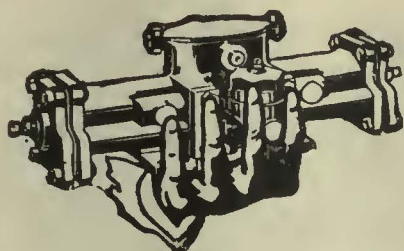
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A single operator has perfect control over the rear door with National Pneumatic equipment. If you study your two-man cars, you'll find the principal thing your conductor now does is to open and close the doors.

Make one man count as two with

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Motorman's Signal Lights	Safety Interlocking Door Control
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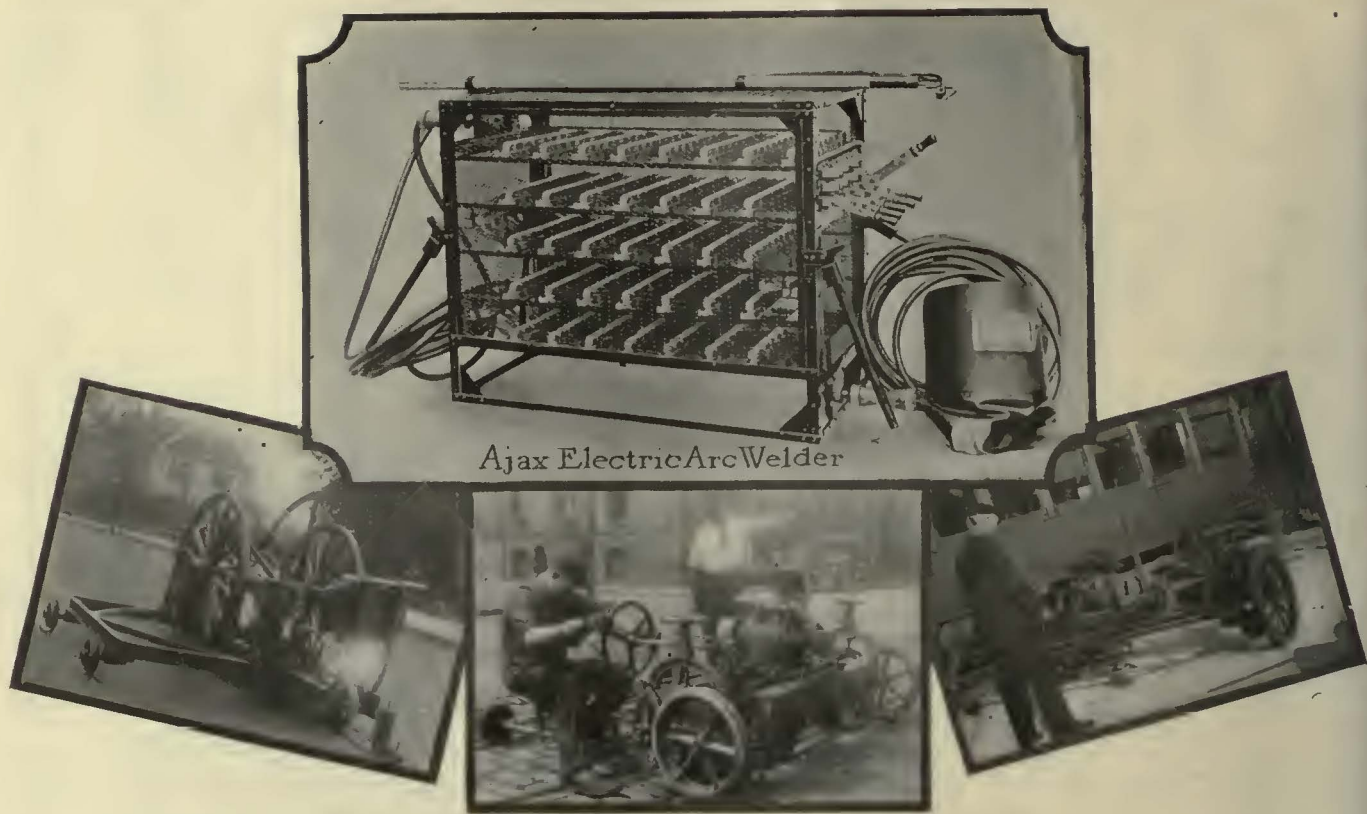
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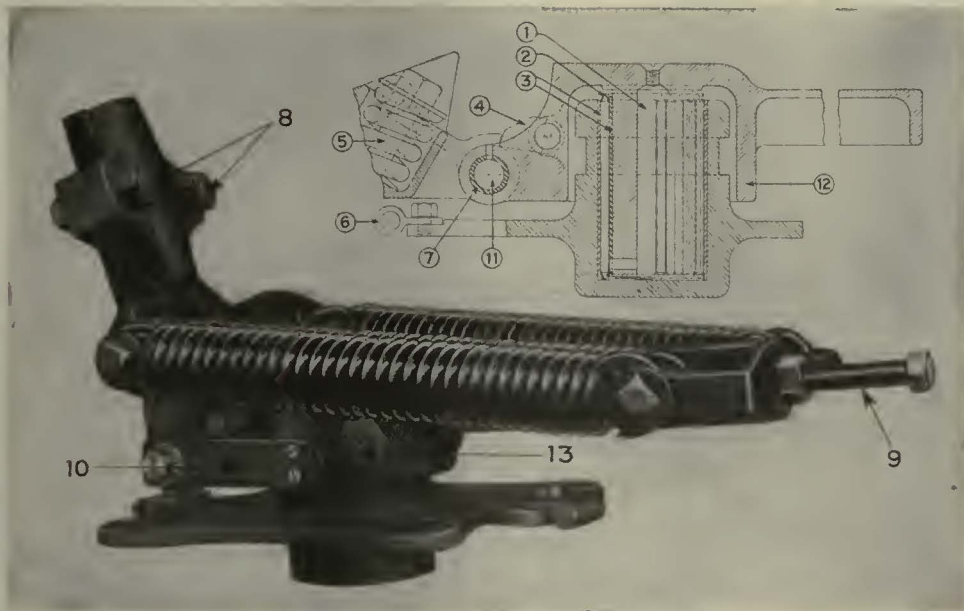


The Ounce of Prevention

Comparable indeed to the old proverb, is the prevention of early deterioration of rails and track foundation, by means of welding and grinding. Just as the ounce of prevention is worth the pound of cure, prompt repairs to bad joints and broken special work, and the immediate removal of corrugations is better than bringing tons of new rail and special work several years before you should. Adequate and suitable welding equipment and track grinding are now within the reach of all.

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Universal Rotary Track Grinders
Atlas Rail Grinders
Reciprocating Track Grinders

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Don't fail to ask about our *Trolley Trade* offer to utilize old, out-worn, or obsolete types toward the purchase of new types.



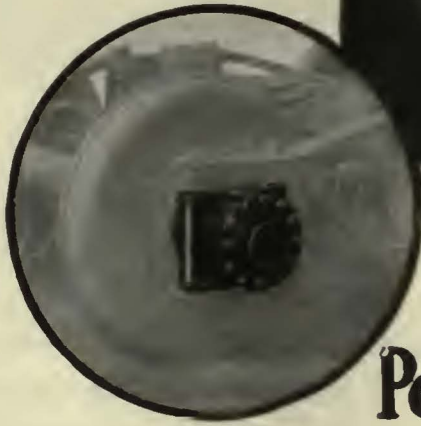
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EVERY GEAR REGISTERED

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Cold weather greatly increases the load on your power plants. Congealed lubrication, frost, snow, or ice-covered rails cause a large increase in power consumption.

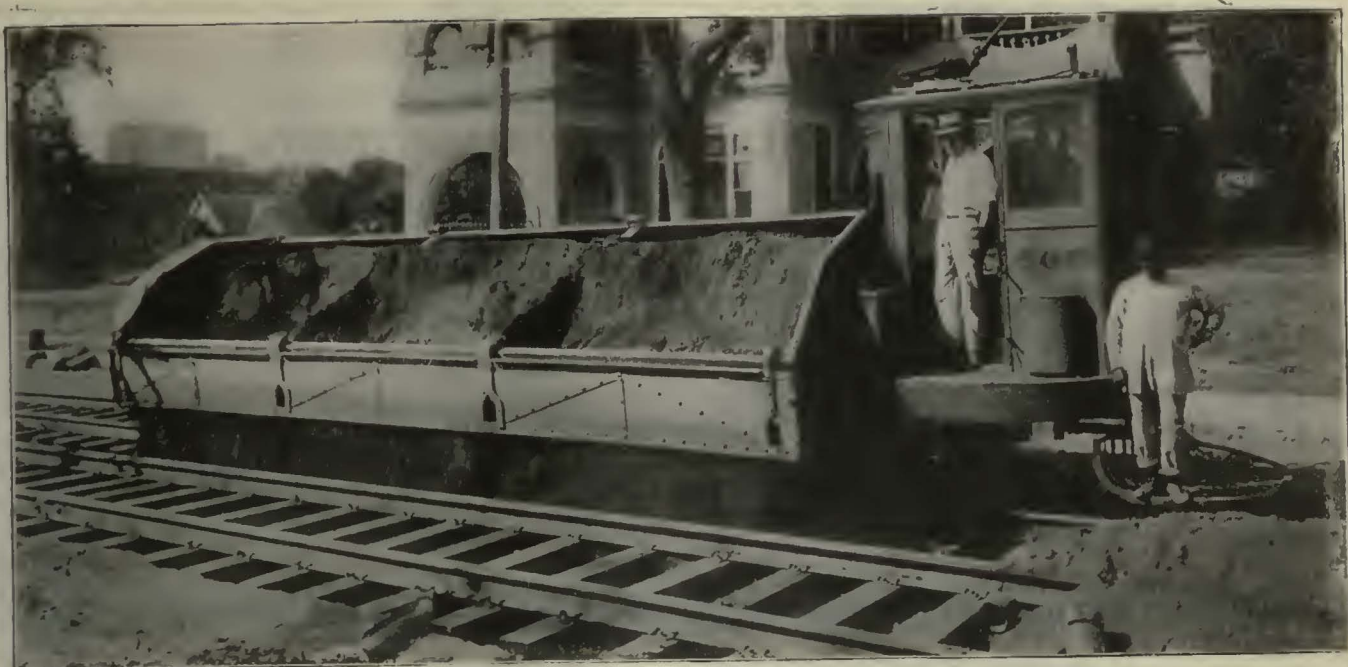
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Not a luxury nor merely a convenient accessory, but a vitally necessary equipment—a paying investment for the prompt and economic execution of every track-work program.

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Differential Cars earn their way in

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Ash Removal

As Electric Locomotives

As Snow Plows

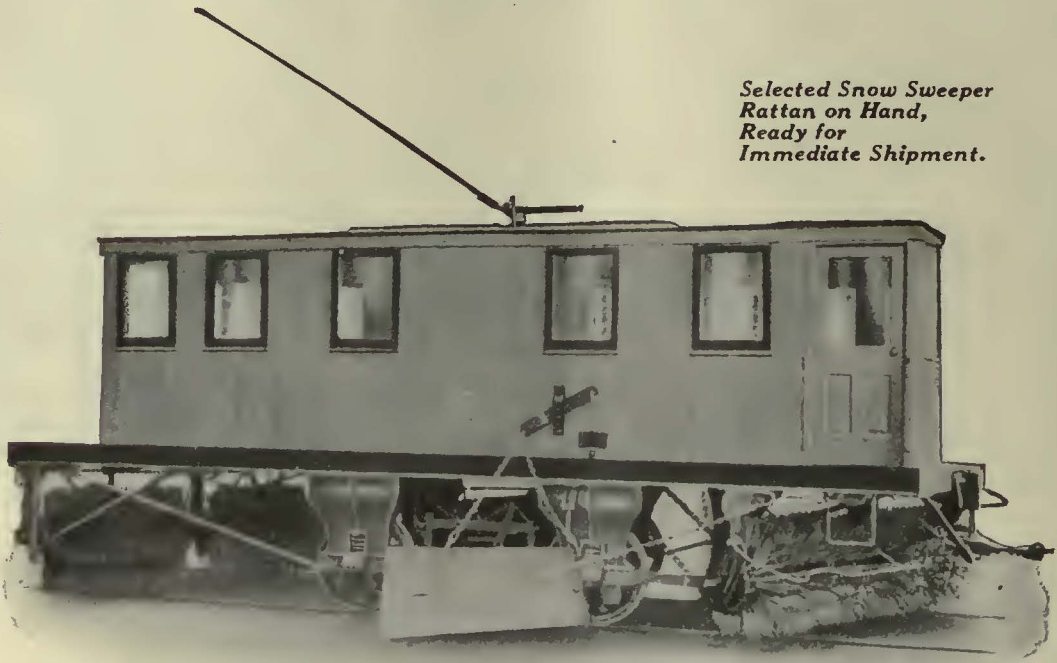
Not only are Differentials a paying investment on account of their versatility, but they also perform each class of service with the least expenditure of time and money.

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Rattan on Hand,
Ready for
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Standard Single Truck, Steel Underframe Long Broom Sweeper

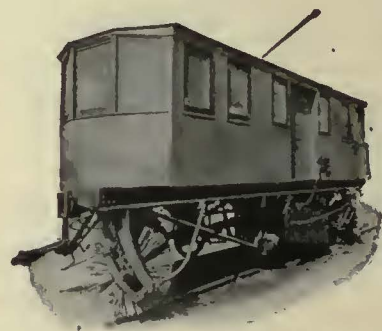
Approximately ninety-five per cent of all the electric snow sweeping equipment, which is used in the United States and Canada, is of McGuire-Cummings make.

The car illustrated here is one example. The brooms are so arranged that they will clean both rails ahead of the car; the side plows will clear 4 ft. 0 in. outside of rails.

It requires two 25-hp. motors to propel the car, and one 25 to 40-hp. motor geared to drive brooms at 300 to 350 r.p.m.

Blueprints and specifications will be submitted on request.

*End view of Standard Single Truck
Sweeper.*



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Snow Sweepers, Electric Locomotives.

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SERVICE, to the Galena-Signal Oil Company, is a pledge of honor, a duty—a sacred trust. *Service to the customer* is the one dominant aim of our organization. In no field of commercial or industrial activity is the word more faithfully or conscientiously exemplified than in the workings of "Galena Service,"

through the installation and delivery of efficient and economical lubrication to electric railroads.

On representative roads in every section of the country Galena Service is giving daily demonstrations of its value as a co-operative force in attaining improved operating conditions through elimination of lubrication difficulties. It is giving practical proof of its ability to deliver maximum mileage, keep equipment in running order, reduce time losses and the repairs of bearing parts, and bring down the actual cost of lubrication to the lowest point ever reached in electric railroad operation.

*"When Galena Service goes in
Lubrication troubles go out!"*



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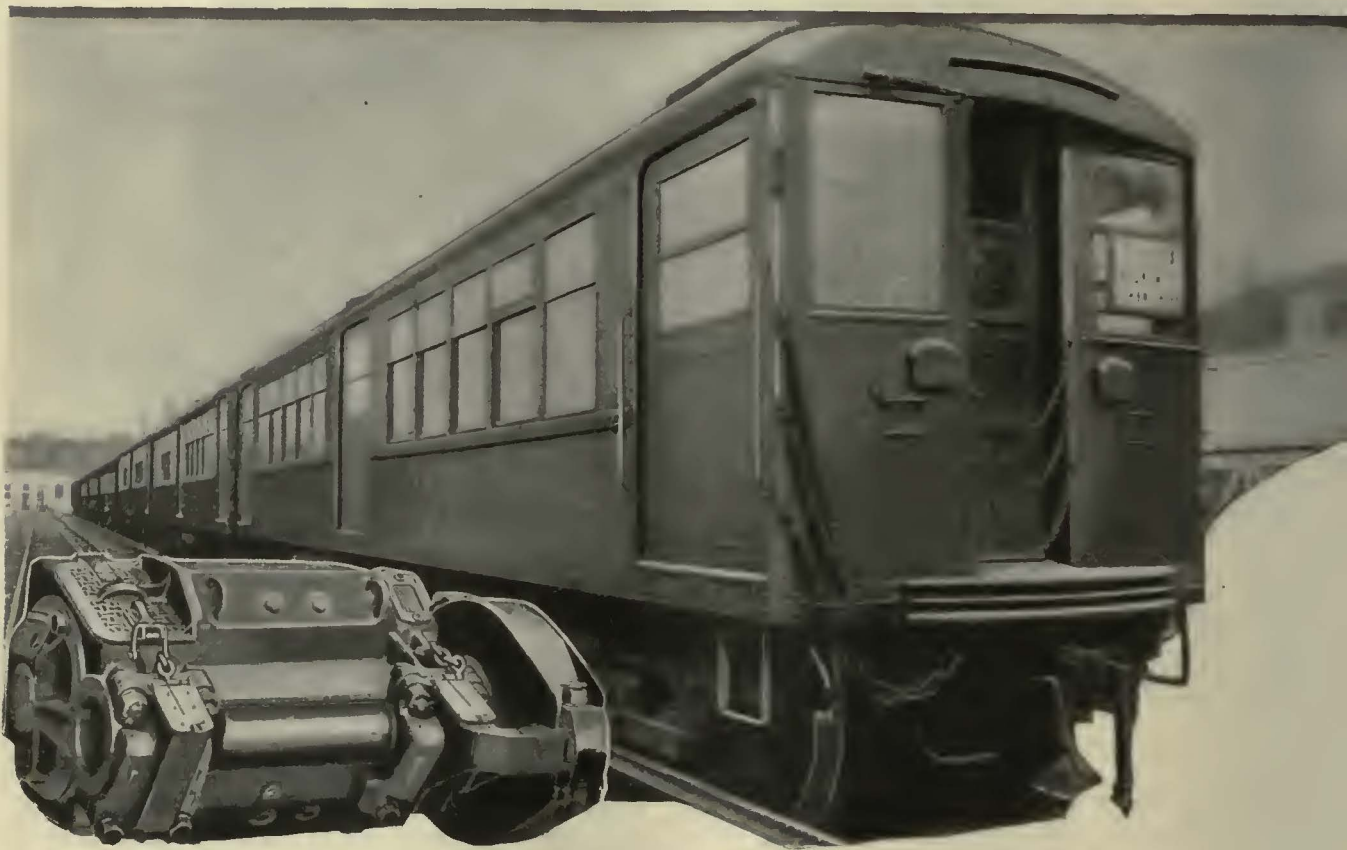
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10 Miles of Train an Hour on the Elevated



GE-243

3 Armature Failures a Year

In the years 1914-15, the Chicago Elevated Railroads purchased 324 GE-243 motors.

These motors have had no difficulty in meeting the higher rates of acceleration and heavier loads which have been required by the increased traffic of recent years. As proof of this, during these eight years the company has reported twenty G-E Armature failures—less than three a year.

Such a record, on a system that cannot afford to have a breakdown, means more than low maintenance cost per mile. It means uninterrupted service, a saving of revenue miles.

Some G-E railway motors have exceeded expectations. That the Chicago Elevated appreciates the success of the GE-243 is evidenced by a recent order for 60 more, duplicates of the 1914-15 order.



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ELECTRIC RAILWAY JOURNAL

Consolidation of Street Railway Journal and Electric Railway Review

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Volume 60

New York, November 25, 1922

Number 22

The Transportation Department Must Get Its Own Information

WHETHER a railway company, particularly a street railway company, makes money or loses it, has an increasing traffic or a stationary or decreasing one, depends to a very large extent on how closely service is fitted to the amount of riding. With too few cars, traffic is driven to other channels, but with too many cars all the revenue goes in excessive platform expense. In order to be able to follow rapidly changing conditions, it is essential that the transportation department know promptly about shifts in riding. It is too late to make corrections if the transportation department has to wait upon the accounting department for the figures showing what happened on a certain day, for that means usually that the day referred to is one passed two weeks ago. This is not in criticism of the accounting department, for that routine is necessary. But the transportation department leads; it is the source of all the revenue and the cause of 60 per cent or more of the expenditures. Why then should it have to wait for some other department, that has only an indirect interest, to supply it with the data with which to check itself?

To be truly successful in building revenue and in conserving its expenditure, the transportation department must have early today data that show yesterday's operation. There is only one way to get this and that is for the transportation department to get it itself. This is not particularly hard nor expensive to do. Just how to go about it will be brought out in a later issue of this paper.

Graphs Help to Visualize Transportation Problems

ON A SIZABLE system with its intricate time-tables it is next to impossible to visualize just how the car spacing works out at various points of the line, how the layover time is distributed, etc., unless the time-tables are reduced to graphic form. On a system where this practice has not been followed some most surprising inconsistencies will often come to light when the existing time-tables are graphed. The cause of bunching of cars may quickly be discovered, as may also errors which lead to expensive layover or non-revenue platform expenditures. It would seem almost presumptuous to suggest that the practice of plotting out time-tables be followed by electric railway men, yet it is not done as generally as one would suppose its usefulness would compel. Hence it may be in place here to urge transportation superintendents to reduce their existing schedules to the graphic form and see—what they shall see.

But the use of the graph should not stop here. The daily check-up of yesterday's operation, spoken of just above, is tremendously facilitated by having the information put in graphic form, showing for each line the seats per passenger at several points, platform cost

per hour, the ratio of platform expense to revenue, passengers per car-mile and per car-hour, etc. From this form of presenting the data the trend is immediately discernible, and any undesirable operation can be readily picked out and checked up. The expense of doing this is exceedingly small compared to its great value in saving money from useless service or making money by putting the service where it is needed.

There Is Little Warrant for the Paving Tax as at Present Assessed

ELECTRIC railway managers are amply justified in urging upon public service commissions and the public the inconsistency of the paving requirements at present made of electric railway companies in general. In many cities of this country the railways are obliged to pave a considerable strip of the streets occupied by tracks and to maintain this paving. The reasons for pushing this matter, and it must be pushed by the electric railways if any results are to be secured, are two-fold: In the first place the burden is becoming heavier from year to year, and in the second place there is a growing demand that all utility taxes should be put upon a logical basis.

As has often been said, the fundamental cause of the present difficulty is a historic one, an inheritance from horse-car days. However, it is necessary to go deeper than this. The present franchises, at least those that date back to the early days, represent bargains made between municipalities and railways under radically different conditions from those now obtaining. When it was proposed that the railways assume certain paving obligations, the doing so was undoubtedly considered a comparatively trifling matter. That this was true is indicated by the jubilant welcome which was given to the new form of transportation by the communities which it was to benefit. It would not have been logical for them to impose burdensome restrictions upon this development. Electric transportation promised inestimable benefits to the communities served, and there was no serious competitor in sight or prospect to suggest the driving of a hard bargain. In other words, the public anxiously desired the new form of transportation and made what, in most cases, appeared to be liberal terms to get it.

On the side of the electric railway promoters, also, something needs to be said. Capital, seeking an outlet for its surplus, saw opportunities in the street railways for a reasonable return on investment and for considerable profit in addition. The franchise terms which communities were willing to give did not seem burdensome in view of any operating conditions which could then be visualized. Hence the imposition of paving and snow-cleaning requirements, limitation of fare, etc., did not appear unreasonable.

Now everything is different, and it is only fair that franchise terms made in good faith under conditions quite foreign to those of today should be revised. This

fact is recognized in the principle now well established that the state is superior to contractual obligations of a franchise given by a municipality to a public utility. In most communities the electric railways are under state control as to practically all of the details of operation. They are heavily taxed by the municipalities to provide money for the performance of all municipal functions, of which paving construction and maintenance is a salient one. Having thus paid once for a share in the general paving program, they should not have to submit to a direct paving charge in addition. In fact they should have nothing to do with paving, except in the necessary co-operation with city engineers to insure proper correlation of track and pavement. If this idea prevailed, they could properly be billed by the city for damage done by railway operation to the pavement, the public service commission being the natural arbiter in this case.

Philadelphia's Rapid Transit System Is Nearly Doubled by Frankford "L"

SINCE Nov. 5 an important section of Philadelphia, before that date rather isolated from the central portion of the city, has been enjoying rapid transit. The new line runs in a northeasterly direction from Second and Market Streets to the center of Frankford, passing through some of the most important manufacturing sections in the city. This increases by 88 per cent the rapid transit mileage in Philadelphia. The jubilation which marked the opening of the line and the heavy traffic which has immediately come to it testify to the transportation need that has been met by this new development. It was built and completely equipped by the city of Philadelphia and is the first part of a comprehensive rapid transit program. The subway running north on Broad Street from City Hall will logically be the next step.

There is no doubt that Philadelphia needs rapid transit and ought to be able to support a reasonable amount of it. At the same time the people of Philadelphia could not expect a privately owned railway property to finance such expensive transportation extensions as this one, unless there was reasonable prospect of a fair return upon the investment. The Frankford "L" appeared not to be a feasible undertaking from the Philadelphia Rapid Transit Company's standpoint, as it would not pay its way for many years to come. The only thing for the city to do, therefore, if it felt it must have this transportation, was to go ahead with the rapid transit program laid out and make up deficits out of taxes. This is an illustration of cases where the transportation needs of a community sometimes have to be considered from a standpoint other than that of financial return.

In Philadelphia the city also built and equipped a 6-mile surface line, as an adjunct to the Frankford "L," and turned it over to the P. R. T. for operation without payment of rental for a period of five years at least. In this case and with the new elevated line the whole city has made a contribution to the welfare of a given section, with a view to assisting in the equable development of all of its parts.

It would have been disastrous for the public if the city had been obliged to operate the Frankford elevated line as a separate unit, although provision was made for doing so in case agreement as to terms of lease could not be reached. The citizens would have had the service, but with city operation they would have paid two

fares instead of having through service for one fare over the entire rapid transit route, the former rapid transit line being the property of the P. R. T. They would also have missed many other advantages that go with a unified system of transportation.

Getting Useful Information Out of Masses of Statistics

AT THE last meeting of the Institute of Transport, the first "ordinary" meeting of the year, Sir William Acworth read a paper on "British Railway Operating Statistics and Their Lessons." He quoted a friend who asked him only recently whether he could give a single instance where operating statistics have effected practical economies. This was to illustrate the attitude toward statistics that is still taken by people in a position to know better. This question of Sir William's friend, however, comes as a challenge to all who are fond of "figures."

Sir William demonstrated by a convincing array of examples that statistics have shown the inaccuracy of many guesses as to railway conditions in Great Britain. The same could undoubtedly be said with respect to the electric railway industry in this country. Nevertheless, it is true that much statistical research fails of its full purpose because either the results are not what were needed or because the necessary effort was not made to determine what the data really show.

Statistics are not an end in themselves, even to the statistician. To justify their cost they must influence procedure. The real test of value is in the economies or the better service produced. Some electric railways have statisticians whose duty is to compile and interpret data. This is an excellent plan if the property is large enough, but on every property some individual might profitably undertake a study of the data which are compiled as a matter of course in connection with reports to regulatory bodies, as well as those made for special purposes. The work of the statistician is dry and uninteresting until it begins to yield suggestions of real value. Then it becomes an inspiration.

The Utility's Problems Are the Problems of the Public Utility Commission

IN INVITING Henry L. Doherty to address its recent convention in Detroit, the National Association of Railway and Utilities Commissioners showed a real desire to get the point of view of the utilities. Mr. Doherty's experience has been so broad and his personality is so convincing that he was a logical representative for the public service industries, of which the largest, as measured by capitalization, is the electric railway. He spoke frankly, but in a spirit of co-operation, pointing out first that state commission regulation is an improvement over regulation by state legislatures or municipal councils, and second that there are many features of utility operation regarding which the commissions can do much along the line of improvement. His remarks are abstracted briefly in another column.

Under the present régime of regulatory control much of the responsibility formerly carried by the utility managements has been transferred to the commissioners. The commissioners feel this responsibility and respond to it, but they have the double duty, a difficult one, of dealing justly with the utilities and at the same time selling the public the idea that they are doing so. Addresses like Mr. Doherty's should help them to do so.

Philadelphia's Rapid Transit Greatly Augmented

City-Owned Elevated Line to Frankford Now Operated Under Five-Year Lease by Philadelphia Rapid Transit Company—Estimated Annual Traffic 33,000,000—Steel Superstructure Carries Concrete Floor Upon Which Ballasted Track Is Laid—Design Was Made with Economy in Maintenance as a Prime Consideration



THIS ROCK-BALLASTED TRACK ON THE FRANKFORD ELEVATED RAILWAY GIVES ONE AN IMPRESSION OF PERMANENCE



THE CHAMFERED ENDS OF THE TRANSVERSE GIRDERS GIVE THE SUPERSTRUCTURE A FINISHED APPEARANCE



A PORTION OF THE TRACK IS CONSTRUCTED WITH SHORT TIE BLOCKS SET IN CONCRETE, BUT NOT BOLTED THERETO

PRIOR to Nov. 5, 1922, the operating rapid-transit system of Philadelphia, Pa., consisted of a 7.35-mile double-track line on Market Street, partly in subway, the remainder elevated. On the day previous to that date the city, with due ceremony, turned over to the Philadelphia Rapid Transit Company for operation the Frankford Elevated line, a 6½-mile double-track extension, complete in all details, including 100 new cars specially designed. The P. R. T. immediately inaugurated through service from Sixty-ninth and Market Streets, the western terminus of the older line, to Frankford, the northern terminus of the new one. The accompanying map shows the location of the new line and its relation to the Market Street line as well as the proposed Broad Street subway. At the time the new line was taken over it was estimated that the annual number of passengers who would be carried on the Frankford Elevated would be 33,000,000, which indicates the importance to Philadelphians of the service which this line is now rendering.

The fare on the extended elevated line is the same as that prevailing over the P. R. T. system, 7 cents cash or four tickets for a quarter. Free transfers are given to intersecting surface lines and to a new line connecting Frankford and Bustleton. The latter, however, is divided into two regular fare zones, the free transfer covering only the one connecting with the elevated. The Bustleton line is covered in an article elsewhere in this issue.

As a result of the opening of the new lines, considerable rerouting was carried out, both to eliminate duplication of service and to provide the best possible service by utilizing as many lines as possible as feeders for the elevated. Some routes were discontinued, new

ones were opened, and others were modified for the purposes mentioned.

This Frankford Elevated line is the first step in a rapid transit program originally laid out by A. Merritt Taylor, former Director of the Department of City Transit. On July 24, 1913, Mr. Taylor recommended the construction by the city of the line from Arch Street to Bridge Street (Frankford). Nearly two years later the City Councils appropriated \$3,000,000 toward the project. The first certificate of public convenience was issued by the Public Service Commission on Aug. 14, 1915, and construction contracts were awarded immediately thereafter.

Thus, there elapsed a period of seven years between the letting of the first contract and the inauguration of service, the delay being in part ascribed to the war and in part to the difficulty experienced in negotiating an operating contract. The Department of City Transit estimated that with the experience gained on this first section the work could be duplicated in about three years, the time originally estimated.

The construction of the Frankford Elevated involved the letting of 100 contracts to sixty contractors. The largest single contract for the elevated structure was for \$1,453,848 to the McClintic-Marshall Company, for 22,550 lin.ft. of steel superstructure. The J. G. Brill Company was paid approximately \$1,644,000 for the second lot of fifty completely equipped steel passenger cars.

In the prosecution of the plan six city ordinances condemning property for station purposes, one striking a city street from the city plan and one authorizing an agreement with the Pennsylvania Railroad for the location of a station on the railroad property, were necessary.

Architectural Features
of Frankford "L"
Approved by Philadel-
phia Art Jury

The Superstructure
and Stations
Present a Finished
Appearance



Here and There Along
Frankford Elevated

1—Where Frankford Ele-
vated Line joins P. R. T.'s
Market Street Line. 2—
Tioga Street Station typical
of architectural design. 3—
Attractive interior of Alle-
gheny Avenue Station. 4—
View from the Bridge Street
Station platform. 5—Train
pulling out from island
platform at Bridge Street
terminal. Copper-covered
signal tower and remote
control house in foreground.
6—Center-column type su-
perstructure in Frankford
Avenue section. 7—Longi-
tudinal trusses have flat
tension members. Concrete-
slab walkway on top chord.



2

4

6

3

7

The actual investment in the Frankford Elevated to Oct. 1 comprised the following items, totaling \$13,383,219: For construction and equipment, \$10,078,211; for real estate, \$529,745; for engineering and administration, \$1,171,897; for legal expenses, \$33,000; for interest, \$1,570,366. At that date the amounts estimated as required to complete the work were: For construction and equipment, \$1,900,000; for real estate, \$170,000; for engineering and administration, \$45,000; for interest, \$40,000, totaling \$2,155,000, and making the grand total for the undertaking \$15,538,219.

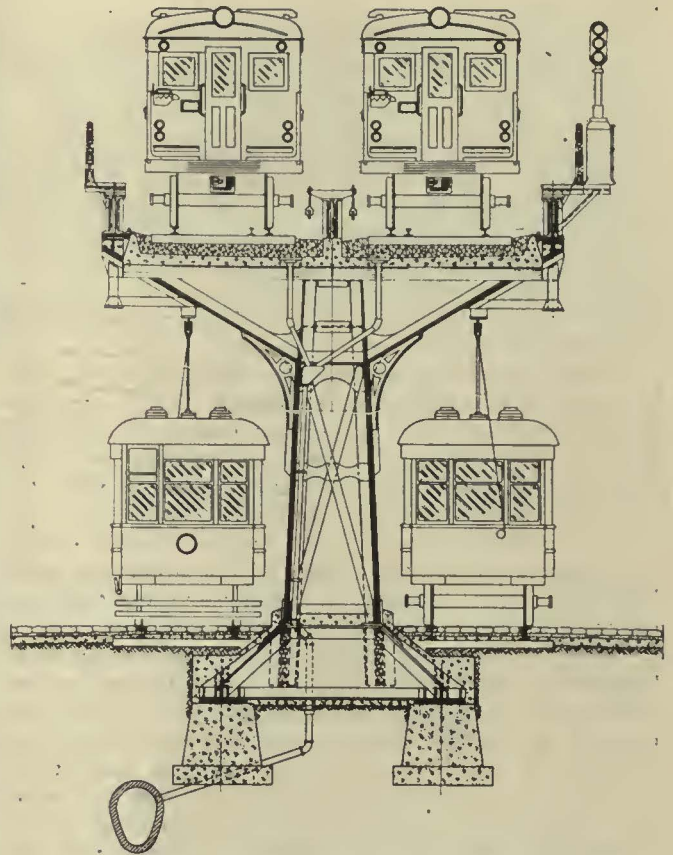
As the total length of developed profile of the line is 6.42 miles, the cost per mile will have totaled approximately \$2,420,280.

Some of the more interesting details of cost were as follows: Average cost of stations, excluding Bridge Street terminal and trainmen's building, \$68,435; average cost of platforms (two to each station), \$61,220; cost of land per station (two properties), \$37,418; making the total cost per station \$167,073. Total cost of 100 cars, approximately \$3,000,000. Cost of three 4,000-kw. substations, exclusive of real estate, approximately \$455,236.

The rapid-transit improvement was financed largely by city bonds, about \$13,500,000, as compared with roughly \$2,000,000 from general appropriations. The latest loans bore an interest rate of 5½ per cent, earlier ones being floated at 4 per cent or better.

The operating contract was a source of contention between the city and the Philadelphia Rapid Transit Company for several years. The city was naturally desirous of securing a return on its investment, and, on its side, the railway company was not able to see a profit in the proposition for many years to come.

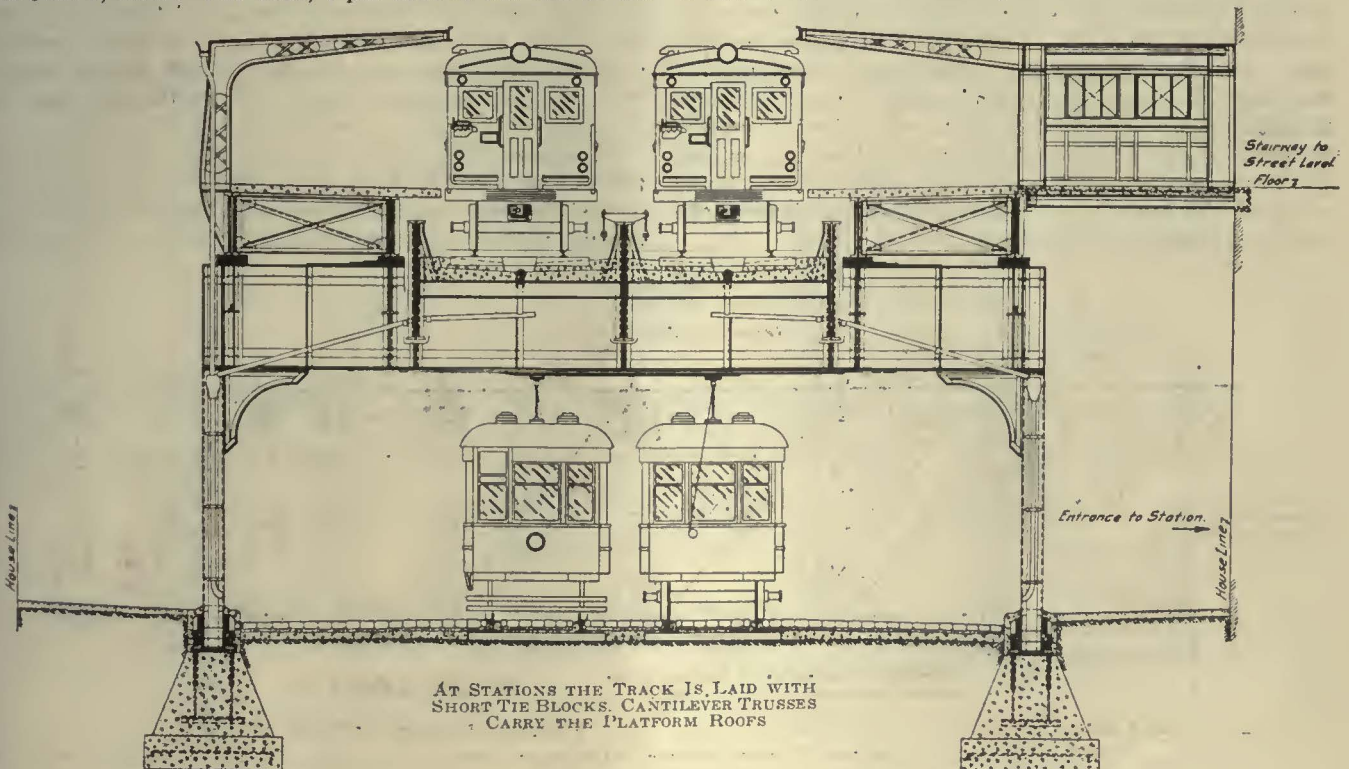
Finally a five-year lease was signed, dating from Nov. 5, 1922, with the right or option on behalf of the city to renew and extend it until July 1, 1927, by written notice given by the city not later than May 5, 1927. The lease specifies the fare privileges already mentioned and provides for the following rentals to begin to accrue on Jan. 1, 1923: For 1923, 1 per cent of the cost of the



THE CENTER-COLUMN SUPERSTRUCTURE IN FRANKFORD AVENUE RESTS UPON CONCRETE PIERS PLACED DIRECTLY BELOW THE TRACK CENTER LINES

Frankford Elevated Railroad; for 1924, 2 per cent; for 1925, 3 per cent; for 1926, 4 per cent, and for 1927, 5 per cent. Thereafter, if the lease should be extended, 5 per cent per annum will be paid, rental payable quarterly.

In general, the Frankford Elevated structure rests on a row of concrete column piers set on the curb line of



AT STATIONS THE TRACK IS LAID WITH SHORT TIE BLOCKS. CANTILEVER TRUSSES CARRY THE PLATFORM ROOFS

each sidewalk. On these are steel columns, each pair carrying a cross girder, usually of the plate type. Three longitudinal lines of trusses supported from these transverse girders carry the I-section floor beams.

Between the floor beams are sprung concrete jack arches, filled in over the tops of the beams to form a continuous floor from bent to bent. A guard or curb of concrete extends above the floor on each side to retain the ballast. Along each side, also, is a concrete slab walkway supported on top of the longitudinal truss.

On the floor, which was mopped with coal tar, the double track is laid, part of it on broken stone ballast and part with the ties set in concrete.

Twelve passenger stations are distributed over the line, thus averaging a 1/2-mile spacing. Each comprises a platform to accommodate six-car trains, or about 350 ft. in length, with an entrance-exit building set alongside but off the street area and connected with the platform by a covered passageway.

At the Frankford end of the line is a larger station building containing the offices of the operating staff, besides a recreation room, a locker room and toilet accommodations for the trainmen. At this point also is a storage yard with a commodious car inspection shop. There are a number of graceful signal towers and remote-control switch houses along the line. These are covered with 16-oz. sheet copper to insure durability.

Power is supplied to the elevated line from three manually operated substations, each of 4,000 kw. capacity. These receive power from the supply system of the Philadelphia Electric Company at 13,000 volts, 60 cycles, through duplicate and separately fed cables.

Each cable is of the three-conductor type, 350,000 circ.mils in area, and installed in an underground conduit. The substations contain each two six-phase rotary converters. Two contain six 700-kw., single-phase, air-cooled transformers and standard switchboard and auxiliary equipment, and one contains seven transformers and equipment. A 20-ton crane is provided in each substation for handling the apparatus.

The feeder conductors, leading from the substation to the conductor rail, are mostly laid under the sidewalk in 3 1/2-in.-bore terra cotta duct. Iron-pipe conduits lead from the underground conduits up the columns of the superstructure to the conductor rail. Twenty 2,000,000-circ.mil paper-insulated cables lead from the substations to outlet manholes, where they are spliced to the rubber-insulated cables used in the risers. Some cable of the same size is also used to supplement the carrying capacity of the contact or third rail.



THE CAR INTERIOR IS WELL DESIGNED FOR HANDLING RUSH-HOUR CROWDS

No return cables are used to supplement the carrying capacity of the track rails, of which but one is used for the return circuit, the other being used for signaling purposes. The return rail is bonded to the structure which forms the main return.

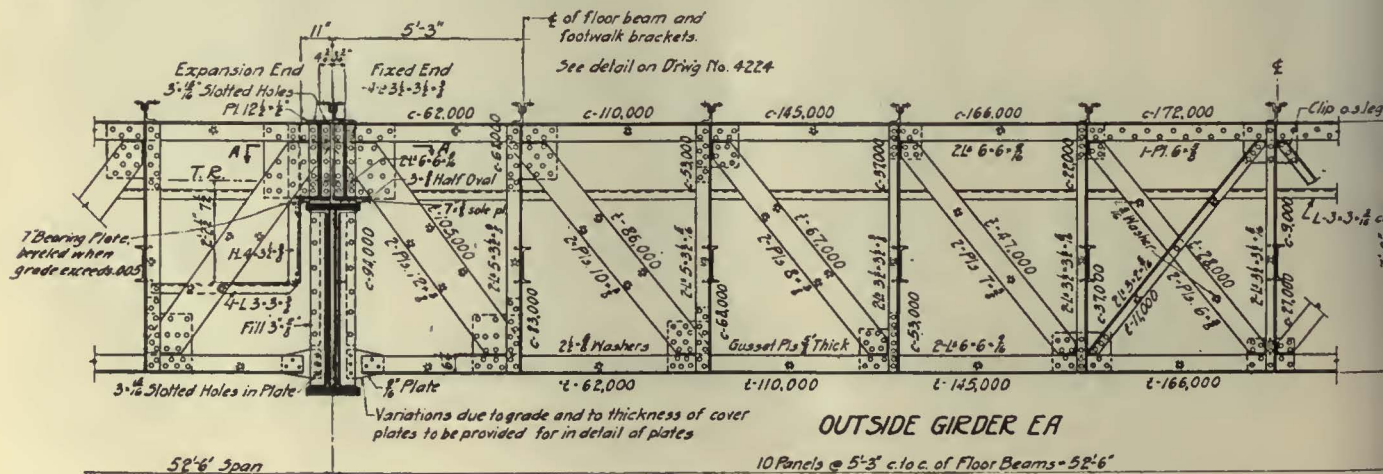
SUPERSTRUCTURE EMBODIES SEVERAL NOVEL FEATURES

In the foregoing paragraphs the general character of the elevated structure was explained. Some features of the design may be profitably examined in more detail, as they are either new or unusual.

The columns are in general formed of Bethlehem H and channel sections, with plates added where loads to be carried required larger sections. The bases are formed of sole plates attached to the column shaft by gusset plates and stiffened with angles.

The columns are anchored by four 1 3/8-in. bolts to concrete piers, made with a pyramidal top. This pier was designed to load the soil to about 3 1/2 tons per square foot. The top of the pier was designed for a bearing pressure under the column space of 500 lb. per square inch, and the minimum distance from the sole plate to the edge of the concrete was fixed at 6 in.

The base plates were set from 1/2 to 1 in. above the top of the finished pier, and after the structure was leveled and aligned, this space was tamped full of stiff cement mortar. The entire base was then inclosed in



THE USE OF FLATS FOR DIAGONAL TENSION MEMBERS FACILITATES DESIGN AND FABRICATION. THIS DRAWING SHOWS DET



THE CAR-DOOR ARRANGEMENT PROVIDES FOR QUICK PASSENGER INTERCHANGE

concrete, which on its top formed the sidewalk surface, and the edge next to the cartway was reinforced with a steel binding that formed the curb.

The columns were filled with concrete, to prevent accumulation of dirt and secure some additional strength from the filling. This also improves their appearance.

On Frankford Avenue, through which the elevated line runs in Frankford, objection was raised to the placing of the columns on the sidewalks on account of the narrowness of the street. A special type of column was therefore designed for this location, having the form shown in an accompanying cross-section of the structure. The column has a single shaft located in the center of the street and supported below the street surface by plate girders, which in turn rest on concrete piers spaced 12 ft. between centers. This brings the line of action of the force due to the weight of the train directly through the center of the foundation.

The outside trusses in this construction are supported by means of diagonal braces, stiffened with curved brackets, of cast iron. These also render the structure more graceful.

TRANSVERSE GIRDERS HAVE SLOPED ENDS

The transverse girders, mentioned previously as being of the plate girder type, have their ends sloped down to a height of 16 in. over the columns. This construction gives the girders a finished appearance, but involves reinforcement on both sides of the web plate to provide resistance against shear. The girder is seated on the top of the column and attached to it by rivets through the column cap and by a tie plate extending up from the back of the column and riveted to the end of the girder. Where the clear height of the structure is less than 21 ft. transverse stiffness is secured by knee braces

of plates and angles. Over that height stiffness is secured by angle struts and ties. At stations the top chord of the transverse girder is carried parallel to the bottom chord for its full length and furnishes support for the platform girders.

FLATS FOR DIAGONALS IN LONGITUDINAL TRUSSES

The longitudinal girders are in general 7 ft. deep and of the half-through Pratt type. They are of especial interest in view of the use of flats for the diagonals, except counters, the width of the flats being selected in accordance with the tension in the member. The chords are of plates and angles, and angles are used for the verticals and end stiffeners.

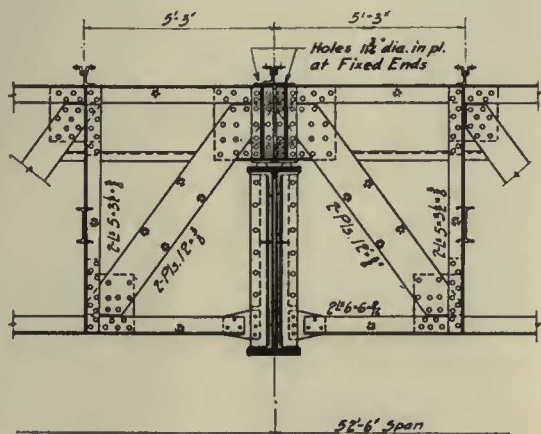
The floor is carried by Bethlehem beams riveted to the truss verticals, which are 5 ft. 3 in. apart. The top chord of the trusses is held by knee braces of angles attached to the top of each floor beam. Lateral stiffness against wind and centrifugal forces is obtained by the use of a continuous angle member riveted to the top of the floor beam adjacent to the outside girders.

The longitudinal girders rest on half oval bars attached to the top chord of the transverse girders. This facilitates adjustment of the structure to variations in grade and elevation. Each girder bearing is fastened to the transverse girder by two rivets and the bottom chord of the longitudinal girder is attached to the stiffener angle of the transverse girders. The ends of the longitudinal girders do not meet; this allows ends to be made normal to the chords and simplifies fabrication. The top chords of adjoining girders are fastened together by light plates. At crossovers the center girder is a plate girder and is depressed to allow the track to pass over it.

The designers of the structure provided for contraction and expansion by placing an expansion joint at the end of every fourth span, or at about 200-ft. intervals on tangents. This joint is shown in the elevation of the girder reproduced. On curves the expansion joints are located at the ends of the curves. The movement is taken up by allowing one end of the longitudinal girder to slide on its seat on the top of the transverse girder. The girders are held in position by bolts working in slotted holes.

In connection with the statement regarding the use of flats for tension members in the trusses, it may be said that they were used on account of the economical distribution of steel which they made possible and for the facility with which joints can be made with this shape.

The span of the longitudinal girders varies by increments of 5 ft. 3 in. from 31 ft. 6 in. to 73 ft. 6 in., the length being determined by the local condition in each



THE EXPANSION JOINTS AND SOME OF THE DESIGN DATA

block. The spans in the center column construction on Frankford Avenue average about 42 ft., measured from center to center of columns.

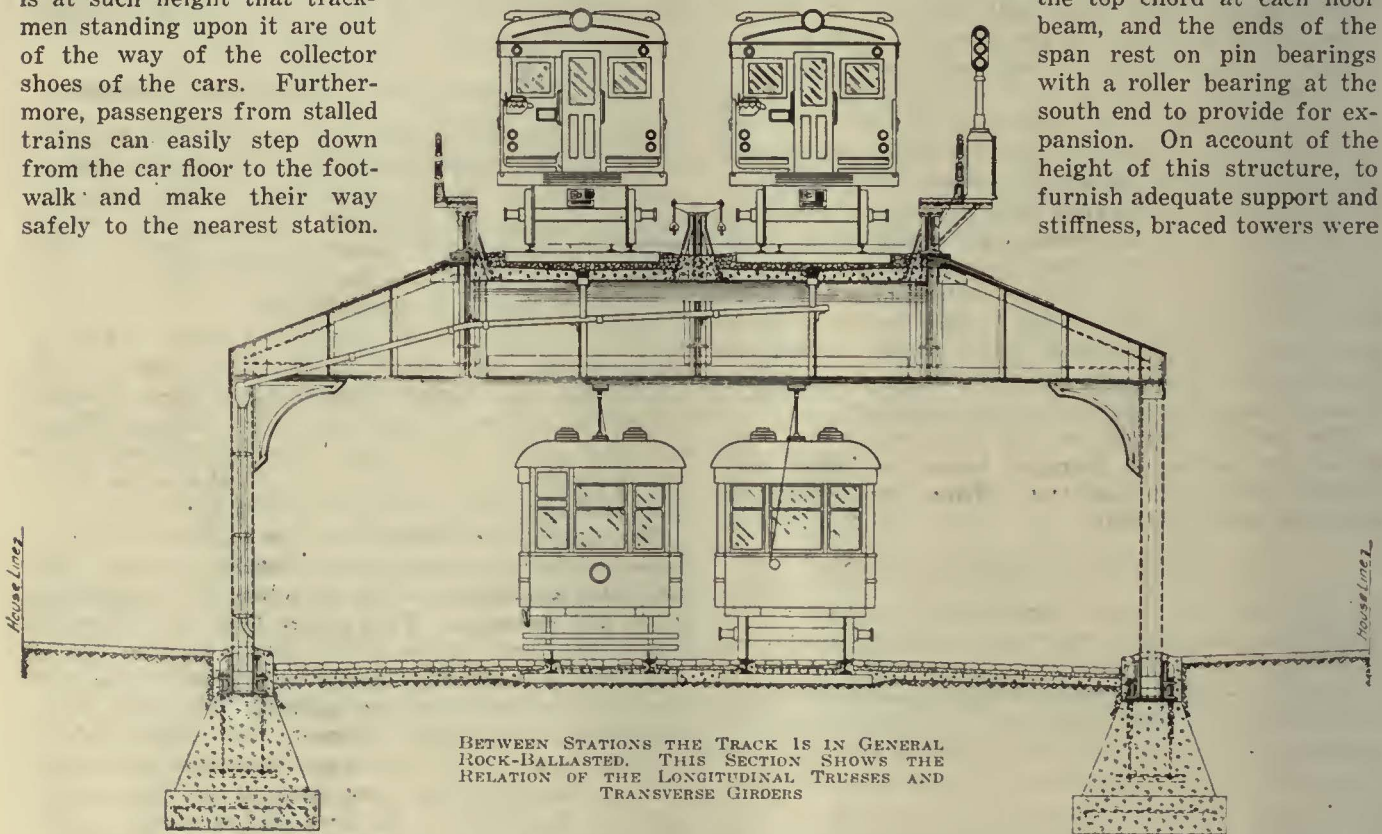
CONCRETE JACK ARCH PROVIDES SUBSTANTIAL FLOOR

The provision of a track floor through the use of jack arches results in a substantial support for the track because the arches distribute the load from floor beam to floor beam, between transverse girders. This brings a number of floor beams into action for each point of load application. For this reason, and also because the jack arch uses concrete with greatest economy, the construction as a whole is an economical one.

An attractive feature of the superstructure, already referred to, is the reinforced concrete footwalk on each side. The slabs, of which the walkway is composed, are bolted in place. The walkways are provided with galvanized pipe railing, and the level of the walkway is at such height that trackmen standing upon it are out of the way of the collector shoes of the cars. Furthermore, passengers from stalled trains can easily step down from the car floor to the footwalk and make their way safely to the nearest station.

Lehigh Avenue, illustrated in the issue of this paper for Nov. 11, page 792. A span of 112 ft. 6 in. was necessary at this point, due to the width of the street and to the fact that double car tracks curved north from Lehigh Avenue into Kensington Avenue at this street intersection. In addition the structure here had to be unusually high.

Where the structure crosses the tracks of the Richmond branch of the Philadelphia & Reading Railway north of Lehigh Avenue and those of the connecting railway of the Pennsylvania Railroad System at Pacific Street, spans of 196 ft. and 143 ft. respectively were required. Through trusses of the Pratt type were used for the P. & R. crossing and pony trusses of the Pratt type, with inclined end posts and parallel chords, were used for the Pennsylvania crossing. In the latter case Bethlehem beams 24 in. deep span the space between trusses to carry the track floor. Knee braces support the top chord at each floor beam, and the ends of the span rest on pin bearings with a roller bearing at the south end to provide for expansion. On account of the height of this structure, to furnish adequate support and stiffness, braced towers were



The matter of drainage was given special attention by the city's designing engineers, and the track floor was sloped for drainage toward the transverse girders, where outlets are provided. These outlets discharge into cast-iron gutters which are attached to the girders, and these in turn discharge through down spouts to the street gutter. An exception is made in the case of the Frankford Avenue center-column construction, where the drainage is into the sewer.

A question may be raised at this point as to why the superstructure was provided with the continuous concrete floor. The first reason was that City Councils required that a tight floor be provided. The construction above described was selected as the most economical and permanent for the purpose.

While the spans provided by the trusses already mentioned were in general sufficient for street crossings, there were several cases which involved special structures. An excellent illustration was the steel arch over

placed at either end of the span. Concluding regarding the superstructure, it should be noted that economical construction and maintenance were the guiding considerations. No wood was used anywhere in the structure already described, although it was necessary to use some slag-covered wood roof on station platforms due to inability to obtain the asbestos roofing desired.

Special attention was given to the painting, paints of the city's own formulas being employed. Tops of girders especially exposed to rust were coated with coal tar as well as painted with pigments and oils in which the engineers had thorough confidence. As already suggested, drainage was a prime consideration.

A large part of the track on the Frankford Elevated is of the rock-ballasted type, with 90-lb. A.S.C.E. rail attached to the ties by means of screw spikes and cast-iron clips. The ties are heart grade longleaf yellow pine impregnated with 10 lb. of creosote oil per cubic foot.



THE STORAGE YARD AT FRANKFORD HAS CAPACITY FOR ALL OF THE ROLLING STOCK OF THE FRANKFORD ELEVATED

A part of the track, that between Arch Street and Girard Avenue, as well as the track in front of stations, was laid with tie blocks, beveled on the side and imbedded in concrete. These blocks are not bolted in place, but to hold the gage every third and sixth tie alternately was made a cross-tie. Between the rows of tie blocks a deep gutter leads to the drain.

Dowel stones set in the top surface of the concrete deck provide against movement of the concrete support of the tie blocks.

A continuous T-rail guard was placed along the inner rail to prevent derailed trains from striking the outside line of track girders. Working and emergency guard rails were provided at curves and special trackwork. The emergency and working guard rails are of 90-lb. A.R.A. section, type A, and the continuous guard rail and the rail used in the yard for sidings are of a 67-lb. relayer rail of a type rolled for the Russian government. Special trackwork is of 90-lb. A.S.C.E. rail, with manganese inserts, and continuous rail joints were used on the running rail except at points where the working guard rail is used and at the insulated joints required for the operation of the signal system. The joint plates are of the 4-bolt type, attached by buttonhead track bolts with spring lock washers under the nuts.

The track grade at stations is $\frac{1}{2}$ per cent, with a



THE INSPECTION SHOP IS CAPACIOUS AND WELL LIGHTED

maximum of 3 per cent between. At the south end the grade of the connection to the tracks of the Market Street subway is 4.6 per cent.

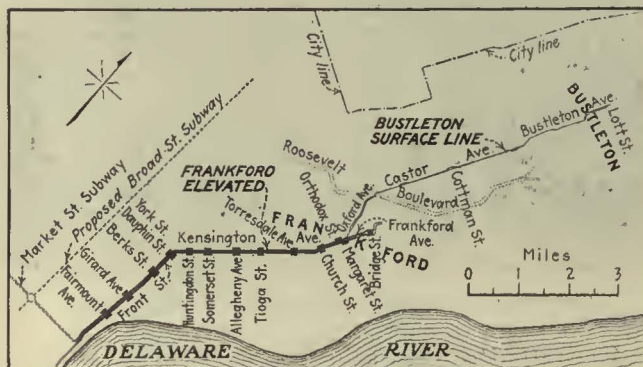
AN UNUSUAL TYPE OF PASSENGER STATION

An important feature of the design of the new elevated line is the use of stations off the street and of pleasing architectural appearance. With one exception these are placed on street corners and they all contain stairways, toilet facilities and space for the sale of tickets and handling of traffic. The plans for the buildings were approved by the Art Jury of Philadelphia. The typical station illustrations give an idea of the appearance of all, although they are by no means alike.

The station platforms are of reinforced concrete, supported on lattice trusses of the Warren type. Construction joints are placed in the slabs over each transverse girder to prevent cracking.

The platforms are 12 ft. wide for some distance on either side of the covered passageway leading to the station and then narrow down to 10 ft. at the end. Provision has been made for future construction of 8-ft. wide platform extensions to accommodate ten-car trains, 550 ft. long.

The roofs, either of wood and slag or asbestos board,



THIS MAP SHOWS THE ROUTE OF THE FRANKFORD "L" AND ITS RELATION TO THE MARKET STREET LINE, THE PROPOSED BROAD STREET SUBWAY AND THE NEWLY BUILT BUSTLETON SURFACE LINE, ALSO CITY-OWNED

are supported on steel framework carried by steel posts with cantilever arms. These posts are attached to the outside platform girders with crossframes between the girders to resist the overturning moment.

The platforms are inclosed by a steel-plate railing with cast-iron posts attached to the top flange of the supporting girders, except at one point where a reinforced-concrete railing was used with good effect. The space between top of railing and latticed struts under the roof is closed with wire-glazed steel sash.

PROVISION FOR STORAGE AND INSPECTION

In view of the expected operation of the new line by the P.R.T. no provision was made for maintenance shops. However, at the Frankford end a large yard was provided where the cars can be stored when out of service, inspected, cleaned and repaired, or where trains can be made up.

At this point an inspection building was constructed along Penn Street, 435 ft. long and 51 ft. wide. It contains three tracks, of seven cars capacity each, with a pit under each track extending the length of the shop. Space is provided in the building for offices, an oil room, a tool room and a small shop with tools and benches where minor repairs can be made.

Two electrically operated traveling cranes, each of 10 tons capacity, serve the entire length of the building. Provision for heating the building is made by a forced circulation system, in which the air warmed by passing over steam coils is distributed through ducts by motor-operated fans.

The building connects with two sets of ladder track, by means of which cars can be readily shifted from shop to yard and vice versa.

CONTACT RAIL IS OF UNDER-RUNNING TYPE

The conductor rail is of the under-running, double-head-section type, weighing 70 lb. per yard. Creosoted wood beams, spaced about 11 ft. apart on the top flange of the center girder, are used to support the conductor rail, which is suspended from the beams by steel hangers and porcelain insulators. At crossovers, curves and



SUBSTATION ARCHITECTURE IS SIMPLE BUT DIGNIFIED

in the yard the rail is hung on special brackets of cast iron fastened to long ties.

The conductor rail is divided into three feeder sections, and each section, in turn, is divided into lengths of about 1,000 ft. with 3-ft. gaps to allow for expansion.

The joints in the conductor rail are bonded with two 500,000-circ.mil stranded copper compression bonds, and feed connections, expansion gaps, offsets and gaps at crossovers or special trackwork are bridged with 1,500,000-circ.mil rubber-insulated lead-covered cable attached to the rail by three compression bonds. Feed cable connections are made in the same manner.

At the gaps between the feeder sections pneumatically operated circuit breakers are placed, by means of which the current can be fed to any section of rail from the adjoining rail section in case of failure of any of the feed cables. These circuit breakers are operated electrically from the substation nearest the gaps. In normal operation each section is fed independently, but under peak load, with all of the breakers closed, the current can flow freely to the point where the demand is greatest.

One rail of each track and the top flange angles of the three lines of longitudinal girders are bonded with copper bonds having gas-welded terminals. One No. 0000 bond was used on each rail joint and two 500,000-circ.mil bonds were used for each connection on the girders. Adjacent to each substation six 2,000,000-circ.mil standard copper, weatherproof cables were attached to the structure by gas-welded bonds and were

carried underground to the negative pit of the substation and there connected to the negative bus. Ground connections are also made to the lead sheath of the cables in the manholes in front of the substations.

BRIEF RÉSUMÉ OF OTHER FEATURES

In this article no attempt has been made to cover the Frankford Elevated line in detail, attention being given mainly to the structural features of the track-supporting structure, with an attempt to show the relation of the new line to the general transportation system, present and prospective, of Philadelphia.

Two articles regarding the cars have appeared in previous issues of this paper, namely, those for Dec. 17, 1921, page 1063, and for April 22, 1922, page 676. An early article will deal with the signal system. The cars are 55 ft. long, 8 ft. 10 in. wide, and 12 ft. 1 in. high from top of rail to top of roof. They are built of steel plates and shapes, reinforced by steel forgings and castings. Each car has eight doors (six side doors and two end doors) and fourteen windows. It seats fifty-one passengers and can comfortably carry 175. Each car is driven by two motors mounted on one truck, each motor being rated at 125 hp. at 600 volts. Helical cut gears of heat-treated forged steel are used in the interest of quietness.

The block signal system was installed by the Union Switch & Signal Company. The signal and interlocking system is controlled electrically and operated by compressed-air mechanism. Typical signal views are given in the illustrations, and in an article to follow the signaling problem as visualized and solved here will be covered in some detail.

Mention was made at the beginning of this article that the Frankford Elevated project was inaugurated by Mr. Taylor. It was carried out, as described, by his successor, William S. Twining. Mr. Twining was assisted by George T. Atkinson, who has the title Assistant Director of the Department of City Transit; Henry H. Quimby, chief engineer, and a large technical staff.

P. R. T. Gets City-Owned Surface Line Free for Five Years

SIMULTANEOUSLY with the turning over by the City of Philadelphia of the Frankford Elevated line to the Philadelphia Rapid Transit Company for operation, the city also leased to the P. R. T. a new 6-mile surface line, connecting Frankford and Bustleton. This comprises double track in the terminal towns and single track with turnouts between. This line was built and equipped, ready for operation, with five standard Birney cars, made by the J. G. Brill Company, and it was leased without payment of rental for a period of five years in order to help in developing a promising residential part of the city.

In the well-settled parts of Frankford and Bustleton, permanent track with 9-in. girder rail and granite block paving was laid. The balance of the road, being largely in undeveloped territory, was constructed less permanently, although substantially. Here the track is laid with 80-lb. T-rail, in crushed slag ballast. A signal system of the Nachod C-D type was installed to control the operation of cars on the single-track sections of the line.

A snow plow and 175 sections of snow fence, each 8 ft. long, were also provided as equipment for snow fighting,

which is made necessary by the exposed location of this line.

The original appropriation for the Bustleton surface line by the City Councils was \$1,200,000, which was intended to pay for a 10-mile double-track line. Later studies made by the Department of City Transit showed that this sum would not be sufficient for the purpose intended. The plan was therefore modified as stated above, so that the actual expenditures to Oct. 15, 1922, amounted to slightly more than \$567,000, with a few contract payments still to be made.

The Crisis of the German Transporting Business

BY DR. LEOPOLD LION
Berlin, Germany

THE great fall in German exchange has not been without its effects on German electric railways. The decrease in the value of the mark has increased the price of all necessities of life without giving to the great majority of the public correspondingly increased buying power.

The crisis of the German railway companies is shown clearly by the fact that during the last few months twenty out of 218 existing electric tramways, or about 10 per cent, had to close down entirely and discharge their employees, and that all the other companies had to make cuts in their service of from 20 to 30 per cent. A recent compilation shows that there were tramways in 218 towns in Germany and that their length, added to that of the rapid transit city lines, was about 3,500 miles. The expenses of these systems up to Aug. 22 had increased (in marks) to about 124 times those of 1914; on Oct. 1 they were 270 times as much, and by the end of October they were about 500 times the amounts spent in peace-time. Specifically, rails are 800 times and ties 1,000 times as dear as during 1914. Meanwhile the tramway fares have been increased about 175 or 200 times the amount of 1914. Thus in Berlin, where the fare paid in 1914 was 10 pfennigs, it is now 20 marks or 200 times as much. The depreciation of the money, however, is 1,000 times, so that a fare of 20 marks does not cover the expenses. But even this price apparently exceeds the buying power of the public and in consequence in Berlin the number of passengers has greatly decreased. All this shows that the railway companies are not able to raise their fares in strict conformity with their expenses, the public not being able to pay the higher fares. The result is that while travel on railways and tramways is almost prohibitively costly for Germans, foreigners from countries with a better exchange can make trips de luxe for ridiculous amounts. Thus the trip from Berlin to Cologne, 360 miles and ten hours, costs by express second class (there still exist a third and a fourth class) but 650 marks or about 15 cents! From Berlin to Munich (410 miles) the second-class fare is 736 marks or not quite 20 cents, whereas the fare before the war was 20 marks gold or about \$5. Even the doubling and tripling of the fares decided upon for Nov. 1 and Dec. 1 will be insufficient to cover the expenses of the railway departments. But if higher fares were charged there would be a complete stoppage of traffic, as the population would be unable to pay.

This crisis in the affairs of the transportation companies led to the holding of an extraordinary general meeting in Berlin on Oct. 20 of the Verein Deutscher

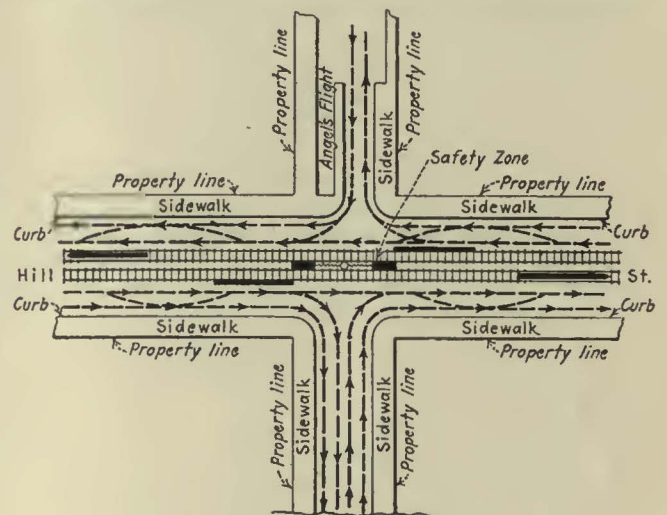
Strassenbahnen, Kleinbahnen und Privateisenbahnen E. V., the German street and interurban railway association. The president, Dr. Wussow, formerly managing director of the Berlin Tramways, declared that the condition of the properties has been brought about by nothing but the economic condition of Germany and could be relieved only by (1) a reduction of the national reparations to the extent of possible fulfillment and (2) a considerable increase in home production. Neither of these two conditions having been fulfilled during the last months, the depreciation of the German mark must proceed. This means that tramways and interurban lines having disastrously low fares and high expenses must soon close down. One reason that they are unable to increase their fares to accord with their expenses is because they have to meet in many places the low fares charged by the government railroads and postal department buses. A resolution was passed asking that this competition be withdrawn and that the railways be relieved of the requirement to keep unprofitable branches in operation.

Los Angeles Relieves Traffic Congestion

FOR the purpose of determining the effectiveness of one-way vehicular traffic, as well as to relieve congestion at Third and Hill Streets in Los Angeles, Calif., a trial test of one-way traffic was recently made by the Los Angeles Traffic Commission.

The car tracks on Hill Street are jointly used by the Pacific Electric and the Los Angeles railway. There is an average headway of one car every thirty seconds during the daytime. This street intersection has long been considered as one of the most congested in the city and many efforts have been made to relieve it.

Under the new scheme east and westbound traffic



TRAFFIC SYSTEM AT THIRD AND HILL STREETS, LOS ANGELES.

across Third on Hill Street will be entirely eliminated from 7 a.m. to 7 p.m. Traffic emerging from the Second Street highway tunnel will necessarily be deflected by a right-hand turn south on Hill Street to Third Street, where entrance to the tunnel will be gained by a right-hand turn. A continuous flow of traffic will result. Further relief will come from the fact that the crossings at Broadway, Spring and Third Streets will be relieved of a large portion of the present east and westbound traffic.

Traffic on Second and Fourth Streets will be increased

directly in proportion to the volume of traffic shifted from Third Street. However, each of these streets will only receive half of that now using Third Street. The use of Fourth Street for traffic bound east of Main Street will be better for the autoist, as an awkward turn at Third and Main Streets will be eliminated. The city is now constructing a tunnel from Hill Street westerly known as the Second Street tunnel. This will be used for both highway and street car service and will assist conditions, but as this tunnel will not be in service for more than a year it is necessary to relieve present conditions.

Special traffic officers will be placed at Third and Hill Streets to care for the movement and safety of pedestrian traffic. In the center of Hill Street, running parallel with the car tracks, a chain barrier will be placed with signs on either side reading "Turn to Right."

Electrification of Stave Lake Railway

THE Stave Lake Railway, a steam line 6 miles in length, running from Ruskin, B. C., a point on the main line of the Canadian Pacific Railway 31 miles east of Vancouver, to Stave Falls, is now being electrified by the British Columbia Electric Railway Company, Ltd., according to information supplied by W. G. Murrin, assistant general manager British Columbia Electric Railway, Vancouver, B.C.

This short line of railway was taken over by the electric company in April, 1921, when it assumed control of the Western Canada Power Company and its operations. The line was originally constructed by the power company to care for the transportation of supplies and material for construction of its power plant at Stave Falls, as well as for the carriage of forest products from this territory to Ruskin, which forest products previous to the construction of the power plant were floated down the Stave River into the Fraser River at Ruskin.

A 600-kw. motor-generator set is being installed at Stave Falls and will supply direct current to the trolley feeder at 500 volts. The cost of the work will be in the neighborhood of \$60,000.

The object of making this expenditure at this time is to reduce the high operating and maintenance costs of running two 42-ton Shay steam locomotives, by substituting therefor one 46-ton Westinghouse locomotive which can be spared from existing interurban equipment of the electric railway company. The principal economies which will result are the following:

1. Saving of coal purchases, \$12,000.
2. Saving of crews' time watering and coaling locomotives, \$1,600.
3. Greater speed and power from electric locomotive over gradients reaching $5\frac{1}{2}$ per cent.
4. Maintenance costs of electric locomotive are decidedly lower than steam locomotives.

Another new feature introduced on this short line of railway since it was taken over by the British Columbia Electric Railway Company is the equipping of a General Motors Company gasoline-propelled motor truck with standard railway wheels and car couplers front and rear end. This vehicle, operated by one man during the greater portion of the year, cares for the passenger, mail and express service of the line, and handles all the less-than-carload freight shipments. In addition it also performs certain switching operations along the line. It will continue to be operated, after electrification is complete, for the same service it is now performing, on account of the economy due to operation by one man.

Eastern Massachusetts Condition Improving

Extensive Betterment of Track, New Light-Weight Double-Truck Cars, a Pension System and Insurance Are Some of the Features

ARTHUR G. WADLEIGH, chairman of public trustees, Eastern Massachusetts Street Railway, has announced that the company contemplates no further discontinuances of service and will abandon no more tracks. Mr. Wadleigh's own words are: "The gloom peak lies behind us; we see only bright clouds ahead." The earnings are now 6 per cent on the investment and the receipts have reached the point which is considered almost normal. So far in November the company is several thousand dollars ahead of the corresponding month of last year.

During the last two years, particularly during 1922, the company has been conducting a very extensive program of rehabilitation, particularly of track. About \$1,500,000 has been spent for this purpose alone in 1922, up to Oct. 1, and by the close of 1922 the sum will probably run up to \$1,750,000. Some statistics for the calendar year of 1921 and for the first nine months of 1922, or for the period up to Oct. 1, follow:

SOME STATISTICS ON THE WORK OF TRACK REHABILITATION

	1922	1921
Feet of track rebuilt.....	139,000	59,000
Feet of track overhauled.....	278,000	270,000
Ties installed.....	105,000	70,000
Pieces of special trackwork installed.....	355	275
Joints welded.....	38,000	35,000
Surface welds installed.....	34,000	19,500
Feet of corrugations removed.....	163,000	0
Rail joints vertically bent.....	23,000	31,000

A striking figure of the tabulation given above is the large amount of corrugations ground out. The company finds that this work costs about $9\frac{1}{2}$ cents per foot of rail, or about \$1,000 a mile of single track. This figure includes all operating expenses and interest and amortization of the equipment extending over four years. The extensive amount of joint welding carried on during the past two years is also notable. Altogether the company has welded rail joints in 1921 and 1922 on 117 miles of track laid in paved street and on 197 miles of exposed track.

The total amount of track operated by the company consists of 337 miles of track in paved street and 316 miles of exposed track.

Twenty-five new light-weight one-man double-truck cars have recently been put in operation for city service in two of the principal cities. They have proved very popular with the traveling public and many commendations have been received over their introduction. They have also proved popular with the men. One-man car operation is now practically universal on the lines of the company.

Coincident with the improved equipment and track, the company has been introducing methods for improving the condition of its trainmen and other employees. During the past year a pension plan for the benefit of men seventy years of age and over and with twenty or more years in service has been installed. The company has also extended its group insurance to include all employees, the amount of such insurance ranging from \$800 to a maximum of \$2,200 after ten years of service; officers and their staff up to \$3,000 after ten years of service. The cost of this insurance is paid entirely by the company.

State Commissioners Discuss Regulatory Problems at Detroit Meeting

The Subjects of Electric Railway Interest Discussed Included Bus Transportation, Municipal Ownership and Depreciation—Utility Representatives Addressed the Convention by Invitation

INCREASED problems of regulation and of responsibility for continued service of public utilities to the public which are now borne by public service commissions were responsible for the large attendance at the recent convention of the National Association of Railway and Utilities Commissioners at Detroit. The convention was held last week and was the thirty-fourth which this association has had. Abstracts of the following committee reports were presented in last week's issue of this paper: Motor vehicle transportation, public ownership and operation, safety of operation of public utilities companies, public utility rates, railway service accommodation and claims, statistics and accounts of railway companies, car service and demurrage, safety of railroad operation and railroad rates.

MAYOR COUZENS AN M. O. ADVOCATE

In welcoming the commissioners to Detroit, Mayor Couzens took the opportunity to present his thinking on municipal ownership. Municipal ownership is on trial, he said. Further, it is on trial in Detroit. He said the commissioners would have to keep their eyes on Detroit to see how the largest experiment in this direction is going to work out. He referred to it as a "so-called" experiment, but pointed out that from his viewpoint it is not an experiment. Instead, it is a definite policy which is growing and will continue to grow. He told the commissioners that they could bring about municipal ownership quickest and in the most sane way by insisting that the utilities eliminate graft, interlocking relationships, unreasonable salaries and other expenses, because once men who control the utilities have these prerogatives eliminated they are not so anxious to run the utilities; they are perfectly willing in a great many cases that the municipality or other political division take over the activities. Another way to secure municipal ownership is to permit the utility men to continue robbing the public, and by that means cause an uprising at the fees and charges that the public have to pay for service.

At another point in his speech, Mayor Couzens said that he did not think there is any sane man who does not recognize that capital has to have a fair return. There is no public officer, who is not a demagogue and who is not talking exclusively for votes, who will question the right of a man to a proper return on the savings he has created from legitimate endeavor. This is the foundation of capital and its big under-

takings. Continuing, the Mayor said that there are many tricks in determining the amount upon which a fair earning is to be allowed. Bankers and lawyers work in all kinds of languages, all kinds of accounts and conditions, and then ask the people to pay a return upon that. He said he thought that rates based on a cost-less-depreciation valuation, in many cases, are ridiculous. The real cost, if the real cost has been honestly found, and if obsolescence and depreciation have been taken care of, is all that any company has a right to recover on.

ADDRESSES AND COMMITTEE REPORTS COVER MANY SUBJECTS

Carl D. Jackson's address as president of the association followed Mayor Couzens's talk. President Jackson's address is given elsewhere in these pages. The address of Chairman McChord of the Interstate Commerce Commission on the relation of state to federal regulation was a feature of the afternoon session on Tuesday.

The report of the committee on express rates indicated the tendency of opinion of the commissions toward the ultimate elimination of express companies and the transfer of their service to the railroads. It was thought by the commissioners that two agencies were unnecessary in the same transaction and that if express business were taken over by the railroads, it would encourage store-door delivery of all railway freight and express business.

In the discussion on the report of the motor vehicle transportation committee Mr. Kuykendall of Washington, chairman of the committee, went into detail on practices in Washington. It was brought out that bus schedules are thoroughly enforced and some motor vehicle lines run on better schedules or keep to their schedules better than do some railroads. Differences between summer and winter schedules are allowed on account of certain seasonal transportation requirements. Some certificates have been granted to motor vehicle lines paralleling railroads and others have been denied, the judgment being based upon whether the railroad is giving satisfactory service or not. The whole purpose is to co-ordinate the various services to give the best possible service to the community with the least possible damage to existing systems.

There was a marked tendency to support the requirement of having to get certificates of public convenience and necessity before motor vehicle lines could be operated and the executive

committee was requested to draw up a proposed law for submission to the various commissions, to be discussed at the next convention of the association, for suggestion to legislatures in the various states.

Almost one whole session was devoted to the telephone question. H. B. Thayer, president of the American Telephone & Telegraph Company, dwelt on the three classes of service that company furnishes—community, state and interstate—which subject the system to three kinds of control—municipal, state and national. Mr. Thayer pointed out that a national universal service could not be provided by a large number of uncorrelated local units. He also showed the advantage of the research facilities of the company in developing better service to the community. Fred B. McKinnon, president United States Independent Telephone Association, pointed out the advantages to the public of maintaining competition—not duplication. Mr. McKinnon supported his argument by saying that all true measure of value of service and much incentive to progress would be lost if the independent group were eliminated. Mr. McKinnon emphasized the fact that the success of independent companies lies in their local character and personality. He also urged that rates be based on service rendered and not alone on valuation.

Chairman Clyde M. Reed of the Kansas Public Utilities Commission strongly supported the maintenance of the independent telephone group as tending to bring about a healthy condition for telephone service generally.

DISCUSSION OF DEPRECIATION

An extended discussion of depreciation resulted from raising the question of telephone depreciation as apparently delegated to the Interstate Commerce Commission for determination by the transportation act. In so far as the discussion affected other utilities, it was brought out that most commissions favor a depreciation reserve, such reserve to be so set up as to provide for a sum equal to the cost, less scrap value, of a given piece of property at the time of its retirement, provided, however, that excessive depreciation reserves be not allowed to accumulate owing to error in figuring the life of property.

The report of the committee on valuation had to do almost entirely with the problems of valuation of the national railroad systems. The commissioners took definite action to request Congress to insist that the Interstate Commerce Commission find values of

the railroads by states as well as by systems and also that these valuations be kept up to date.

UTILITY REPRESENTATIVES HEARD

Public utilities had their opportunity on Thursday morning when by invitation addresses were given by Frank W. Smith, president of the National Electric Light Association; M. H. Aylesworth, executive manager of the National Electric Light Association; Martin J. Insull, president of the Middle West Utilities Company, and Henry L. Doherty of Henry L. Doherty & Company, New York City. Mr. Doherty's address is abstracted at length elsewhere in these pages. Mr. Smith showed that executives of the company as well as public service commissions are charged with responsibility. Public service corporation directors are not a little group of men who own the enterprise and run it in a selfish way.

He said that the utility is a great human institution, a vital part of the life and welfare of thousands of men and women who are as much a part of the public as are any leaders of public utility. Mr. Smith maintained that the prime responsibility to this public rested on the boards of directors, with public service commissions acting to represent the public and give final advice on utility action. The great mass of questions arising in public utility operation and management are decided soundly and fairly in the interest of all concerned by the directorate of the utility.

According to Mr. Smith, if private ownership and operation of public utilities is to succeed and endure, public regulation must succeed and command a generous measure of public confidence. If public regulation is to endure, private ownership and operation of the utilities must ever be alert to conform its policies to the American spirit of fair play and the American desire for the best in public service. If private ownership departs from this course or if public regulation fails to achieve its intended purpose, our industries and our governmental institutions will be at the mercy of men whose views are alien to American traditions.

PLEA FOR SOUND SECURITIES

M. H. Aylesworth showed the extent and advantages of public ownership of utility securities and defined true public ownership as that where a substantial percentage of people in the community served own a financial interest in the utility company, register their complaints and protest against imperfect service with their own managing employees, share in the earnings and have a direct voice in shaping the policies.

In view of the favorable public attitude toward utility securities and their widespread purchase by customers and employees, Mr. Aylesworth asked the commissioners to see to it that only stocks of unquestioned merit and stability, backed by good value and good

management, be made available for customer-ownership campaigns. This, he maintained, is necessary in order to safeguard the priceless public support which electric public utilities now enjoy, and it is manifestly in the public interest.

ADVANTAGES OF HOLDING COMPANIES

Martin J. Insull, Chicago, called attention to the enormous amount of money necessary in the development of the public utilities. He showed how holding or investment companies assisted by raising money on their own securities to purchase junior securities of operating companies. He pointed out how by the large aggregate purchasing power of such groups of utilities under holding companies machinery and supplies can be bought at lowest market prices. He also pointed out that in times of financial stress the investment company can provide money to tide over this on account of the spread of risk and of the higher credit rating of these holding companies.

AT THE BANQUET

At the banquet on Thursday evening Carl D. Jackson, retiring president, received as a token of respect from his colleagues a set of platinum and pearl shirt studs and cuff links. The toastmaster, James Schermerhorn, who spoke with no little wit and humor, told of Detroit's experiment with municipal ownership, saying that all the people were led to believe that when once they had municipal ownership their troubles would be ended, but that at the recent election they found out that after a" they still had to spend five million dollars more for extensions, to build a subway, to have the interurban cars stop at the city limits and to shift the paving charges from the Department of Street Railways to the general city expenses, and they were not therefore so sure that their troubles had ended. "But," said Mr. Schermerhorn, "this is an age of experimentation, and if we live through it we shall at least know that we were a part of the experiment."

Mr. Jackson said that the commissioners were all interested in watching Detroit. "For Detroit," he said, "may solve what we as commissioners have not yet been able to do—to make money transporting people at less than cost."

The principal address of the evening was made by H. H. Emmons, now president of the Detroit Board of Commerce, who was an officer in the air service during the war. He urged upon the commissioners, as men influential in widely separated localities, that they use their influence to develop landing fields and other facilities which would tend to encourage civilian aviation. Mr. Emmons pointed out that this would be a service of national loyalty and thereby provide, at no cost to the government, ample aviation protection in case of future war.

RESOLUTIONS PASSED

The last session of the convention was concerned chiefly with considera-

tion of resolutions recommended to it by the executive committee. Many of these had to do with railroad regulation. Two of these suggested an amendment of the Esch-Cummins act so that rights and duties of state commissions will be more clearly defined, particularly with reference to rates and distribution of cars, and so that the Interstate Commerce Commission will be compelled to make valuations of railroads by states as well as by systems and to keep these valuations up to date.

Of particular interest to railway men, however, were two other resolutions, one supporting the indeterminate permit and the other urging uniformity in regulatory laws of the several states.

The first of these, after reciting existing limitations to the possibility of uniform treatment of the utilities on the part of the commissions and the difficulty met by utilities in financing themselves on limited-term franchises, and after stating that the principle of the indeterminate permit goes far toward solving these difficulties, provided ample safeguards be made for the protection of both the public and the investors in the case of the determination of such permits, includes the following clauses:

"Now, therefore, be it resolved, That it is the sense of the National Association of Railway and Utilities Commissioners that the principle of the indeterminate permit is economic and sound and should be adopted in the legislation of the various states relating to public utilities;

"And resolved further, That this association do, and it does hereby, urge the legislatures of the various states which have not as yet adopted the principle of the indeterminate permit to enact legislation recognizing and putting such principle into effect."

The second resolution authorizes a committee of the association "to consider carefully the various forms and practices of utility regulation and report from time to time to this association conclusions and recommendations for a desirable uniform system of public utility regulatory law."

The American Electric Railway Association was represented at the convention by James W. Welsh, executive secretary; C. L. Henry, chairman of the national relations committee, and J. P. Barnes and W. H. Maltbie of the valuation committee.

Officers for the ensuing year were elected as follows: President, Dwight N. Lewis, member Iowa Railroad Commission; first vice-president, Alexander Forward, member Virginia State Corporation Commission; second vice-president, H. G. Taylor, chairman Nebraska State Railway Commission; secretary, J. B. Walker, secretary New York Transit Commission, and assistant secretary, J. H. Corbitt, secretary Tennessee Railroad and Public Utilities Commission.

The next convention of the association will be held at Miami, Fla., Dec. 4, 1923.

Address of President Jackson Before Utilities Commissioners' Convention*

Government Ownership, the Limited Term Franchise and Tax-Exempt Securities Condemned—Need for Uniform Utility Laws and Advantages of Customer Ownership and Non-Par Value Stock Discussed

BY D. C. JACKSON
Chairman Wisconsin Railroad Commission

THERE is no organization more completely representing the sentiments of the several states and the local needs and problems of the country than the National Association of Railway and Utilities Commissioners. It is therefore fitting that this body should take cognizance of present tendencies, not only where they directly affect our own activities but where they tend to subvert the fundamental policies of our government and adversely affect the welfare of the coming generation. I do not think I exaggerate when I express the belief that if it were not for the activities of this organization the states would find themselves stripped of local control in fields where regulation can be successfully administered only by those intimately acquainted with local problems and conditions.

This organization has taken no narrow or partisan view of these great questions. It has approved the exercise of federal authority to the extent necessary for the efficient exercise of undoubted national rights. It is my candid belief that any temporary advantage to the utilities from an undue extension of federal interference with local control and regulation would in the end be far more than offset by disadvantages of concrete and perhaps disastrous nature. Regulation cannot be successfully carried on out of contact with those people who are interested in regulation, and public relations, the basis of all future prosperity in the public utility field, will not be helped by centralized and distant administrative regulation.

In a way this centralizing tendency is the outgrowth of unrest. We are inclined to forget that the fathers laid down certain principles recognizing our dual form of government and safeguarding local government and control in the states, at the same time encouraging that free play for individualism which has created in the people of this country the greatest capacity for initiative, responsibility and progress found anywhere in the world. Out of this spirit of unrest, and the everlasting preaching by some of discontent with whatever is, has come the agitation for government control, such as has just been passed through in the State of California. On the whole, the movement for municipal ownership seems to have largely abated. In fact, a marked tendency in the opposite direction can be observed in several places. The present form of agitation is far more important and borders on socialism or

communism. The endeavor to bring about Federal government ownership of vast utility properties can only be looked upon as the entering wedge for the socialization of all property.

By use of the initiative the people in California have just been required to vote upon a state bond issue (an initial issue) of \$500,000,000 to acquire water power and electrical business in that state or elsewhere, but so far as I can ascertain there was no call for any such general measure or policy. As a matter of fact the electric companies of the United States are making great progress with water-power development and are expending vast sums to bring home the use of power heretofore wasted. Forty-one per cent of all hydro-electric development in the world has taken place in the United States, although but 15 per cent of the water power is within our boundaries. The greatest hydro-electric development in the world is now taking place in California. These developments have been brought about not by government or by municipalities, but by the ingenuity, initiative and courage of individuals. Private ownership has done this and given California about the lowest electric rates on earth, and yet agitators have attempted to apply the dead hand of government ownership to one of the most worthy, public-spirited and successful enterprises in the world. California has passed unscathed through this ordeal and has emphatically repudiated this socialistic propaganda. Practically the same verdict has been given in Wisconsin, where a constitutional amendment to authorize increased municipal indebtedness for the acquisition of public utilities was also turned down.

This association and its members can do much to bring accurate information to the public. Where agitators point to resident rates anywhere in America approaching 2½ cents per kilowatt-hour, the people should be told the truth, known to every public utility regulator, that any such residence rate merely represents service at a loss for political purposes.

NEED FOR UNIFORMITY OF GOVERNMENT UTILITY LAWS

The necessity for regulation of utilities is no longer, I believe, an open question, and its universal establishment throughout the states seems only a matter of time. Is it not desirable, in fact imperative, that every effort be made to bring about gradually a uniformity in the laws in the several states and the laws in the states where utility regulation may soon be established? It will not be a disadvantage in the meetings of our association to

find that we are all talking the same language. A matter of this kind means careful study and I earnestly recommend the appointment of a standing or special committee of this organization to go into the matter fully. It seems to me our association can do a service along this line of prime public importance.

Most utility laws recognize the economic necessity for monopoly in the utility field, with power to require adequate service at reasonable rates. I do not know anything more difficult to regulate than competitive service under cut-throat competition, involving the waste of effort, time, material and wealth that necessarily follows. Nor do I know of any instances in which wasteful competition is encouraged where regulatory problems are not either most difficult and complex, or unsolvable in a satisfactory manner. Competition in the utility field generates public unrest and dissatisfaction with the utilities and the regulatory commission. Good public relations and mutual understanding between the utility and its patron become most difficult to maintain, and yet good public relations are in the end the controlling factor in regulation. It is sufficient to say that successful regulation will be founded on the elimination of this competitive theory of bygone days. First class service at reasonable rates is based on economics, not on waste.

This principle is recognized in the laws of thirty-three states where certificates of convenience and necessity must be secured from commissions before competition can become effective, but control of competition is lacking in fifteen states, in some of which no public utility regulatory laws exist. We have far from outgrown many of the practices of former days. A glaring example of this is found in the franchise provisions of various states and the varying franchise conditions within the states themselves. A limited term franchise is a suspended sentence or threat. It is the outgrowth of the old speculative idea. It is directly responsible for many of the problems which come to us under regulation. A limited term franchise is notice that at some future date the municipality or state may see fit to treat the legitimate investment in a public utility on the junk value basis. Such possibilities discourage incentives for improvements, extensions and good service, and at the same time increase the cost of all financing. Theoretically and perhaps legally, to some extent at least, regulatory bodies would be justified in imposing rates sufficient to amortize a large part of the investment over the period of the limited franchise. Under any circumstances, the additional burden on the utility must be borne by the users of service unless the property is to be confiscated.

There is no more equitable treatment to be found than in the provisions of the indeterminate permit. On the one hand it offers that necessary stimulus for continued uninterrupted and adequate service at the lowest reasonable

*Abstract of address presented before the National Association of Railway and Utilities Commissioners, Detroit, Mich., Nov. 14 to 17, 1922.

cost, and on the other hand it reserves to the public all rights necessary for its future protection. Regulation under limited franchises is regulation under a club. It is divided regulation. One party is enjoined to require the best service at the most reasonable rate and strictly supervise all the activities of the utilities. Another independent, changing political body retains the power to destroy the utility.

A cursory examination of the provisions in the various states shows widely varying conditions. In six states the indeterminate permit form of franchise prevails. In some others the limitation is fixed by constitution. In many states the statutory limitation is different for different classes of utilities. In other states the grant may be and often is perpetual without the public protective features of the indeterminate permit. In some cases the franchises are exclusive. In other cases they expressly permit competition. The terms in some states are limited to twenty and twenty-five years; in others to various periods, running as long as ninety-nine years. Such chaotic conditions do not lend themselves to just, stable and effective public regulation in the public interest.

As utility laws are modified from time to time, and adopted in states where regulations do not now prevail, this association is in a position to urge the adoption of the indeterminate permit form of franchise and encourage the desirability of establishing uniformity on sound principles.

GOOD PUBLIC RELATIONS THE KEY TO SUCCESS

It is my opinion that under regulation there has been a great improvement in the matter of public relations between the utilities and the public served. Every man privileged to serve in a regulatory capacity has come to understand thoroughly how essential good public relations are. It means everything to the public utility and its capacity for service at reasonable rates. Both the utility and the public are gainers thereby. Ought we not on our part, therefore, to stimulate this mutual understanding and make known generally those simple truths that are to us perhaps the A B C of regulatory problems?

There grew up in years gone by the idea that public utilities were always owned by somebody else, generally covered by the indefinite term "Wall Street." The actual fact, of course, is that most public utilities, and always the largest interest in all of them, are actually owned directly or indirectly by the people themselves. The misconception is easily accounted for. Often the securities of a public utility in some Eastern state are owned by people in some Western state, and most of the securities of some Western utility may be the property of Eastern residents. Again, large blocks of such securities are owned by insurance companies, trust companies or savings banks. Few policy holders or depositors take the trouble to see how their

premiums, savings or deposits are invested. So the public has come to think of the utility it deals with as being owned by foreign or distant interests. For several years just past a determined effort has been made to overcome this situation and to bring home the ownership directly to the patrons or consumers of the utility. It is my belief that this organization should emphatically encourage this movement. It means improved public relations, better understanding of our problems by the people served, and furthermore it means close scrutiny of the efficiency of management by the owners of the property. It also brings the problems of financing directly home to the people.

WAYS OF FINANCING DISCUSSED

There is a growing recognition throughout the country of the value of non-par value stock as a means of financing. As a matter of fact, par value stock is par value only in name after any company has started in business. The value of the stock is fixed by the value of the capital represented by it and by the amount of the earnings both present and prospective. To acquire a rigid par value for all future issues of stock regardless of the value of the stock has often made financing difficult where the stock is not selling in the market for par. Elasticity should be possible in financing of this nature. Non-par value misleads nobody. It is a frank statement of the actual fact that the value does not depend on the dollar sign on the certificate. The power to issue non-par value stock will make financing possible on more just terms to all concerned than is possible under a rigid par value system. The matter is of great importance and I earnestly recommend the serious consideration of it by the association.

A half century or more ago liberal laws were enacted in most states recognizing secured steam railroad bonds as proper investments for trust funds and savings banks. As yet, in only twelve states has effective action been taken giving equal recognition to the conservative issues of electric, gas and telephone companies. The situation with respect to the securities of electric railways is somewhat better in some states. It may be said that the restrictions governing the issue of utility securities are as closely and carefully drawn as those governing railroad corporations. In fact, with the extension of commission jurisdiction over utility security issues, it may be justly said that restrictions in a large number of states and the supervision exercised by regulatory bodies over such issues have given the securities of these public utilities a sounder basis than formerly existed even in regard to railroad securities. There is no reason whatever why this discrimination against the sound securities of electric plants, telephone and electric railway issues should not be abolished. Yet in thirty-one states there appears to be an entire absence of statutory authorization to

savings banks for investment in such securities. In two other states there is authorization for the securities of electric railways. New York state has not yet given the matter due consideration and it may be named with the other thirty-three states. Massachusetts has provisions covering street railways and telephones. You will see at once, therefore, that the situation is wholly unsatisfactory. Statutes enacted to meet the conditions of half a century ago should give way to non-discriminatory provisions recognizing the public interests in utility investments and placing utilities on a fair competitive basis in the money market. This is a matter of importance to all commissions having jurisdiction over utilities.

TAX-EXEMPT SECURITIES A MENACE

A matter of far-reaching importance which affects all business and includes all securities subject to regulation is that of tax-exempt securities, issued principally by states and municipalities. This practice has driven a large class of investors wholly into the tax-exempt field. This effect is demonstrated not only by statistics placed before congress but by reports of most of the important banking houses. Where the former average sale of securities was in lots of \$10,000 to \$15,000, reports available show sales in average lots of about \$3,000. This, of course, shows not only the absence of a large class of borrowers from the market, but clearly indicates increased cost of financing. This tax-exempt privilege is being used to further stimulate the propaganda for government ownership. The favorable interest rates on tax-exempt state securities are compared with the necessarily increased rates on securities that are not tax exempt, and no reference is made to the fact that the taxpayers of the state are penalized in loss of taxes for a larger amount than they save in loss of interest rates. If the evil of tax exemption stopped here it would be important enough for your consideration, but the evil of tax exemption goes much further. It violates the ability principle of taxation and unfairly discriminates between taxpayers. It discourages new enterprises. It creates social unrest. It is responsible for a tax-exemption privilege class. It discourages thrift and enterprise by unduly taxing every constructive and successful endeavor in the industrial field. It throws an undue proportion of taxation on tangible property. Ultimately it will increase the burden of the farming communities, bringing heavy taxes on farm land and on all other real estate. It encourages extravagance in government agencies and piles up an enormous debt burden to be met by our children and our children's children. This matter concerns this organization, as it affects utility and railway financing, but I think it affects all of us in a much larger way in that the continuance of the practice may in the end seriously and vitally affect our institutions and our form of government.

Some Difficulties Under Which Public Utilities Operate*

Experienced Utility Administrator Points Out to Public Utility Commissioners Some of the Problems Under Which the Electric Railway and Other Utilities Are Laboring—He Approves of Regulation for This Line of Business, but Feels that the Utilities Have Not in All Cases Been Justly Treated

BY HENRY L. DOHERTY
President Henry L. Doherty & Company,
New York City

THE regulation of public utilities by the vesting of power in state commissions has proved to be a great step in advance over regulation either by state legislature or city government. When the public learns to look to its state commission as to what ought to be done, rather than expecting to tell the commission what it should do, then and then only will all of the benefits that are possible through intelligent regulation be realized.

The violent opposition of many public service companies against being placed under state commissions, at one time in evidence, has now largely disappeared. The constructive and progressive public service companies want intelligent regulation, and they do not want to be compelled to fool with politics. However, a large part of the public still seems to think it the duty of the state commissions to give the public service companies hell instead of justice. Too many want service at the lowest cost regardless of whether rates are adequate for the company's needs or not. They fail to realize that inadequate rates in the long run mean higher rates.

It has been only a few years since public utilities were indiscriminately subjected to competition. Finally, the public concluded that it was a sufferer by this competition and resolved that the best service at the lowest rates could only be had by doing away with it. The public said, in substance, however: "We are going to recognize you as a necessary and natural monopoly, but if we do this, we must regulate your service and earnings." The utilities accepted this statement partly because it was right, but largely because there was nothing else to do. Hardly was this work under way before the electric railways of the country were subjected to jitney competition.

Now it is idle to suppose that a rubber-tired vehicle using gasoline for motive power can possibly give as economical service as a street car with steel wheels on steel rails supplied with electric power from a central power plant. This jitney competition is simply a repetition of the old folly of competition with a natural monopoly. It represents one of our serious national wastes, and if it is not stopped by the proper regulatory bodies, it should be made a national issue.

I shall now proceed to point out some of the important matters that I think

public service commissions should consider. While these may not be new, they do not seem yet ready for universal acceptance.

SOME FUNDAMENTALS OF THE SUBJECT

1. If the public utility business is to command the same efficiency and interest on the part of capital and management as will be secured by other and more profitable lines of business, it will be necessary to adopt some form of profit sharing between customer and company to stimulate effort.

The laws relating to public service commissions should be so broadened that the commissions will have the power to fix an initial rate for a long period in advance, and then to permit the company to earn all it can over what would not be considered a reasonable rate of return, with the provision that these earnings shall be divided between the company and its patrons. Under this plan the management can be "premiumized" out of the company's portion.

2. If the theory of control by state commissions is a correct one, then it is not consistent to have a division of authority between the state commission and the city government or the legislature. In some states part of the cities are under the public service commission, while others are not. Sometimes the gas companies are controlled by the public service commission, but not the street railways. In my opinion the best results would be secured by giving the state commission the widest possible control.

3. In my opinion the taxicab business in many of our American cities ought to be declared a public utility and a monopoly created. Instead of permitting taxicabs simply to "shop" for passengers, they should be compelled really to give service. In most American cities there is an over-supply of taxicabs in congested districts and a perfect vacuum of service in other portions of the city. This is especially true where, if wanted at all, taxicabs are wanted badly, and where they are a necessity, not an extravagance.

In the same category, in our highly congested cities, like New York, I think we should give some thought as to whether the delivery of goods should not be treated as a public utility and regulated as a monopoly.

4. Some of the cost accounting and rate making which today are looked upon as scientifically correct are not even based on facts which are fundamental and in many cases controlling. In the street railway business⁶ for ex-

ample, we have huge expenses which are due entirely to the necessity of standing ready to give service, with no simple way whereby the readiness-to-serve expenses can be apportioned among the beneficiaries. The electric railway business is today where some of the electrical companies were in the pioneer days when they charged a flat sum per month regardless of how much current was used. This "premiumized" waste. A ride is a ride, whether for a block or for 10 miles. Some system of metering must be used. Riding should be based on distance with a fixed loading and unloading charge. That is, a small charge to represent the cost of stopping the car and taking on passengers, and stopping the car and letting the passengers off, plus a fixed charge per unit of distance riding, should be made. The system of uniform charges for street railway rides, to my mind, has not only brought harm to street railway companies but harm to the public as well.

It has heretofore been thought that public utilities should be expected to bear some sort of a tax or other burdens in exchange for the right to use the streets of cities. In my opinion this theory is all wrong, and we must sooner or later completely reverse it. In the old days it was presumed that these taxes or burdens were paid for by the stockholders, but with a regulated monopoly it must be remembered that they are paid by the patrons.

As a business proposition the public could afford to "premiumize" all forms of public utilities by paying a portion of the readiness-to-serve expenses by a property tax.

5. Bond houses have for years talked to their clients about the necessity for a bond earning double its interest rate, or some provision of that character, with a substantial sinking fund. Anything that can be done to educate the bond buyer and the bond houses to the fact that no large ratio of earnings to bond interest is necessary will help greatly in developing the public utilities. The same is true with regard to a sinking fund exclusively of cash. If any sinking fund whatever is demanded, it should be one which could be provided either by cash or by the creation of more property without issuing bonds on it, at the option of the company.

6. There are few classes of business that can submit to public regulation and live. Changed conditions must permit an immediate change of plans. This is not possible when a change in plans can be made only after hearings before a public regulatory body.

Perhaps the greatest damage that has been done by public regulation has been the element of delay and the abandonment of any attempt at certain improvements in the belief that time and trouble would simply be wasted and no good would be accomplished. It will, therefore, never be possible for the so-called public utility companies to embark upon any business not absolutely necessary for furnishing the product they are selling to the public.

* Abstract of address presented before the National Association of Railway and Utilities Commissioners, Detroit, Mich., Nov. 14 to 17, 1922.

Heavy Traction Report by A.R.E.E. Committee

AT ITS ANNUAL convention, concluded on Nov. 3, and held in Chicago, the Association of Railway Electrical Engineers received among others a comprehensive report on heavy electric traction. The committee on this subject consisted of J. R. Sloan, chief electrician Pennsylvania System, and J. H. Davis, electrical engineer Baltimore & Ohio Railroad. The report commended the action of the American Electric Railway Engineering Association in suggesting some kind of a joint organization to prevent duplication of statistical work. It also appended a revision of the data presented in its 1912 report, checked and corrected by various railroads and revised to include all railroad electrification in North and South America. There were added the corresponding data relative to multiple-unit equipment, for which credit was given to the heavy traction committee of the American Electric Railway Engineering Association.

New York Power Show Making Progress

PRACTICALLY all of the exhibition space for the first National Exposition of Power and Mechanical Engineering, which will open on Dec. 7 at the Grand Central Palace in New York City and extend through Dec. 13, has been leased. Requests for approximately 200,000 tickets have been received by the management. The exposition covers the field of power and mechanical engineering from the moment coal is taken from the ground until power is turned into work in the final machine. Not only will there be representatives of prime movers and steam generating devices, but also exhibits of manufacturers who have devoted their efforts to the solution of the problems involved in burning fuel and making and using power, whatever the industry requiring the heat and power derived.

New York Association to Meet

THE New York Electric Railway Association will meet in New York on Jan. 25, probably at the Commodore Hotel. Definite announcement of the place and program will be made later.

International Association Delegates Inspect Brussels Tramway System

IN CONNECTION with the conventions of the Union Internationale des Tramways et des Chemins de fer d'intérêt local, held in Brussels Oct. 2-7, an inspection was made of the local tramway system. The delegates noted the following facts: The system employs 1,230 single-truck cars, of which 489 are motor cars, 276 are closed trailers, and 465 are open trailers. On these either hand or air brakes are used, and in emergency electric braking on resistance is employed. The rolling stock

is stored in six depots, of which the largest has capacity for 340.

The Falk system of cast welding is used for the track joints. The larger part of the contact system is overhead, but some conduit is used. About 75 miles of track is equipped with the overhead system. The conduit, where such is used, is located under one rail with a slot on the inside.

Both poles and rosette attachments to building walls are used for span-wire supports, the latter being preferred. The contact wire employed is of 97 per cent conductivity, two diameters are employed, corresponding to No. 0 and 000 in the American gage. A guard wire of phosphor bronze, slightly smaller than No. 7, A.W.G., is used also.

A.S.T.M. Notes

THE executive committee of the American Society for Testing Materials has voted to hold the 1923 annual meeting at Atlantic City during the latter half of June, provided satisfactory arrangements can be made for the meeting. Two dates of meeting are tentatively under consideration: (1) June 25 to 29, (2) immediately following the meeting of the American Railway Association, Mechanical Division, customarily held about the middle of June.

By the end of the year the society will have issued this year three regular publications, the Year Book, the 1922 supplement to the book of A.S.T.M. standards, and the Proceedings. The first two have already been sent out and the third, a volume of about 1,650 pages, will be ready for distribution in December.

On Oct. 31 the membership of the society was reported to number 3,104.

Special Committee of A.E.S.C. on Wood and Tubular Poles Is Active

THE American Engineering Standards Committee recently appointed a special committee to consider and make recommendations to the A.E.S.C. concerning the application of the American Electric Railway Association for approval as "American Standards" of its specifications for wood poles and tubular poles.

Twenty-one men, representing producers and consumers of both types of poles, as well as the public are on this committee, including C. S. Andrew, representing the Electric Railway Equipment Company, Cincinnati, Ohio; C. R. Harte, American Electric Railway Association, New Haven, Conn.; D. F. Holtman, National Lumber Manufacturers Association, Washington, D. C.; M. G. Lloyd, chief of safety section, Bureau of Standards, Washington, D. C.; A. E. Owen, electrical section of the American Railway Association, Jersey City, N. J.; H. H. Quimby, American Society of Civil Engineers, Philadelphia, Pa.; F. N. Speller, National Tube Company, Pittsburgh, Pa.; J. C. Ware, National Electric Light

Association, Newark, N. J.; W. M. Leavitt, Western Red Cedar Association, Spokane, Wash.

At the November meeting of the executive committee of the A.E.S.C. the above committee made a progress report, indicating that it is already functioning.

Annual Meeting of A.S.M.E.

THE annual meeting of the American Society of Mechanical Engineers will be held in New York City, Dec. 4 to 7. An elaborate program of papers, reports and entertainment has been provided.

A feature of the meeting will be joint sessions with the American Economic Association, the American Society of Safety Engineers, the American Society of Refrigerating Engineers, and the American Engineering Standards Committee.

H. F. Loree, president Delaware & Hudson Railroad, and E. M. Herr, president Westinghouse Electric & Manufacturing Company, will be among the speakers at an "economic forum."

American Association News

Executive Committee Meeting

THE American Association executive committee met at association headquarters in New York on Nov. 24 with an attendance of nineteen of the twenty-two members and four past-presidents. After reading the minutes the financial report of the executive secretary was presented, an interesting feature of it being that for the first time the receipts from convention exhibits showed a surplus of \$317 over expenses. A vote of special thanks to the exhibits and entertainment committees of the convention was passed. In connection with the plan that the association appropriate \$10,000 for the work of the committee on welded rail joints and that \$10,000 additional be solicited from member companies, it was reported that this \$10,000 was already oversubscribed by \$100, with more to come.

The committee appointed to recommend a new member of the executive committee to fill the vacancy created by the election of W. H. Sawyer to the fourth vice-presidency, nominated, and the executive committee unanimously elected, C. E. Morgan, vice-president Brooklyn City Railroad.

A report of the finance committee and the report of the auditor for the fiscal year ending Oct. 31, 1922, were made and it was decided to invest \$50,000 of the surplus in third 4½ per cent Liberty bonds.

A report of the meetings and subjects committee was presented by J. N. Shannahan and approved by the exec-

utive committee, thus definitely locating the Mid-Year Conference at Washington, D. C. The report is published elsewhere in this issue. A report of the work of the publicity committee presented by F. R. Coates disclosed the effectiveness of the work being done in this direction, special note being made of the very large amount of newspaper space throughout the country devoted to the last annual convention. A notable feature of this was the prominence given particularly to the fact that the railways are keeping their promise to rehabilitate as soon as they get the necessary money.

C. L. Henry reported for the committee on national relations that a test will be made as to whether Section 15-A of the amendment to the Interstate Commerce Commission Act applies to the interurban roads. The test case will be that of the Chicago, North Shore & Milwaukee Railroad which will shortly go before the commission for a hearing. It is hoped that a decision may be secured which will answer the question for all companies.

L. S. Storrs reported for the publications committee that the publication of *Aera* had resulted in a deficit of \$5,000 last year and that the prospect for this year was \$9,000 deficit if present advertising rates were continued. The committee recommended that beginning with the February issue a 20 per cent increase in all advertising rates be made effective and that the subscription rate to individuals be increased slightly. On this basis it was thought that the paper would very nearly pay its way. The executive committee approved the recommendations of this committee.

Mr. Welsh presented the report of the membership committee, showing members resigned, delinquent and new. A proposal in a letter from W. H. Maltbie to enlarge the scope of the tax committee to include a study of all forms of special taxes, such as paving, snow removal, etc., and thus develop a report analyzing the nature of these special levies and make constructive suggestions for the future guidance of the association, was approved.

A committee on insurance was authorized after it was pointed out that a similar committee of the N.E.L.A. had succeeded in securing a 25 per cent reduction in the rate on power houses and overhead lines. It was thought that a similar opportunity existed for the railways. Action was taken approving membership of the United States Department of Labor in the American Engineering Standards Committee. The standard rules for city operation as revised at the recent convention and approved by the T. & T. executive committee, which embodied slight changes to cover one-man operation, was approved.

A discussion by some of the committee members who had attended the recent convention of the National Association of Public Utilities Commissioners brought out the fact that they were highly impressed with the thinking and direction of work of this body of men,

and it was the consensus that railway men would do well to attend this convention in larger numbers.

MID-YEAR DINNER COMMITTEE

President Emmons then announced the mid-year dinner committee as follows: J. H. Hanna, vice-president Capital Traction Company, Washington, D. C., chairman; H. B. Flowers, C. C. Peirce, E. F. Wickwire, C. R. Ellicott, C. E. Morgan, W. H. Heulings and H. L. Brown.

The next meeting of the executive committee will be held at Louisville, Ky., at 2 p.m. on Friday, Jan. 19, following the annual meeting of the Central Electric Railway Association in the same city on Jan. 18 and 19.

Those present were: President C. D. Emmons; vice-presidents, J. N. Shannahan, F. R. Coates and W. H. Sawyer; treasurer, Barron G. Collier; G. T. Seely, L. C. Datz and Wallace Muir, presidents of affiliated associations; H. E. Chubbuck, R. P. Stevens, H. G. Bradlee, J. P. Barnes and C. E. Morgan, operating members; S. M. Curwen, J. G. Barry, A. A. Hale, L. E. Gould, M. B. Lambert representing H. D. Shute and Carl Beck representing C. R. Ellicott, manufacturing members; P. H. Gadsden, C. L. Henry, L. S. Storrs and J. H. Pardee, past presidents. L. H. Palmer and J. H. Hanna were present as guests.

Mid-Year Meeting to Be Held in Washington

AT A MEETING of the subjects and meetings committee of the American Association on Thursday, Nov. 23, the matter of location of the mid-year meeting was fully discussed. Following the request of the executive committee, full consideration was given to the invitation of California. Member companies have been thoroughly canvassed and out of 650 companies 275 responded. While several companies apparently favored California, only 31 railway delegates and 66 manufacturer delegates were listed as sure to go from east of the Mississippi, 14 railway and manufacturer delegates from between the Rockies and the Mississippi and a total of 71 on the Coast.

After a transcontinental telephone conversation between Mr. Emmons, president of the association, and Mr. Alberger, president of the California association, it was unanimously decided that with the number of attendants in prospect, it would not be best to try to carry the mid-year meeting to California this year.

The subjects and meetings committee then recommended to the executive committee the acceptance of the invitation to hold the convention in Washington, D. C., and set the date at Feb. 15 or 16, 1923.

The committee made some progress toward a program. It recommended one principal address at the morning session, and one principal address at the afternoon session, thus leaving ample time for discussion of both subjects. The usual mid-year dinner is planned

for the evening with speakers of such prominence and caliber that the dinner will be sure to prove valuable.

Members of the committee present at the meeting were J. N. Shannahan, chairman; Harlow Clark, L. H. Palmer, L. C. Datz, Wallace Muir, and H. V. Bozell.

Connecticut Company Section Opens Season

THE forty-third monthly meeting of the Connecticut Company section, the first of the present season, was a dinner meeting held at Hotel Garde, New Haven, on Nov. 14. The company orchestra furnished music, besides which were other musical and "stunt" entertainment features. The first speaker of the evening was William Arthur, president Arthur Power Saving Recorder Company, who told of his recent European trip. A. L. Donnelly, division engineer The Connecticut Company, followed with some observations as to track and pavement construction in Europe, also based on a recent trip abroad. It was voted to hold the next meeting, the annual one, at Waterbury.

Plea for Support of American Committee on Electrolysis

IN DISCUSSION of that section of the report of the Engineering Association committee on power distribution, relating to a review of the 1921 report of the American Committee on Electrolysis, a paper was presented at the Chicago convention by H. S. Warren, electrical interference engineer American Telephone & Telegraph Company. Space limitations in the report issue of this paper, covering the convention, prevented an extended abstract of Mr. Warren's paper at the time. In view, however, of the approaching inauguration of committee activity on this and allied subjects, an abstract is given below.

It is not necessarily the fact, said Mr. Warren, that the presence of current on underground pipes or cables causes electrolytic corrosion. Whether such injury is occurring depends upon the circumstances under which the current leaves the structure. Wherever current flows directly from the metal structure to earth corrosion occurs.

There is no necessity to suppose that ground return of railway current must be abandoned in order to bring about a practical solution of the electrolysis problem. Where electrolysis conditions are bad, it is usually because there are relatively large potential drops between different points on the railway grounded return. If the potential drops are reduced, as, for example, by the installation of more frequent power-supply stations or a system of insulated return feeders, the stray currents will be largely reduced. Such methods are capable of reducing stray currents sufficiently practically to stop electrolytic injuries.

Many engineers have failed to understand just what is meant by "insulated

return feeders." It is important to note that insulated return feeders, as installed for purposes of mitigating electrolysis conditions, involve the insulation of the negative bus at the substation from ground, except as connected thereto by feeders extending from the bus to different points on the rail. These feeders are so proportioned and designed that the drop in potential from bus to rail is substantially the same on all feeders. This means, of course, that the several points where these feeders are connected to the rail have substantially the same potential. It is customary, however, to lay out the feeders so that there will be a slight gradient in potential toward the power-supply station.

Insulated return feeders are open to the objection that they tend to increase energy losses in the return, since they do not admit of the full utilization of the conductivity of the rail. This method, therefore, is not usually as attractive for improving electrolysis conditions as the use of an increased number of power-supply stations. The latter method, thanks to the development of automatic apparatus, can be designed to produce economies in distribution as well as reduced stray earth current.

Continuing, Mr. Warren deplored the fact that the subject of pipe drainage is so highly controversial, that condition having been brought about largely because pipe drainage has often been applied or proposed in situations where the stray currents were unjustifiably large. If the stray currents are first suitably reduced in magnitude by putting the railway return in a condition representing maximum economy from the railway standpoint, the objectionable features incident to drainage are in large measure avoided. It may well be that under such conditions no further measures would be necessary in many cases, and in those cases where some additional measure is necessary, it would remain to be seen whether pipe drainage could be justified, or whether some other method would be preferable.

In the general engineering solution of the electrolysis problem, neither pipe drainage nor any other system of electrolysis mitigation should be employed until the railway return has been put in economic condition. When that has been done, the electrolysis problem in many cases may have practically disappeared. Admittedly to apply drainage to a situation which is not in proper condition for any method of electrolysis mitigation is inexcusably bad. It is illogical, however, to object to its use in proper measure, provided it can be "proved in" as the most economic solution.

Referring to the statement of the committee as to the limited significance of potential difference indications, Mr. Warren pointed out that voltage measurements alone are wholly inadequate to determine the values or even the directions of stray earth currents. For example, a voltage measurement made

between a rail and a paralleling underground pipe may show the pipe to be positive to the rail, but this does not prove that current is flowing from the pipe to the earth and thence to the rail, nor does it even prove that current is flowing at all from the pipe to earth at that point. In fact, it does not by itself prove anything of practical value.

In conclusion, Mr. Warren quoted from the report the following: "The nucleus and most encouraging feature of the American committee's report, in so far as it concerns electric railways, is the conclusion to be drawn that in the normal development of the railway systems, including the use of automatically controlled substations, welded joints and a roadbed of comparatively high resistance, electrolysis conditions will be correspondingly improved." He indorsed this sentiment and said that electric railways are fortunate in that the investigations of the American Committee on Electrolysis have brought out this consideration and thereby largely dissipated the old idea that it is enormously and unreasonably expensive for an electric railway to avoid setting up bad electrolysis conditions. It is now seen that if the railways' efforts are properly directed, the improvement of electrolysis conditions is not an expense but is actually a large economy which should be availed of even if injury by electrolysis did not exist.

Interchangeable Mileage or Strip Coupon Tickets for Electric Railways

Messrs. Henry and Earlywine Discuss Their Merits in a Brief Presented to the Interstate Commerce Commission

THE CHAIRMAN of the committee on national relations of the American Electric Railway Association, Charles L. Henry, and L. E. Earlywine, secretary of the Central Electric Railway Association, have prepared a brief for the Interstate Commerce Commission on the subject of the use of interchangeable mileage or strip coupon tickets in connection with steam railroads. The brief forms part of the evidence which the electric railways of the country were asked to submit to the commission in connection with the hearing which it is conducting on interchangeable mileage of some form for the steam railroad, and they were particularly asked whether such mileage should be available for use on interurban electric railways as well as on the steam railroads. The brief discusses this topic from two standpoints, namely, whether a mileage book is desirable, and second, whether a strip coupon ticket is desirable.

In regard to the first question the brief points out that a large proportion of the electric railways are now charging 3 cents a mile for passenger fares, and some of them, the Detroit United Lines, for instance, as low as 2 cents a mile. The steam railroads, of course,

are charging 3.6 cents a mile. This would complicate the use of a mileage ticket, and as the representatives of the Commercial Travelers' Association have also admitted that it would not be feasible to issue interchangeable mileage tickets, this subject is not further discussed in the brief.

On the matter of strip coupon tickets, Messrs. Henry and Earlywine say that the interurban electric railways are not averse to joining in the use of interchangeable strip coupon tickets if the commission shall provide rules and regulations therefor which will not cause them loss. On the contrary, they would willingly join in such an arrangement. They realize that the large mass of the public which would use the proposed strip coupon tickets ride and desire to ride upon the lines of the interurban electric railways, and these railways do not want to throw any obstacles in the way of their doing so, provided it can be done without a reduction of fares, which the present financial condition of the interurban electric railways will not permit without injury. However, as there is a margin of 0.6 cent per mile between the present basic fares of the steam railroads and the ordinary basic fares of the interurban electric railways, Messrs. Henry and Earlywine express a belief that a satisfactory plan for using interchangeable strip coupon tickets can be worked out without calling for any fare reduction on the electric lines.

For instance, they say, suppose that a passenger purchased the strip coupon ticket at 15 per cent discount from 3.6 cents per mile and desired to make a trip on three different roads, 50 miles on each road, the first a steam railroad whose basic fare is 3.6 cents per mile, the second an interurban electric railway whose basic fare is 3 cents per mile, and the third on an interurban electric railway whose basic fare is 2 cents per mile. On the first road the conductor would detach coupons to the amount of the regular basic fare of the steam railroad or \$1.80 face value. If the book was sold at a discount of 15 per cent, this would make the net fare \$1.53. On the second (the 3-cent fare road) the conductor would detach \$1.77 face value of the coupon, which, reduced by 15 per cent, makes \$1.50 or the regular basic fare on that road. On the third (the 2-cent fare road) the conductor would detach coupons to the amount of \$1.18 face value, which reduced by 15 per cent, the discount at which the ticket was sold, makes \$1, the basic fare of that road. A chart is attached to the brief showing the application of the plan suggested at different rates of discount on the sale of strip coupon tickets.

In conclusion, Messrs. Henry and Earlywine suggest that the tickets be sold in denominations as small as \$25, and say that the way suggested seems the only one by which the proposed strip coupon ticket could be used by interurban electric railways without real financial loss to them.

News of the Electric Railways

FINANCIAL AND CORPORATE :: TRAFFIC AND TRANSPORTATION
PERSONAL MENTION

Submits Report

R. M. Feustel Values Ottawa Property—
Suggests Extensions and Additions
—Fares an Issue

The report of Robert M. Feustel, consulting engineer, dealing with valuation, proposed extensions and equipment additions to the Ottawa (Ont.) Electric Railway System, has been submitted and approved by the civic committee. The program extending over a period of five years includes the construction of 18 miles of extensions, the abandoning of 1 mile of the present lines running through sections which would be covered by the new routes, purchase of additional rolling stock and the erection of extra carhousing accommodations. The work involves an expenditure of \$1,517,690. A definite program of construction for each of the five years has been laid down, with the heaviest work being planned for the first year.

CONFERENCES HELD SINCE FEBRUARY

The negotiations between the Ottawa Electric Railway and the committee dates back to Feb. 20 last, when the City Council appointed a special committee consisting of the Mayor, members of the Board of Control and others to confer with the railway on terms for a new extended franchise agreement. After the first meeting the city sought permission to have access to the company's books and decided to seek an expert to find out the amount invested by the company in its different properties. Robert Feustel of Fort Wayne, Ind., was selected.

He began his work in May and presented his report early in October. In his analysis he employed the books and records of the company since 1895. He reported that the investment in the property down to the date of his report, including allowance for engineering and interest during construction, was approximately \$3,978,000 and that an allowance of between \$75,000 and \$100,000 for working capital and stores should be added. In round figures he reported the historical investment to date as \$4,075,000, with a return of 8 per cent.

MAKES FIVE YEAR FORECAST

Mr. Feustel, in dealing with the valuation of the plant and the returns to the company, made a comparison between the financial statement for 1921 and a forecast of the result of operations after each year's extensions during the five year construction program.

For 1921 these figures are given:

Passenger revenue, \$1,820,983; other revenue, \$18,934; total operating revenue, \$1,839,907; operating expenses, \$1,374,911. This left a balance of \$464,996. Charges

against this were taxes, etc., \$45,704; depreciation reserve, \$120,000, and income taxes, \$34,204; leaving net for interest and dividends, \$265,000.

The forecast for the first year's operation of the construction program follows:

Passenger revenue, \$1,910,470; other revenue, \$19,000; total revenue, \$1,929,470; operating expenses, \$1,929,470; leaving a balance of \$567,020. Charges against this are placed at: Taxes, etc., \$53,160; depreciation reserve, \$140,000; income taxes, \$34,965; leaving net for interest and dividends of \$338,895. To this is added \$70,715, saving by elimination of limited and Sunday tickets, and \$32,945, saving by partial use of one-man cars, making an estimated net for interest and dividends of \$442,555.

The estimate of revenue continues to increase from year to year, until for the fifth year of the construction program the estimate is:

Passenger revenue, \$2,173,655; other revenue, \$19,000; total revenue, \$2,192,655; operating expenses, \$1,573,955; balance, \$618,700. Charges against this balance are estimated at: Taxes, etc., \$58,045; depreciation reserve, \$168,000; income taxes, \$28,985; leaving net for interest and dividends, \$363,670. To this is added \$80,455 estimated saving by eliminating limited and Sunday tickets, and \$112,075 estimated saving by partial operation of one-man cars, leaving \$556,200 on interest and dividends.

On the subject of fares Mr. Feustel said that he considered it probable that, based upon the past experience of the company, by the elimination of the workmen's tickets and Sunday tickets the company could operate on a straight 5-cent fare and earn 8 per cent on the historical cost plus the cost of the additional expenditures which he suggested. He added that this would mean the continuation of the present operating methods with no abnormal conditions interfering. However, on this matter of fares the company and the city have failed to agree. The company has refused to agree to a fixed schedule for twenty years, but has submitted a plan providing for a fluctuating fare with an 8 per cent return.

The committee's conclusions will probably not be ready until about Dec. 1.

A dispatch from Montreal on Nov. 22 said that the company has just offered to sell its entire system to the city for \$4,500,000, or about \$400,000 more than the historic cost as found by Mr. Feustel.

May Have Electric Line

A charter has been applied for by business men of Lansdowne, Pa., to operate an electric railway line to be known as the Lansdowne Street Railway. The application shows that the company proposes to operate cars north on Owen Avenue to Essex Avenue, to Wycombe Avenue, to Marshall Road in Upper Darby township, east along Marshall Road to a new street in Stonehurst and along Walnut Street to Sixty-ninth Street.

Strike Called

Linemen and Substation Operators of
Cincinnati Property Sought 25 per
Cent Wage Increase

Following a notification of only one hour and a half, the overhead linemen and substation operators, some forty men, employed by the Cincinnati (Ohio) Traction Company went on strike at midnight, Nov. 15. T. H. Schoepf, vice-president and chief engineer of the traction company, said that the men going out violated their contract, which, he said, is an anti-strike pact and provides for settlement of differences by arbitration, if they fail to do so by agreement. Colonel Schoepf and electrical superintendents and other electrical supervisors were up all night Nov. 15 attending to the emergency repairs made necessary as a result of the strike.

Colonel Schoepf said the contract between Local No. 101, International Brotherhood of Electrical Workers, and the traction company was entered into on Nov. 15, 1921. It provided that if either side wanted any changes in the contract notice must be given to the other side within thirty days of midnight Nov. 15 each year. Then, if the side could not agree, each side was to select an arbitrator and the two arbitrators were to choose a third, or failing to do so within ten days the State Industrial Commission of Ohio was to be requested to name the third arbitrator.

This year each side notified the other that it wanted changes in the contract. The traction company asked for a reduction of 4 per cent in the wage scale, which ranged from 44 cents an hour for helpers of emergency linemen to 78 cents for foremen of linemen. The men requested an increase of 25 per cent. The men selected a committee. This committee had conferences with Colonel Schoepf, who made two concessions, totaling an increase of 3 cents an hour over the old wages. These were rejected by the men, who asked that further negotiations be postponed until the arrival of one of their international officers.

However, the men notified the traction company at 10:30 o'clock on the night of Nov. 15 that they had held a meeting and had decided to strike at midnight. After the men left their posts, Colonel Schoepf called on William Jerome Kuertz, Street Railway Commissioner, and Charles Tudor, Safety Director, to ask for protection for the company's substations. Mr. Tudor has detailed two policemen to guard each one of the company's substations during the strike.

Franchise Negotiations Ended

Tentative Agreement in Winnipeg Ready to Go Before Council—Terms Are Favorable

The referendum to give the Winnipeg (Man.) Electric Railway an extension of its franchise for ten years will likely be voted upon by the ratepayers some time in January.

Negotiations between a committee of the City Council and the company have been in progress for some months and culminated on Nov. 3 in the submission to the Council of an agreement which stabilizes relations between the city and the company and clears up all outstanding disputes. This agreement is only a tentative one, but there is not much doubt that it will be accepted by the City Council and submitted to the ratepayers for their approval.

FARE SCHEDULE AN IMPORTANT CONCESSION

The request of the company which led up to the formation of this agreement was expressed in the terms that the city defer exercising its option to purchase the railway from 1927 to

	To expire Aug. 1, 1923	To expire Aug. 1, 1924	To expire Aug. 1, 1925	To expire Aug. 1, 1926
Cash—weekdays.....	7 cents	7 cents	7 cents	6 cents
Cash Sundays.....	5 cents	5 cents	5 cents	5 cents
White tickets.....	4 for 25 cents	5 for 30 cents	5 for 30 cents	5 for 25 cents
Blue tickets.....	None	None	18 for \$1
Red tickets.....	5 for 25 cents	5 for 25 cents	5 for 25 cents	6 for 25 cents
Good weekdays only, 6 to 8 a.m. and 5 to 6:30 p.m.				
Children under 16 years of age.....	8 for 25 cents	8 for 25 cents	8 for 25 cents	8 for 25 cents

1937. The company points out that if this is granted, and it is now exceedingly likely that such will be the case, it will be able to issue a fifteen-year security, which will enable it to raise the necessary capital to make extensions and improvements to the service. As one of the concessions, the company has agreed to the fare schedule shown in the accompanying table.

Some of the outstanding points in the agreement are as follows:

The company has agreed to fix a definite value of the property on which it is allowed a fair return.

Before the agreement goes into effect, the company must pay the city all its outstanding obligations, amounting to approximately \$1,000,000, being composed of taxes, paving charges and damage to water mains by electrolysis.

Some of these amounts were disputed by the company, but this agreement on the part of the company clears up long standing controversies. The company will pay the money into a trust fund which will not only pay the above items but will provide a cash working capital toward the other items in the agreement involving the expenditure of money by the company.

The company has agreed to a definite progressive scheme for placing wires underground within the business section of the city. This will greatly improve the appearance of the city, removing many unsightly poles and the

overhead network of wires. This is regarded by the technical men in the company's employ as an immense advantage to the city. It involves the expenditure of a large sum of money, and only by such agreement could this advantage be obtained.

The agreement specifically provides for certain extensions of seven lines. The list of extensions is subject to such changes as may be mutually agreed upon, the whole program to be completed within three years. As to future extensions, the company agrees to carry them out upon receipt of proper notice from the city engineer.

Subject to the rights of the municipalities affected, the company has agreed to sell to the city, in the event of the city purchasing the company's system in 1937, its property and franchise rights in the municipalities adjacent to the city, if the city should so want them. This will enable the city to deal with the transportation question of Greater Winnipeg as a whole in 1937 if it should so desire, the purchase price to be fixed on the valuation of only the physical property.

The agreement provides that in default of the company carrying out the major provisions of the contract, the

city can declare the franchise of the company at an end and purchase the system, or the city may have a representative appointed to remedy the then existing default at the expense of the company. Other penalties are provided in case the company should default in carrying out the minor provisions of the contract.

MODERN EQUIPMENT PROMISED

By the agreement, the city is given more supervision over maintenance and repair of rails, roadbed, etc., and has it within its power to see to it that any renewal or new construction is of the most modern design. The agreement provides that the existing track and roadbed shall always be capable of carrying the most modern rolling stock.

The object of this provision is that the system will be kept in such condition that in the event of the city taking it over in 1937 it will not be necessary to spend abnormal sums of money in rehabilitation or in modernizing the track and roadbed of the company.

Definite responsibility in the matter of electrolysis is placed on the company, and the latter is to pay to the city immediately \$35,868 for damages to underground structures alleged to be due to electrolysis. The company is to pay for all future damage within sixty days of its being ascertained.

The company is to continue to take necessary steps to eliminate electroly-

sis, and to obtain the results provided for in the recommendations of Professor Ganz.

The company agrees to bear a share of the cost of building any subways through which car lines will be laid.

These are the main considerations in the franchise agreement. The issue in Winnipeg has been referred to previously in the *Electric Railway Journal*.

Must Show Authority for Operation

Application for permission to file a petition in quo warranto to compel the Dayton & Western Traction Company to show by what warrant of authority it is maintaining its right-of-way through the village of New Lebanon, Ohio, was made in the Court of Appeals in Dayton, Ohio, on Nov. 18, by Prosecuting Attorney Haveth E. Mau. The action was brought in the name of the State of Ohio at the instigation of John Hinkle, member of the board of trustees of New Lebanon.

The franchise by which the traction company was permitted to operate its cars through the village expired March 22, 1922. Valentine Winters, Dayton, president of the road, negotiated with the village officials for a new franchise, to which the village would not agree unless Winters promised to lower the company's tracks in New Lebanon and to pave between them. This the company declined to do and was refused a franchise.

The company then announced its intention of building a track around the village, but this was never done and the cars have continued to operate through New Lebanon.

The petition which the prosecutor requests he be permitted to file demands that the company be ousted from the village unless it can show authority for its use of the streets.

While the company was negotiating with the New Lebanon officials, county commissioners granted the road a fifty-year franchise to operate in the county outside the municipalities.

Lost Articles Would Provide Many Comforts

In the annual report of the Liverpool Corporation Tramways the number of articles left on the cars or lost property totalled 28,970 articles during 1921, compared with 28,342 in 1920, or an increase of 628. The lost property included practically everything the human mind could think of and anything the human frame could be devoid of. There were three typewriters, two sewing machines, one skeleton (human), seven crutches and 1,445 knives, keys and locks. Unlucky "13" appeared in the role of false teeth against twelve the year before. The number of live birds and animals was decreased from eighteen in 1920 to five in 1921. The number of unclaimed articles was 8,911. The loose cash and cash found in purses amounted to £989.

Transit Work May Stop

Mayor of Cincinnati Requests Cessation of Work on Loop—Commission Disapproves and Has Authority to Proceed

The present financial condition of Cincinnati and the views of the voters as expressed at the late election demand that work be stopped on the rapid transit loop. This bombshell was exploded by Mayor George P. Carrel of that city at a called meeting of the Rapid Transit Commission on Nov. 17. There were present the heads of all the city departments and members of the Rapid Transit Commission.

Mayor Carrel said that the additional \$500,000 bond issue seemed to be contrary to the present policy of the city to retrench in its expenditures within the limits the voters asked for at the last election. He asked to defer further work on the rapid transit system until a time when the city was in better finances.

The Rapid Transit Commissioners recently authorized an issue of \$500,000 for further work on the subway. Most of this money was to be used in purchasing property from St. Bernard to Oakley to allow continuance of the subway system.

The Cincinnati Sinking Fund agreed to take the bonds and the money is ready to be turned over to the Rapid Transit Commission as soon as Mayor Carrel signs the bonds as required by law.

COMMISSIONERS DISAGREE WITH MAYOR

The commissioners could not see the matter in the same light as the city officials and there followed the voicing of a considerable difference of opinion. The conference ended without decision, the commissioners agreeing to compile figures showing that the completion of the system was necessary and that the interest charges on the increased sinking fund would not embarrass the city's finances.

When the commissioners protested against the Mayor's request, Charles Hornberger, Director of Public Service, presented the city's views and said that the vote at the last election against the extra city tax levy involving increased city expenditures indicated the opinion of the people against anything but strict economy.

The Rapid Transit Commission has the authority under the city charter to proceed with the work regardless of the intervention of city officials. Approximately \$4,000,000 has been spent on the rapid transit system since work was begun in 1919. Two miles of the subway proper have been constructed and 4 miles of surface track are now under construction.

There are several thousand dollars left in the Rapid Transit Commission's coffers. If it is decided to comply with the Mayor's request it is probable that the loop will be continued to the Spring Grove Cemetery, at which point the Ohio Traction Company, Dayton division, will be invited to operate its cars into the city. This can be done with

the money now on hand regardless of the \$300,000 bond issue.

The proposed interurban line from Indianapolis to Cincinnati, of which the Connersville - Cincinnati stretch remains to be completed, is expected to run into the loop system over the Ohio Traction line and will augment the rolling-stock.

The interest on the money borrowed by the Rapid Transit Commission is not paid by the city, but comes out of an extra .50 mills tax specified by the 1916 law, which is placed on the tax duplicate every year, yields about \$380,000 and goes to pay interest charges. The annual interest on the \$4,000,000 worth of bonds now issued—the money used in construction work—is \$240,000. The interest rate on the new \$500,000 issue is 5½ per cent.

Under the powers of the law that created the Rapid Transit Commission the commission has the right to order Mayor Carrel to sign the bonds and bring a mandamus suit against him to compel his signature.

Paving Charge Rescinded in New Franchise

The city of Belleville, Ill., granted on Nov. 20 a twenty-year franchise to the East St. Louis & Suburban Railway. This company has been operating without a franchise in Belleville since Sept. 1, 1919, on which date the old franchise expired.

When the franchise first expired the city authorities seriously discussed bringing injunction, or seeking by other means to prevent the company operating without a franchise, but upon further deliberation decided that the city needed the railway service to continue even if agreement could not be reached regarding the franchise.

At the time the franchise expired the city asked to have many extensions built and also asked the company to agree in a new franchise to many things which the company felt it could not afford. The company also took the ground that the franchise should relieve the car riders of unjust burdens such as paving.

The franchise as passed on Nov. 20 exempts the company from paving between the lines on the so-called city lines. It contains no set fare or service conditions, but fares and service are to be under the jurisdiction of the Illinois Commerce Commission, the courts, or other duly constituted authorities. The company agrees to make in the future only such extensions as will pay a fair rate upon the investment after operating expenses and proper depreciation have been deducted. The company makes no other promises in the franchise, but now that agreement has been arrived at with the city it is expected that the company will start at once toward improving track conditions which it has been unwilling to do in the past, awaiting an agreement regarding future rights.

All during the period of negotiations there were many conferences and many discussions, but no friction.

City Wins Case Against Dallas Railway

The city of Highland Park, a suburb of the city of Dallas, Tex., has won its case on appeal wherein it sought to compel the Dallas (Tex.) Railway to repair its tracks on Beverley Drive so that the city could proceed with the laying of pavement on this street. Pat Edwards, attorney for Highland Park, said his municipality is prepared to fight the case all the way to the Supreme Court if necessary to compel the traction company to repair its tracks and take care of its part of the pavement on the streets where the railway company operates.

Petition for a writ of mandatory injunction against the Dallas Railway to compel it to repair its tracks was filed by the city of Highland Park in the Sixty-eighth District Court in October. Judge J. E. Gilbert, presiding, declined to issue the writ, and the case was taken on appeal to the Fifth Court of Civil Appeals at Dallas. The Appellate Court granted the mandatory injunction as prayed for, and the traction company then asked for a rehearing. This was denied.

The rails of the Dallas Railway are elevated several inches above the level of the street pavement, and the city of Highland Park seeks to compel the company to lower its track so that the pavement will be smooth.

Rentals Will Be Subject for Arbitration

Clarence J. Wilcox, the corporation counsel of Detroit, Mich., has announced that arbitration proceedings will soon be started on the question of the Detroit United Railway's rentals for the use of city tracks by interurban cars.

A month ago, the city sent a communication to the Detroit United Railway, according to Wilcox, asking that arrangements be made for starting arbitration proceedings to fix the rental rate early in November. Recently Elliot G. Stevenson, president of the Detroit United Railway, again was requested to nominate that company's arbitrator.

The delay is occasioned, according to Mr. Wilcox, by the desire of the Detroit United Railway to include in the discussion differences between the city and the company relative to supply items and car parts.

No rental moneys have been received by the city from the Detroit United Railway, the city in its monthly street railway financial statements setting up an estimated credit of \$80,000 monthly. According to City Controller Steffens, this credit was arrived at by using the interurban rental figures of Toledo, which are 36 cents per car mile for motor cars and 24 cents per mile for trailers.

In Mr. Steffens' opinion, this \$80,000 credit item is low, and it is his belief that a board of arbitration will fix for Detroit a higher rental rate than is in vogue in Toledo.

Financial and Corporate

Opposes Sale of Municipal Line

The Board of Public Utilities of Los Angeles has encountered considerable opposition in its investigations of the merits for recommending the granting of a freight franchise to the Pacific Electric Railway over the municipal line of the city on San Pedro Street, over which line the Pacific Electric holds a franchise for operation of passenger trains only. There is particular opposition in regard to an allegation that the Pacific Electric Railway was negotiating with the city to purchase the municipal line on San Pedro Street.

The matter of the railway's application for a freight franchise was reviewed in the *Electric Railway Journal*, issue of Oct. 7.

The Los Angeles City Harbor Commission has entered the discussion and has found itself divided on the issue. The president of the Harbor Commission has offered a resolution opposing the sale of the city-owned line, while the other commissioners have disagreed with his stand. The president's resolution declared the sale of the tracks would give the Southern Pacific interests a monopoly, and would bar other railroads from the harbor. The tracks should be retained, he believed, as the start for a belt railway. The opposing commissioners declared the city was getting no revenue from the tracks and they should be sold to some one who could put them to use.

The Pacific Electric Railway has been using the line, which was built in 1913 at a cost of \$250,000 to the city. It runs between Aliso and Ninth Streets on San Pedro Street. Postponement on action on the track sale matter means, the commissioners explained, that the commission would look into the question thoroughly before doing anything.

A statement was issued by D. W. Pontius, vice-president and general manager of the Pacific Electric Railway, on Nov. 14 concerning the suggested sale of the San Pedro Street line to the Pacific Electric Railway.

Mr. Pontius stated that the present operating agreement with the city is satisfactory and at no time has the railway suggested that the city sell the line to the Pacific Electric.

Public Service of New Jersey Increases Common Dividend Rate

The directors of the Public Service Corporation of New Jersey announced on Nov. 22 the declaration of a quarterly dividend of \$2 a share on the common stock, placing it on an \$8 annual basis. The previous quarterly payments have been \$1.50, or \$6 annually, the disbursement having been increased from \$1 quarterly in March, 1922. The regular

quarterly dividend of \$2 a share also was declared on the preferred stock. All disbursements are payable Dec. 30 to stock of record Dec. 15.

Thomas N. McCarter, president of the company, stated that the directors also had voted on a voluntary reduction in the electric light and retail power rate, effective with December sales. He stated the action would result in a saving of at least \$1,600,000 annually to the customers served.

Two changes were decided upon in the capitalization of the company. Mr. McCarter described them as follows:

At present the authorized issue of preferred stock is \$50,000,000 at par, carrying 8 per cent cumulative dividend, of which approximately \$18,500,000 is outstanding. This stock is redeemable at 110 per cent of its par value, but as this tends to keep down the price of the issue to the redemption figure, the stockholders will be asked to waive this provision.

The directors of the company also felt that there would be times hereafter when it would be practicable for the corporation to sell 7 per cent preferred stock and have therefore decided to recommend to the stockholders for approval the alteration of the company's charter so that the \$50,000,000 of authorized preferred stock shall hereafter consist of \$25,000,000 of 8 per cent preferred stock and \$25,000,000 of 7 per cent preferred stock.

The company reported operating revenues of subsidiary companies for October, 1922, amounting to \$7,025,012, an increase of \$480,539 over October, 1921. The net increase in surplus before dividends was \$590,693, an increase of \$98,887 over October, 1921, and for the first twelve months ended Oct. 31, 1922, the net increase in surplus before dividends was \$5,416,693, an increase of \$2,477,619, as compared with the twelve months ended Oct. 31, 1921.

Identity of Purchasers Disclosed

F. L. Dame, Edwin Gruhl, James F. Fogarty and Robert Sealy, all connected with the North American Company, New York, N. Y., and L. E. Kilmarx and others are the principals of a syndicate which has purchased 27,500 shares of the common stock of the Washington Railway & Electric Company, Washington, D. C. As noted in the *Electric Railway Journal* for Nov. 11, the purchase was negotiated through Crane, Parris & Company, investment bankers, during the week ended Nov. 4 and created lively comment in financial circles at that time.

So far as Messrs Dame, Gruhl, Fogarty and Sealy are concerned the purchase was made by them as individuals for investment and not in the interests of the North American Company. The stock taken over had been pledged as collateral for a loan and the prices paid by Crane, Parris & Company for it, while not made public, is said to have been sufficient to pay the noteholders both principal and accrued interest on their investment.

Deficit Reported in Albany

According to the third quarterly report the United Traction Company, Albany, N. Y., suffered a net corporate loss for the period from July to September inclusive of \$56,353. The loss for the corresponding period a year ago was \$476,318. The net operating revenues showed a profit of \$119,261 and the operating expenses advanced more than \$29,600 over the same quarter in 1921.

In the third quarter this year 10,103,995 fares were collected, compared with 3,540,995 in the same 1921 quarter.

The net corporate loss to date for this year is \$106,726, bringing the accumulated deficit of the company to \$3,308,051. While the company has operated at a net corporate loss of \$106,726 for the first nine months of this year, last year, due to the strike, its net loss for the same quarter was \$2,040,442.

To date this year 32,329,507 passengers have been carried, which compares very favorably with five years ago, when a peak was reached for the first nine months with 36,122,382 passengers carried. A total of 24,284,094 more passengers were carried up to Sept. 20 this year than last year.

Order Issued on Discontinuance

Service on three branch lines of the Indiana, Columbus & Eastern Traction Company in Ohio will be discontinued at midnight on Dec. 31, 1922, under an order issued by the State Public Utilities Commission on Nov. 17. The order was issued on application of the company, which produced evidence to show that it was losing money on operations on all three of the lines. The branches on which service is to be stopped are the New Carlisle-Carlisle Junction, Columbus-Orient and Lima-Defiance branches.

Application to discontinue service on the three lines was filed more than a year ago by the company with the State Utilities Commission. The first of this year, however, the commission instructed the company to continue service on the branch lines for at least six months more, after which the commission would consider a renewal of the application should the company care to file it. In September, 1922, J. H. McClure, receiver of the company, filed a renewed application, at the same time submitting evidence to show that the three lines had been operated at a loss during 1922.

Officials of the company say that automobile ownership by suburbanites, coupled with motor bus competition, led to the loss.

Line Sold

The Maumee Valley Railways & Light Company, operating between Toledo and Perrysburg, Ohio, was sold on Nov. 15 to M. M. Miller, president of the Home Savings Bank of Toledo. The price was \$50,000. The company had been in receiver's hands for more than a year.

Early Publication of New York Commission Reports Expected

When the reorganized Public Service Commission in New York State went into office in 1921, it found statistical reports in arrears for 1918, 1919 and 1920 in the first district and for 1919 and 1920 in the up-state district.

During the past year the commission up state has published the back reports and expects to have ready for distribution by the middle of January, 1923, reports covering full statistical data from all of the service corporations over which it exercises supervision and which are required to report to it, for the year 1921. Thereafter it aims to print and distribute all reports within one year after the companies file their statements with it.

It takes about a year to collect, correct and put into final form for the printer annual reports of public service corporations. Many corporations are late in filing and after the statements are filed the accounting department of the commission checks them over carefully for errors either in the manner of making out the reports or of calculations.

This early distribution of up-to-date reports will be of incalculable value to municipalities and corporations and will in many instances save a trip to Albany and exhaustive searches of records. Under the new system the accounting department after January, 1923, will be caught up with its work on reports at all times and will be able to devote a considerable amount of time to the detailed examination of the returns of corporations which they have not previously been able to do. In restoring order to these commission activities not a little credit is due to H. M. Ingram, who was appointed to the newly-created position of director of information early in 1922.

Line May Be Junked

Deed to the properties of the Springfield Terminal Railway, operating the Springfield, Troy & Piqua Railway, was passed to the Shoenthal Company of Columbus, Ohio, in the latter city by

Receiver George Whysall on Nov. 17. The company recently purchased the traction properties for \$87,000 with approval of the sale by the Federal District Court.

Officials of the Shoenthal Company announced that they would wait a reasonable length of time for offers from persons who might desire to operate the traction line, but that if no such offers were received within the near future, the road would be junked. The company holds the value of the line as junk to exceed \$100,000.

Reports covering revenues and operating expenses of the traction line for the months of July, August and September, 1922, were filed by the receiver in Federal District Court at Cincinnati on Nov. 18. The reports disclose a deficiency of \$213 for July, \$89 for August and a surplus of \$201 for September. The receiver reported a total deficit of \$709 for the period from Jan. 1, 1922, to Sept. 30.

R. P. Stevens and Associates Purchase Williams Interest in Republic Company

Eastman, Dillon & Company, New York, N. Y.; R. P. Stevens and John T. Harrington of Youngstown, Ohio, have purchased from Harrison Williams and associates their interests in the Republic Railway & Light Company, which, through its subsidiaries, Pennsylvania-Ohio Electric and the Pennsylvania-Ohio Power & Light, owns and controls the entire electric light, power, local and interurban electric railway business in the industrial district between Pittsburgh and Cleveland. The territory served comprises about 600 square miles with a population of more than 300,000.

At a meeting on Nov. 22 Herbert L. Dillon, Henry L. Bogert, Jr., and Walter H. Nash of New York, and John T. Harrington and John R. Rowland of Youngstown were elected directors of the company to succeed Harrison Williams, R. E. Breed, F. L. Dame, Edwin Gruhl and Robert Lindsay as members of the board. No changes either in management or policy are contemplated.

Financial News Notes

Seeks Dissolution.—The Point Loma Railroad, San Diego, Calif., has made application to the Superior Court for voluntary dissolution. The property of the company has been taken over by the San Diego Electric Railway.

Amount of Accumulated Dividend Due Reduced.—The Duluth-Superior Traction Company, Duluth, Minn., has reduced the amount of accumulated dividends on its preferred stock to \$3 through the declaration of a dividend of \$3 on account of accumulations on that issue since the last quarterly payment of \$1 on April 1, 1921. The disbursement will be made on Jan. 2 next to stockholders of Dec. 15.

Appoints Receiver for Insolvent Road.—George Raelsley, Mount Bethel, Pa., has been appointed receiver for the Bangor & Portland Traction Company, Bangor, Pa., on application for attorneys for the Easton Trust Company, trustee for the Bangor & Portland Traction Company and the Bangor Trust Company bondholders, who have a mortgage on the property of the company. In the application for a receiver it is stated that the road at the present time is insolvent.

Bonds on Sale.—A syndicate composed of Hemphill, Noyes & Company, Stroud & Company, Inc., Coffin & Burr, Inc., and Otis & Company is offering \$3,000,000 of Tide Water Power Company's first lien and refunding mortgage series "A" sinking fund 6 per cent gold bonds. The bonds are offered at 96 and interest to yield 6.35 per cent. The bonds are dated Oct. 2, 1922, and are due Oct. 1, 1942. The Tide Water Power Company does all the electric light and power, gas and railway business in Wilmington, N. C., and suburbs. The company also furnishes through a subsidiary all the electric light and power in St. Petersburg and Clearwater, Fla.

	Latest	Month Ago	Year Ago	Peak	1913
Street Railway Fares*	Nov. 1922 6.98	Oct. 1922 7.00	Nov. 1921 7.21	May 1921 7.24	4.84
Street Railway Materials*	Oct. 1922 177	Sept. 1922 181	Oct. 1921 156	Sept. 1920 247	100
Street Railway Wages*	Nov. 1922 208	Oct. 1922 208	Nov. 1921 214	Sept. 1920 232	100
Steel Unfilled orders (Million tons)	Oct. 31 1922 6.90	Sept. 30 1922 6.69	Oct. 31 1921 4.29	Apr. 30 1917 12.18	5.91
U.S. Bank Clearings Outside N. Y. City (Billions)	Oct. 1922 14.69	Sept. 1922 12.82	Oct. 1921 12.25	March 1920 18.54	Av. Mo. 1913 6.12
Business Failures Number	Oct. 1922 1,600	Sept. 1922 1,469	Oct. 1921 1,809	Jan. 1922 2,722	Av. Mo. 1913 1,213
Liabilities (millions)	Oct. 1922 36.94	Sept. 1922 31.92	Oct. 1921 48.37	Jan. 1922 105.7	Av. Mo. 1913 24.64

Conspectus of Indexes for Nov., 1922
Compiled for Publication in this Paper by
Albert S. Richey
Electric Railway Engineer
Worcester, Mass.

	Latest	Month Ago	Year Ago	Peak	1913
Eng. News-Record Construction costs	Nov. 1922 188.6	Oct. 1922 188.6	Nov. 1921 166.3	June 1920 27.38	100
U.S. Bur. Lab. Stat. Wholesale Commodities	Oct. 1922 154	Sept. 1922 153	Oct. 1921 142	May 1920 247	100
Bradstreet's Wholesale Commodities	Nov. 1 1922 13.35	Oct. 1 1922 12.50	Nov. 1 1921 11.35	Feb. 1 1920 20.87	9.21
Dun's Wholesale Commodities	Nov. 1 1922 182.3	Oct. 1 1922 175.6	Nov. 1 1921 163.7	May 1 1920 263.3	120.9
U.S. Bur. Lab. Stat. Retail food	Oct. 1922 143	Sept. 1922 140	Oct. 1921 153	June 1920 219	100
Nat. Ind. Conf. Bd. Cost of living	Oct. 1922 157.1	Sept. 1922 155.6	Oct. 1921 163.7	July 1920 204.5	(1914) 100

*The three index numbers marked with an asterisk are computed by Mr. Richey, as follows: Fares index is average street railway fare in all United States cities with a population of 50,000 or over except New York City, and weighted according to population.

materials (including fuel) used in street railway operation and maintenance, weighted according to average use of such materials. Wages index is relative average maximum hourly wage of motormen and conductors on 105 street and interurban railways in the United States, operating more than 100 passenger cars each, and weighted according to number of cars.

Street Railway Materials index is relative average price of

Traffic and Transportation

New Chicago Bus Franchise

Commission Discusses Permanence, Financial and Operating Ability and Competition in Decision

The Illinois Commerce Commission on Nov. 21 granted to the Chicago Motor Bus Company a certificate of convenience and necessity, giving it the right to operate a bus service over certain boulevards on the south side of the city in addition to the present operation on the north side. In the course of its decision the commission said there was "involved not only the demand on the part of the public for a certain service to be rendered by a public utility but also whether or not the applicant had the experience, ability and stability to become a permanent part of the transportation service in the community involved." It was pointed out that in all public and private enterprises transportation service is one of the cogent influences involved, but that it cannot be held to be a public convenience that some inadequate or ill-advised transportation service for a particular district be authorized when it is apparent that such service would be only temporary.

SURFACE AND "L" LINES ESSENTIAL

The commission said that considerable evidence was introduced as to the inadequacy of service of the surface and elevated lines in certain portions of the South Side, but continued:

Nevertheless the Surface Lines are an existing transportation utility and extensive development has taken place on the south side of Chicago depending upon the continued service heretofore rendered by said company. In the consideration of motor bus transportation, the commission should be cognizant of the fact that it would not be considered to be the public convenience and necessity of either the whole people of Chicago or those persons immediately depending upon the surface or elevated lines for transportation that bus lines should be instituted which would either seriously impair the service of present lines of transportation or would ultimately destroy this service entirely. The witnesses in this case were unanimous in that while they criticized the service of the surface and elevated lines severely, yet none of them desired that the car service be entirely eliminated. Mr. Richie, a witness for the Chicago Motor Bus Company, indicated by his evidence that bus service is rather a classified service supplementary to the service ordinarily rendered by street cars, and in addition affords more recreational advantages to many persons and families who might not otherwise be able to enjoy the pleasures and benefits of the park system in Chicago.

Discussing the place of the bus with respect to the entire transportation scheme in Chicago, the commission declared it must keep the institution of bus line transportation in mind but such service should be unified in the main artery in Michigan Avenue, so that ultimately there may be a through bus service from the south to the north side of the city of Chicago. The bus service should also be so distributed and controlled that it will be permanent in the communities which it shall serve

and readily unified in any general transportation scheme, which ultimately may be necessary.

One of the considerations mentioned by the commission in granting the certificate to the Chicago Motor Bus Company rather than the Depot Motor Bus Lines or the Chicago Stage Company, which had made similar applications, was that the first named had drafted for its enterprise "experienced and talented managers and engineers." Special mention was made of the ability, research and experience that had been employed by this company in solving the Chicago motor bus problem.

FINANCIAL STRENGTH CONSIDERED

The Commerce Commission also took note of the relative financial strength of the three applicants and noted that the Chicago Motor Bus Company had interested sufficient capital to carry out successfully a permanent motor bus enterprise, while the Depot Motor Bus Lines was said to be lacking in ability and financial stability. Another point mentioned with respect to the Depot Motor Bus Lines was that the routes over which it had applied for the right to operate would cause it to come "in immediate competition with present transportation service to a much greater degree than those routes proposed by the Chicago Motor Bus Company."

No Telling Results of Weekly Pass Plan

In September, 1922, the Pacific Electric Railway undertook to try out a weekly pass plan for its local lines in Pomona and Riverside, Calif. The plan provided for the sale of "weekly passes" for local lines at the rate of \$1 a week, the purchaser being privileged to use his pass as often as desired during the seven days period on local lines and without restriction as to individual use.

Up to Oct. 10 the results were somewhat disappointing, the number of persons in the cities named being very small who availed themselves of this privilege. At this time it was anticipated that unless the demand for the tickets became greater their sale would have to be discontinued.

On Nov. 10, after summarizing the result for the month of October, the company was unable to predict the final outcome or results, yet early indications are that revenue from this new class of service, which heretofore has been entirely insufficient to pay operating expenses on these particular car lines, may be somewhat increased.

Travel on the Riverside local lines increased 7 per cent, with approximately 2 per cent increase in revenues, while in Pomona travel increase was shown to be 15 per cent with no increase in revenue.

Transportation Issue Aroused Saginaw

Unprecedented Vote in Michigan City on Nov. 7 on Car Question—Recount Under Way

Although the franchise calling for street car-bus transportation for Saginaw failed to carry unofficially by fifteen votes, which would have given the proposition a 60 per cent majority, there is every evidence that the people of that city have awakened to the need of street cars with proper bus extensions and feeders, and are not at all satisfied with motor bus transportation which they have had exclusively since Aug. 10, 1921.

The election of Nov. 7 made history for Saginaw. With one exception, and that was the general election of 1920 when throughout the United States there was the greatest vote cast, Saginaw had its second largest election. No local proposition in the history of the city every attracted the votes the franchise did. The total vote was 10,534 for the franchise and 7,047 against. No municipal proposition was ever given the affirmative vote that the franchise received.

There has never been such an absolute opposite expression from the electors, who since 1907, when the state constitution was adopted fixing the percentages as 60-40 for all franchises and bond issues, have consistently refused to grant a contract to a public utility corporation.

These propositions have even failed to secure simple majorities. This franchise was submitted by initiatory petitions signed by 10,000 citizens, 6,000 more than required. An educational campaign was carried on in every voting precinct. Even the chronic "No" districts were converted to an extent, and friends of street cars believe that if a new measure is presented, with certain revisions from the one recently rejected, there is little question of its adoption.

At the present time the Council is conducting a recount acting on petitions of both sides in the campaign. As all members of the Council publicly opposed the franchise it is believed as a result of their rulings on certain ballots the Supreme Court will be the agency that will finally determine the result of the election.

With half of the vote canvassed, 75 "No" ballots have been counted where the electors placed a cross in the "o" of the word "No" and not in the square before the word. These ballots friends of the franchise insist are illegal, and were backed by the city attorney, but the canvassers disregarded his opinion, and it went so far that Mayor Mercer accused the city attorney of favoring an attorney for the franchise when just prior to his opinion, two "Yes" votes had been thrown out on his ruling. The city attorney resigned his post when his honesty was questioned, but since then has withdrawn his resignation, the Mayor having publicly retracted his statement.

Request for Half Fares for Oakland School Children

The city of Oakland, Calif., petitioned the Railroad Commission on Nov. 16 for an order requiring the San Francisco-Oakland Terminal Railways to establish half fares for school children in that city. The city alleges that the company has refused to grant half fare for school children as requested by the Council, although it is alleged such fares have been put in effect by the company in Richmond and Alameda. It is claimed there is no valid reason for this distinction which is asserted to be an illegal discrimination. A check made by the Board of Education of Oakland is set forth showing that 3,616 pupils use the street cars daily, 3,338 occasionally and it is estimated that if half fare rates were granted 5,800 students would use the car service. The net revenues of the company, it is declared would be increased by the granting of half fares.

Operation of One-Man Cars Within Three Months

The City Council of Augusta, Ga., has unanimously passed the amendment to Ordinance 104, whereby the Augusta-Aiken Railway & Electric Corporation will be allowed to operate one-man cars in the city without having to flag the crossings of steam railroads. Section 3 of the amendment requires the driver or operator of the one-man car to bring his car to a full stop not less than 15 ft. from the near rail of the steam railroad crossing. Further, that the operator shall not proceed with his car across the crossing until "he is fully satisfied by careful observation that no locomotive engine or engine and cars are approaching such crossing from either direction." General Manager Banghart announced some time ago that following an official notice of the Council's action he would try to have the one-man cars in the city within three months.

Service on Interurban Lines Resumed

For the first time since May 1, when its employees walked out following a lockout, the Steubenville, East Liverpool & Beaver Valley Traction Company on Nov. 21 resumed service on its interurban lines between the Pennsylvania-Ohio state line and the Pittsburgh & Lake Erie station at Beaver, Pa. The resumption of operations on this line was marked by a complete absence of disorder. The first car, operated by an imported crew, carried two members of the Pennsylvania state constabulary, General Manager C. A. Smith and other officials.

The company has established a carhouse at Industry, Pa., and the cars are being operated out of it. The company announces that everything is in standard running condition and that full provisions have been made for car repairs at the Industry carhouse.

As the first car was on its way to

the state line, hundreds of pedestrians looked on, but no attempt whatever was made to impede its progress. No passengers boarded the first car. About thirty state constables were stationed at strategic points.

Outside carmen are operating the interurban cars and no positions were accepted by members of Division 52, the company's employees before the tie commenced. The majority of these former employees are operating buses in the East End, Liverpool. They will make no comment on the company's action, stating that they will remain steadfast in their policy of complete non-interference.

The situation in East Liverpool practically remains unchanged. Members of the City Council met the day the company resumed its interurban operations and discussed the situation, but declined to indicate that any action would be taken before the hearing in court on the injunction which is now pending against the traction company.

Transportation News Notes

One-Man Idea Given Up.—The Washington-Virginia Railway, Washington, D. C., has decided against the operation of one-man cars on its system between Alexandria and Washington.

Opposes Bus Application.—The Philadelphia (Pa.) Rapid Transit Company recently opposed an application made by Wilbur F. Menke for the right to operate two buses between Bridge Street, Frankford, and Byberry. Representatives of the railway said that there were ample facilities to reach the elevated line.

Cannot Grant Request.—The request of employees of the Bethlehem Steel Company that the Harrisburg (Pa.) Railways reduce its fare 1 cent has been turned down. The traction company said in its refusal that such step was impossible in view of present conditions and that it could not afford to operate on less than a 6-cent rate.

Claims Excessive Freight Rates.—The Eastern Texas Electric Company, Beaumont, Tex., has filed suit in the Eightieth District Court for \$24,274 for alleged excessive freight rates for transporting oil shipments from Port Arthur to Beaumont. The claim involves 38,331,695 lb. of oil shipped in the year 1920.

Railway Hauls Sugar.—The newly electrified railroad, the Cuban Electric, plays an important part in the sugar-producing industry. It carries trains of cars loaded with sugar cane on the north Cuban coast, 30 miles east of Havana. Besides hauling cane to the mills, three-car passenger trains are run for the accommodation of the traveling public of Havana and Matanzas and intervening territory.

May Substitute Bus for Trolley.—The Northumberland County Railway, Sunbury, Pa., is considering petitioning the Public Service Commission for permission to abandon its line to Hamilton, a suburb of Sunbury, and substitute a motor bus line. The poor service conditions, which cannot be remedied because of the enormous expense that is encountered in maintaining the line, will necessitate a cessation of operation. The fare on the trolley is 7 cents.

Extends Eight-Cent Fare.—The Missouri Public Service Commission at Jefferson City, Mo., has entered an order extending the present 8-cent fare of the Kansas City (Mo.) Railways for six months from Nov. 18. No one appeared to oppose. John P. Pew, city counselor, said that the city did not oppose the granting of the extension, because it is believed that the present fare is necessary to sustain the company.

City Dictates Car Stops.—Has the city in Indiana a right to say where a street car shall stop to discharge or take on passengers? The city of East Chicago, Ind., believes it has. Recently the City Council there passed an ordinance to prevent street cars from stopping on Forsythe Avenue between the Wabash Railroad tracks and Chicago Avenues. Violation of the ordinance was made a penal offense. The police have arrested the crew of a Hammond, Whiting & East Chicago Railway car for violating the ordinance. The company will make it a test case.

More One-Man Cars in Milwaukee.—The Railroad Commission of Wisconsin has permitted the Milwaukee Northern Railway to operate one-man cars on its Milwaukee city line which runs from Fifth and Wells Streets in the heart of the business district to Twentieth Street and Atkinson Avenue on the north side. The company must make changes in its cars in accordance with plans approved by the commission for installation of safety devices. In considering a Milwaukee city ordinance of 1914 requiring two men on all street cars, the commission pointed out that it believed the ordinance to be unreasonable in so far as it applied to this particular case.

Arranging for Electric Express Business.—Arrangements have been concluded for the rapid delivery or receipt of shipments in Philadelphia sent from or to any point on the Morristown and Reading divisions of the Reading Transit & Light Company, Reading, Pa., and connecting electric railway lines. An important increase in the electric express business of the Reading Transit & Light Company is expected to follow these arrangements. Under the new arrangement shipments are accepted for or received from Front and Market Streets, Philadelphia, where a large, efficient and convenient terminal is used by the Public Service Transportation Company. The latter company and the Reading Transit & Light Company now interchange shipments at Wissahickon, and the advantages of through billing at freight rates is proving popular.

Personal Mention

Editor Will Help in Coal Investigation

The Federal Coal Commission has called upon C. E. Leshar, editor of *Coal Age*, a McGraw-Hill publication, to organize the investigation division and to direct the engineering phases of its work. He will act as a special adviser serving as a consultant on statistical and engineering problems. Production cost problems will be investigated by David L. Wing, formerly of the Federal Trade Commission and of the Department of Commerce.

The appointment of Mr. Leshar and Mr. Wing expresses the plan of the commission to put the actual work of fact finding into the hands of a few men who thoroughly understand this problem of coal which is constantly harassing industry and the householder.

The commissioners expect to obtain much of their information from the outstanding men engaged in coal production, distribution, wholesaling and retailing, but a vast amount of data must be collected by a technical staff. Direction must be given to the collection and interpretation of the facts and figures gathered, and for this work the commission has selected Mr. Leshar and Mr. Wing.

In organizing the investigation division for the commission, Mr. Leshar will have to do with (1) production (including all phases of mining coal, except the labor element); (2) transportation in its effect on the coal industry; (3) distribution of the product.

Mr. Mitten for Mayor

Thomas E. Mitten, president of the Philadelphia Rapid Transit Company, has been asked by the Republican women of Pennsylvania if he will consent to run for Mayor. The organization is headed by Mrs. George Horace Lorimer. It boasts a membership which includes virtually all women in this city prominent in Republican politics. The *Philadelphia Ledger* unfolds the story as follows:

In "hunting about for a good man to be the next Mayor," Mrs. Lorimer requested Mrs. Rudolph Blankenburg, honorary president of the organization, to ascertain Mr. Mitten's views of the matter and tell him that many persons in this city would like to see him run in the next mayoralty race. Furthermore, he was requested to say whether or not he would consent to be boomed for the office.

In reply to Mrs. Blankenburg, Mr. Mitten stated that he was too busy at this time to enter politics and that he couldn't consider the matter for some time.

"But Mr. Mitten didn't say that he wouldn't consider the matter," said

Mrs. Lorimer, after learning of Mr. Mitten's reply. "The organization which I head feels it is important to place its support squarely behind a worthy candidate. We want to be ready to assist such a man. Many of us feel that Mr. Mitten could do a great deal for Philadelphia. That is why he was asked to consent to enter the race."

Iowan Heads Utility Commissioners

Dwight N. Lewis Chosen at Detroit as President of National Association of Railway and Utilities Commissioners

Dwight N. Lewis was elected president of the National Association of Railway and Utilities Commissioners at the meeting of the members of the association in Detroit during the week



D. N. LEWIS

ended Nov. 18. A lawyer by profession, Mr. Lewis entered the employ of the commission of which he is now a member twenty-five years ago when he was the whole office force in charge of its accounting, secretarial work, rate work and reporting. He went into training as a commissioner right then and gradually advanced to secretary and later to counsel for the commission, which position he held for six years. He was then appointed to fill out an unexpired term and was elected in 1918 to a four-year term. He has just been re-elected for another four-year term by a majority of 200,000, one of the largest Republican votes ever given in that state.

Mr. Lewis is noted for his thorough and consistent work as an Iowa commissioner. Not only does he stand high in the estimate of Iowans, but also in the estimate of every public service commissioner in the United States. For twenty-three years he has been a member of the national association and has done an immense amount of committee work and all the other things which go to make association activities

useful. The election of Mr. Lewis at Detroit to the presidency of the association for the ensuing year was one of the most popular which that association has had.

Mr. Lewis is a native Iowan. He was graduated from the Drake University Law School at Des Moines, Iowa. His ideal as a public service commissioner is so to regulate the utilities that they may be permitted to grow to serve the public adequately.

Another Railway Man Makes the Grade

Some few weeks ago it was said in these columns in recording the accomplishments of W. B. Yereance that railway men did not usually succeed in "Making the Grade" in the sense that the *New York Globe* uses the phrase. It was explained then that this was probably so because in railroad life the opportunity seldom presented itself for spectacular or quick success. And just as though it desired to prove that this is not entirely true or taking to heart the fact that it had been chided for its seeming neglect of railway men, the *Globe* in its issue of Nov. 21 nominated a railway man to its gallery of notables.

Now there are many local railroad men fairly well known to New Yorkers, but the *Globe* picked a street railway man. He was none other than Frank Hedley. As for romance and accomplishment, there are perhaps few other careers that offer such possibilities as his. Mr. Hedley comes from a family of railroaders. His great uncle had a great deal to do with perfecting the first locomotive. In fact as between William Hedley, for that was the great-uncle's name, and George Stephenson there appears to have been almost the same parallel in applying new theories that happened in the case of Darwin and Wallace in their biological discoveries.

From such surroundings did Mr. Hedley spring. The rungs of the ladder on which he climbed from machinists' helper to head of the Interborough Rapid Transit Company are too well known to railway men to be repeated now. To them his philosophy is of greater interest. In the *Globe* Mr. Hedley says: "The best way to make a living is to be able to produce; convince the other fellow that you know how to do it—then make him pay you well for it."

A. W. Thompson Elected Pennsylvania Director

Arthur W. Thompson, Pittsburgh, was elected a director of the Pennsylvania Railroad on Nov. 22 to succeed the late Thomas De Witt Cuyler. Mr. Thompson is president of the Philadelphia Company and the Pittsburgh Railways. He was vice-president in charge of operation and traffic of the Baltimore & Ohio Railroad before becoming head of the Philadelphia Company.

Manufactures and the Markets

DISCUSSIONS OF MARKET AND TRADE CONDITIONS FOR THE
MANUFACTURER, SALESMAN AND PURCHASING AGENT

ROLLING STOCK PURCHASES

BUSINESS ANNOUNCEMENTS

Does It Pay to Use Home-Made Repair Parts in Signals

The User Cannot Expect the Manufacturer to Be Responsible for Results Unless
Worn Parts Are Replaced with Standard Duplicates

BY CARL P. NACHOD

President Nachod Signal Company, Inc., Louisville, Ky.

Manufacturers of block signals for electric railways have successively improved their designs, both by using materials of recent development (and this especially as regards insulation) and incorporating the results of experience as revealed by a close following-up of actual service conditions; as well as by embodying the oft-times valuable suggestions of users. Thus modern equipment contains all improvements that tend to simplify operation, reduce maintenance cost and contribute to safety.

NORMAL WEAR VERY SLIGHT

During their service electric railway signals depreciate little by normal wear, but are subject to occasional high voltages, as from lightning or other surges, which often result in the destruction of insulation. Also accidents to the signal line wires, such as grounding, or crossing with other high-voltage wires, cause roasting out and destruction of magnets and resistors, so that repairs eventually have to be made.

The subject of maintenance is fundamental and of prime importance to the railway, which should use the proper materials and most efficient system to insure economical results. Many railways carry a sufficient stock of the manufacturer's spare parts, for they realize that primarily they are operators, and not manufacturers, and have found it to their advantage to recognize such a dividing line for the general good of the industry. Railways sometimes claim that by making their own repair parts they do so at a lower cost, but it will generally be found that their accounting systems do not take into consideration the proper allocation of the overhead charges that should be made.

HOME-MADE PARTS COSTLY

The ultimate cost of home-made parts is higher in most cases for at least one reason, namely, that the quality is not up to the standards of the manufacturers. They are indeed best fitted to produce reliable and interchangeable renewal parts. They have skilled and specialized workmen and trained engineering and inspection organizations to insure that only the best and most suitable materials are used, and that all important details are com-

plied with during manufacture to produce renewal parts of first quality that go into the old location without any fitting. It is also true that when the railway makes its spare parts these are literal copies of the original design. Progressive manufacturers, on the other hand, through their research and the work of their design engineers, continually improve their product by the use of the most suitable materials, and improved and up-to-date shop equipment. These improvements are, of course, not incorporated in the home-made parts. Probably one most valuable benefit of all is forfeited in that the railway loses personal touch with the manufacturer. It consequently does not get the full co-operation and assistance from his expert service department. By using the manufacturer's parts, however, railway operators put themselves in a position to receive suggestions as to improved methods of operation, testing and location of troubles and defects. All of this results in decreased expense and improved operation.

CASES OF FALSE ECONOMY CITED

A few cases from the writer's experience will serve to show the false economy of using home-made parts.

A brass rod on a magnet plunger broke after some eight years of service in a certain signal, and the railway replaced it with a home-made part, the dimensions of which were not sufficiently accurate. As a consequence, the signal failed intermittently, perhaps once or twice a week, and more than two weeks time on the part of an employee was required to watch the signal, catch such a failure and disconnect to find the affected parts. Not only was the good service and reputation of the signal affected adversely thereby, but the cost of the man's time to discover the trouble must have been hundreds of times the total cost of the part referred to.

In another case one of our users had replaced with Chinese copies one of the patented elements in our signal system, but the steel used in the part had not the proper temper and would not hold its shape, while the inferior insulation broke down in the presence of moisture.

Another user made some parts, simplifying them by leaving out what

seemed to him useless openings, but after he had assembled these in the signal it was discovered that he had destroyed accessibility, and there was no way to reach certain assemblies in the relay unit.

The manufacturer is interested at all times to have the railway obtain the best service from his apparatus. To that end he is willing to give all available instruction not only in the form of printed manuals or by sending an expert to confer with the maintainer and to inspect the actual signals by visits in the field with him, but even in training the maintainer at the manufacturer's shops. The latter course is greatly to be recommended, and has produced remarkable results in low maintenance. The writer has found that without this training the continuous and unnecessary destruction of parts due to a wrong diagnosis of an existing trouble is considerable, and furthermore the ordering of spare parts is not intelligently done.

If the maintainer would exercise as much zeal in analyzing and recognizing the conditions that cause damage and keeping them away from his installations as he does to make his own parts a great deal would be accomplished.

Post Office Department Co-operates With Business Houses

The use of antiquated and antedated mailing lists by business concerns sending out advertising matter and circular letters is resulting in serious economic waste, the Post Office Department averred recently.

Besides the delays undergone by the postal machinery in handling and re-handling vast quantities of this class of mail, which is incorrectly addressed in most instances, the loss suffered by the mail order houses and other large users of mail runs into thousands of dollars annually.

In an effort to put an end to this tremendous waste of energy and time instructions were issued to postmasters throughout the country to co-operate with business concerns in correcting and revising their mailing lists. A charge of 60 cents an hour may be made for this service, according to the order issued by Postmaster-General Work.

Metal, Coal and Material Prices

Metals—New York		Nov. 21, 1922
Copper, electrolytic, cents per lb.		13.90
Copper wire base, cents per lb.		15.625
Lead, cents per lb.		7.10
Zinc, cents per lb.		7.50
Tin, Straits, cents per lb.		36.625
Bituminous Coal, f.o.b. Mines		
Smokeless mine run, f.o.b. vessel, Hampton Roads, gross tons		\$8.00
Somerset mine run, Boston, net tons		4.125
Pittsburgh mine run, Pittsburgh, net tons		3.37
Franklin, Ill., screenings, Chicago, net tons		2.625
Central, Ill., screenings, Chicago, net tons		1.87
Kansas screenings, Kansas City, net tons		2.50
Materials		
Rubber-covered wire, N. Y., No. 14, per 1,000 ft.		6.50
Weatherproof wire base, N. Y., cents per lb.		16.00
Cement, Chicago net prices, without bags		\$2.20
Linseed oil (5-bbl. lots), N. Y., cents per gal.		90.00
White lead, (100-lb. keg), N. Y., cents per lb.		12.125
Turpentine, (bbl. lots), N. Y., per gal.		\$1.59

Rolling Stock

Elmira Water, Light & Railroad Company, Elmira, N. Y., is placing an order for four new safety cars similar to the eighteen now in use on the lines in Elmira.

St. Petersburg, Fla.—Voters of St. Petersburg will decide on Dec. 5 whether they approve a bond issuance of \$30,000 for the purchase of cars for the local municipal railway.

New York & Queens County Railroad, New York, N. Y., suffered the loss of three trolley cars and a tower repair wagon in a recent fire at the Woodside carhouse. The loss was estimated at \$10,000, all covered by insurance.

New York, New Haven & Hartford Railroad, New York, N. Y., has increased its contract for five electric locomotives with the Westinghouse Electric & Manufacturing Company until a total of twelve locomotives are now covered by the contract. When the twelve new locomotives are put into service there will be 117 Baldwin Westinghouse freight, passenger and switcher type locomotives in operation on this road. The original order was referred to in the *Electric Railway Journal*, issue of Oct. 14.

Track and Roadway

Savannah Electric & Power Company, Savannah, Ga., will soon start work on constructing the track and necessary overhead equipment south on Ott Street from Anderson to Thirty-fourth and thence on Thirty-fourth Street to the present line on Waters Road.

Capital Traction Company, Washington, D. C., has started work on its extension over the new Georgetown bridge. The job will not be completed before spring and will cost \$160,000. This extension will make possible the first through car route from Rosslyn, Va., to Washington.

Boise Valley Traction Company, Boise, Idaho, has completed the new belt line. Two blocks of track have been laid on Brumback Street between Eighth and Tenth Streets. The light rail on Ridenbaugh Street, over which the Boise Street Car Company will route its cars, has been replaced by heavier stock taken up from Tenth Street.

Southern Pacific Company, San Francisco, Calif., has received permission from the Railroad Commission to construct a track at grade across east Twenty-fifth Street and across Alameda Street and to relocate two of its tracks at grade across East Twenty-fifth Street in the city of Vernon. The company was also granted permission to construct a spur track at grade across Beck Street in Oakland.

New York, N. Y.—The Transit Commission has awarded the contract for constructing the column foundation for part of the Flushing extension of the

Corona branch of the Queensboro Subway to the Gustin-Morris Contracting Corporation of Long Island City. Its bid of \$91,613 was the lowest. The commission also announced the awarding of a contract for concreting voids under the platform of the Eighth Street station of the Broadway subway, New York, to Edwards & Flood, Inc., lowest bidders, at \$1,236.

Power Houses, Shops and Buildings

Savannah Electric & Power Company, Savannah, Ga., has begun work on the repairing and reinforcing of the bulkhead and wharf at the Riverside power station. The contract for this work was awarded to David Power, contractor.

Union Traction Company of Indiana, Anderson, Ind., has announced that it will enlarge its central power plant at Anderson to provide sufficient power to operate all its electric car lines, of about 460 miles. Additional high-tension feed lines will carry power to substations at Muncie, Union City, Bluffton, Peru, Indianapolis, Logansport, Wabash, Warsaw, Newcastle and smaller towns.

New York, New Haven & Hartford Railroad, New York, N. Y., will install a new turbine-generator in its Cos Cob station, to take care of an increased load due to the placing in service of twelve new high-speed passenger locomotives. Both the locomotives and the turbine-generator are being constructed by the Westinghouse Electric & Manufacturing Company. The new turbine-generator is a 9,000-kw., single-phase, 25-cycle unit. The turbine is designed to carry 12,500 kw. and the generator to take these peaks for a period of five minutes. In the order received by the Westinghouse Company for this apparatus is also included switching equipment for control of the turbine-generator exciter.

Trade Notes

American Mason Safety Tread Company, New York, N. Y., announces that J. W. Scott, formerly sales manager of its New York office, has severed his connection with the company. The management of the office is now under the direction of A. T. Dulfer.

Nic Le Grand, Inc., Rock Island, Ill., announces that it is the representative of the Burry Railway Supply Company for Hartman ball bearing center plates and roller side bearings. Nic Le Grand covers the states of Kentucky, Indiana, Illinois, Wisconsin, Michigan, Missouri, Iowa and Nebraska.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., will supply the West Penn Power Company with two 30,000-kw. turbo-generators with surface condensers for installation in its Springdale plant. It is expected that the equipment covered in the contract will be ready and installed in December, 1923.

Clark-Williams Engineering Company, Bridgeport, Conn., has recently been incorporated to manufacture and deal in poles, railway, structures and other equipment for the support of wires, rails and overhead structures. The capital stock of the concern is \$10,000, and the officers are: Roland G. Williams, president; Arthur L. Clark, Bridgeport, treasurer.

C. F. Bulotti Machinery Company, San Francisco, Calif., has moved into its new storeroom at 67-71 Main Street. The new location is in the heart of the machine tool district and gives ample room for display as well as office facilities and immediate shop repair work. This firm has made rapid progress within the last year and is now recognized as one of the leading machine tool houses in central California.

The Norwalk Iron Works Company, South Norwalk, Conn., pioneer builders of compressors, manufacturing air and gas compressors for all purposes and also refrigerating machinery, has just opened a Chicago office. It is located at 627 West Washington Boulevard and is in charge of L. R. Bremser, who for thirteen years was associated with the Gardner Governor Company. He is thoroughly familiar with all angles of the compressor business.

New Advertising Literature

Roller-Smith Company, New York, N. Y., has issued Bulletin No. B-20, describing in detail its phone and loud speakers.

The Sterling Varnish Company, Pittsburgh, Pa., has published a forty-eight-page booklet with accounts of its insulating varnishes, impregnating compounds and baking enamels. Diagrams and descriptive matter tell about vacuum pressure impregnation in general.

Columbia Machine Works, Brooklyn, N. Y., has issued a beautiful thirty-one-page illustrated booklet. This is the first catalog of the kind this company has published. The first page gives a little history of the company referring to the Columbia Service to railways.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has reprinted an article on the "Advantages of Railroad Electrification" by R. J. O'Brien of its heavy traction department that appeared recently in the technical press. The publication is known as reprint No. 128. In answer to the question, "Why electrify?" and "What are the advantages of electrification?" statistics and data acquired from actual operating records on both steam and electric roads serve as a means of comparing the two methods of operation. These statistics touch on fuel consumption, maintenance costs, schedules possible under existing modes of transportation, and other subjects of importance. The feasibility of electric operation in tunnels, on heavy mountain grades, in congested freight yards, or in heavy interurban traffic is also clearly set forth.

Can One Man Operate Double-Truck Cars With Safety?

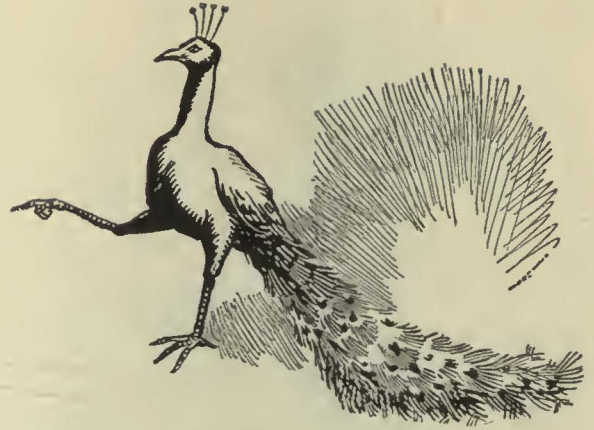
Not an academic question, but a practical one which is being put up to railway officials by employees, public service commissions and safety engineers. And the answer, "Yes," must be backed up by a demonstration that suitable equipment has been provided to insure absolute safety despite any emergency which may arise.

Remove the Element of Risk

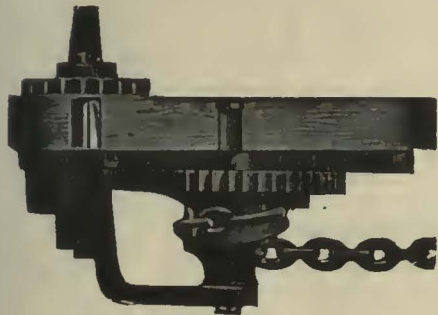
Next to the equipment which *makes the car go*, that which *makes it stop* is all important. The best air brake system that money can buy, backed up by the best hand brake on the market is the only sound and logical policy to follow.

The Peacock Improved Brake with its unique eccentric chain-winding drum, is the fastest brake in an emergency application, and most powerful brake under any conditions.

With Peacock Brakes on the cars, there is created at once a strong assurance of safety.



PEACOCK IMPROVED BRAKES



NATIONAL BRAKE COMPANY, INC.

890 ELLICOTT SQUARE, BUFFALO, NEW YORK

Canadian Representative: Lyman Tube & Supply Co., Montreal, Can.



What do your "Out of Service" signs really mean?

THERE are 831 street railways in the United States.

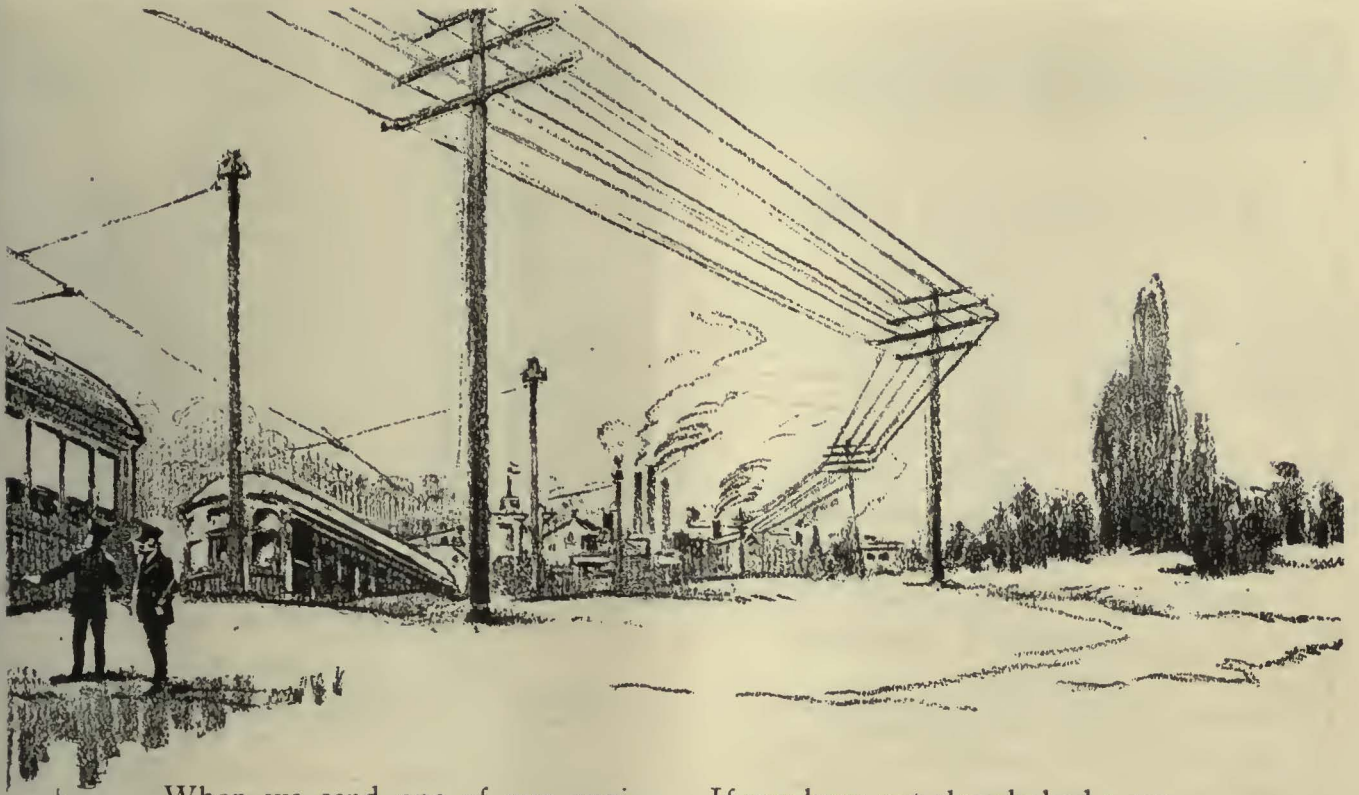
We don't know how many "Out of Service" signs there are in the various car barns of these railways.

We do know that they decorate the 100,000 cars of the country far too often.

We speak from 56 years' experience when we say this: The commonest cause of repairs on cars is traceable directly to incorrect lubrication. "Out of Service" signs often mean that you have not yet solved your lubrication problems.

Grant that fact for a moment. It may start you thinking.

VACUUM OIL COMPANY



When we send one of our engineers to talk lubrication with your Equipment Superintendent, he will not be sent as an oil salesman. We wish to make that point clear.

Our first thought is to see if a scientific study of your lubrication problems will point the way to lower operating costs. Your order for supplies of the correct oils is the last thing we need talk about.

If you have not already had a conference with a Vacuum Oil Company engineer, we suggest that an hour with him will be time well spent.

The great fund of Vacuum Oil Company experience in reducing maintenance and upkeep cost through correct lubrication—probably the widest experience in the world is at your service. In writing, kindly address our nearest branch office.



Lubricating Oils

A grade for each type of service

Domestic Branches:

New York (Main Office)
Rochester

Boston
Indianapolis

Chicago
Minneapolis

Philadelphia
Buffalo

Pittsburgh
Des Moines

Detroit
Kansas City, Kan.

Albany
Dallas

VACUUM OIL COMPANY



CARNEGIE Wrought Steel Wheels

You demand high mileage at low cost per mile. This demand is met in the special process by which Carnegie Wrought Steel Wheels are manufactured.

The Wheel for Real Service.

Carnegie Steel Company

GENERAL OFFICES - - Carnegie Building - - PITTSBURGH, PA.

1579

The Corporation Service Bureau

D. H. Boyle, President L. A. Christiansen, Vice President
A. R. McLean, General Manager

LABOR ADJUSTERS

Investigations—Inspections—Confessions

GENERAL OFFICES:

Suite 1215, Ulmer Building, Cleveland, Ohio

Dwight P. Robinson & Company

Incorporated

Design and Construction of

Electric Railways, Shops, Power Stations

125 East 46th Street, New York

Chicago
Los Angeles

Youngstown
Montreal

Dallas
Rio de Janeiro

SERVICE EFFICIENCY ECONOMY

TIME-TABLE SERVICE

TRAFFIC EXPERTS

CITY AND INTERURBAN RAILWAYS

The Jas. H. Crosett Co.
ENGINEERS

348 Carl St.
San Francisco, Calif.

THE P. EDWARD WISH SERVICE

50 Church St.
NEW YORK

Street Railway Inspection
DETECTIVES

131 State St.
BOSTON

When writing the advertiser for information or prices, a mention of the Electric Railway Journal would be appreciated.

A Really Useful Wiring Handbook

This book will enable the inexperienced as well as experienced wiremen to meet the requirements of the National Electrical Code.



Croft's Wiring for Light and Power

426 pages, flexible, pocket size, \$3.00 net, postpaid

A Wiring Handbook

That fits the requirements of the National Code.

That conforms to the best American practice.

That is indexed so that you can find instantly the facts you need.

That is a common sense, practical commentary on the National Electrical Code.

That tells how to install wiring and apparatus for practically all services, under practically all conditions.

That tells how to install these so as to be electrically safe and mechanically correct.

That explains why installations should be made in a given way.

Examine it
for 10 days
FREE

McGraw-Hill Book Co., Inc.
370 Seventh Avenue, New York, N. Y.

You may send me on 10 days' approval.

Croft's Wiring for Light and Power, \$3.00. I agree to remit for the book or return it postpaid within 10 days of receipt.

Member of A. I. E. E.?
Subscriber to Electric Railway Journal?..

Signed.....
Address..... Official Position.....
Name of Company..... F.E.



PORTLAND RAILWAY, LIGHT AND POWER CO.
PORTLAND, OREGON

9-5-22

My dear Mac:-

I guess folks read the Journal, all right.

I have had over 30 requests for copies of our little publication: "Outing Days by Trolley" as a result of your announcement in your issue of August 26th, and I want to assure you that I am very grateful for giving us this notice.

Hope I can do something for you some time.

Yours and everything.

Outing Days by Trolley

"OUTING Days by Trolley" is the kind of publicity folder that makes you want to go. And in the last analysis that is saying that it is the highest form of advertising, for the principles which the ad writer keeps always in mind are: (1) Attract attention; (2) sustain the interest; (3) compel action. W. P. Strandborg, publicity agent of the Portland Railway, Light & Power Company, Portland, Ore., has done all three. Page one lists as attractions along the company's lines picnicking, camping, dancing, bathing, fishing and hiking, with a thought thrown in about chicken dinners. Best of all, the intending excursionist after having all these attractions called to his attention is told on page ten, the last page of the folder, that there are reduced round-trip rates, good Sundays only, to Ostacada, at \$1 and to Bull Run and Dodge Park at 75 cents.

Bree Strandborg

This was the item

*They certainly do read it -
text and ads -*

Electric Railway Journal



Time and Safety

How much are they worth in your carshop?

Have you ever stopped to figure the dollar and cents value of time wasted by mechanics crawling around, working in dim light and constrained positions, on inspection and repair work underneath the cars? Must you wait until some costly accident to a man in the pits startles you into realization of the unnecessary risk?

COLUMBIA Electric Car Hoists

save time of shop men and make their work safer. It is quicker and easier, more efficient and more economical to work on a car from the floor level than from underneath.

This equipment will raise a 50-ton car six feet in less than five minutes, and any old discarded car motor will operate it. A typical installation is shown above.

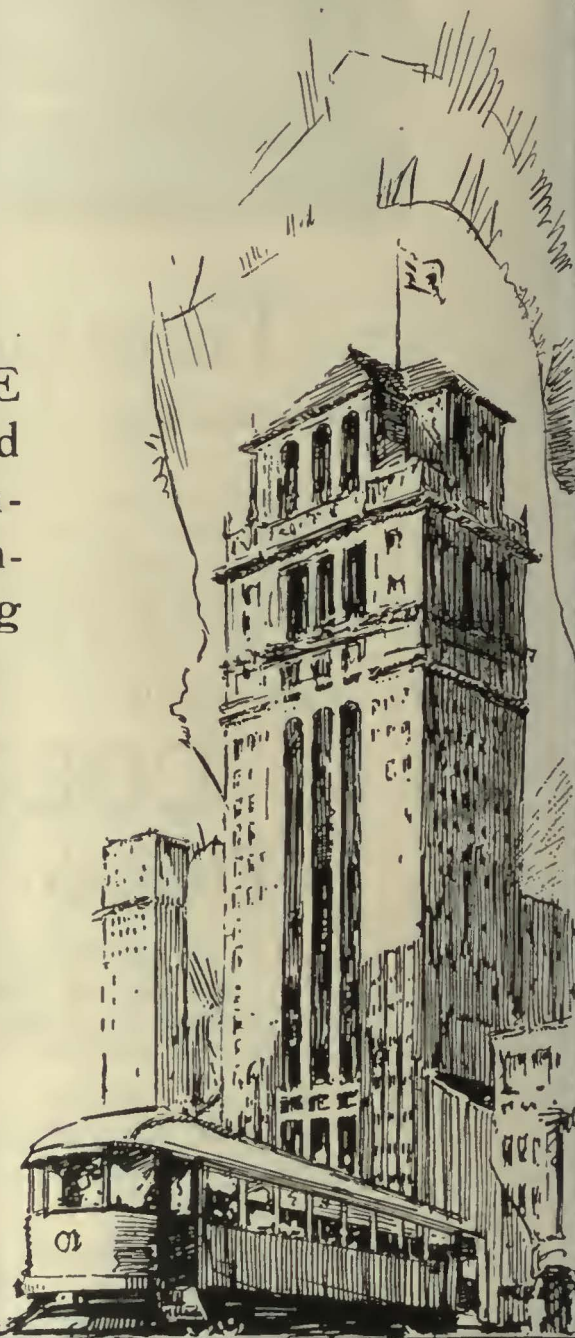
A Columbia Electric Car Hoist will pay for itself in a short while, by savings in time of labor, and eliminating of certain accident hazards.

Write for information.

**The Columbia Machine Works
and Malleable Iron Company**
Atlantic Ave. and Chestnut St., Brooklyn, N. Y.

A. A. Green, Sales Mgr., Brooklyn, N. Y.
E. Keller, Brooklyn, N. Y.
F. C. Hedley, Brooklyn, N. Y.
J. L. Whittaker, 141 Milk St., Boston, Mass.
E. Allison Thornwell, 1513 Candler Bldg., Atlanta, Ga.
F. F. Bodler, 903 Monadnock Bldg., San Francisco, Cal.

COLLIER SERVICE sustains car card space value by maintaining a nation-wide organization of car advertising experts.



CANDLER BUILDING, THE HOME OF COLLIER SERVICE.



Barron G. Collier
INCORPORATED

CANDLER BLDG NEW YORK

V-K OILLESS TROLLEY WHEEL and NON-ARCING HARPS



V-K Wheels are properly balanced and exceedingly tough, which means greater durability for both wheel and wire. — Perfect lubrication is provided by a patented oilless bushing, which is non-insulating, heat proof, long lived and easily interchangeable.

MORE-JONES BRASS & METAL CO.
St. Louis, Missouri

TROLLEY WHEELS
V-K Oilless, M-J Lubricated
HARPS: *V-K Non-Arcing*

BEARINGS: *"Tiger" Bronze*
Axle and Armature

ARMATURE BABBITT
and Similar Products

MORE-JONES QUALITY PRODUCTS

Have you noticed?
Every time a "Question Box"
asks gear data, the answers
cite the records of
Cincinnati "Tool Steel."

Is Money Ever "Spent" for Advertising?

A young and energetic executive took hold of a fine old business in New York.

"What this business needs," he told himself, "is a place in the mind of the public."

And deliberately he set out to sacrifice the greater volume of his profits and invest the sacrifice into the building of good will.

He did. And to this old business, advertising was the breath of life.

For six months had not passed before the business had grown so that the

advertising cost was a smaller percentage than ever it had been, and, because of a larger volume, the shop effected economies and gave far superior service.

That was five years ago. Today a certain percentage is spent, or supposed to be spent, for advertising. But as fast as the appropriation is spent, the more the business increases; and the more that the business increases, the smaller the percentage becomes.

Is money ever "spent" for advertising?

HALE & KILBURN SEATS

are the BEST for One Man Safety Cars

*Our Patented Space-Saving Feature
gives 1½ inches more space for each Passenger*



*Lightest Weight
Stationary
Steel Seat*

**Lightest
Strongest
Simplest
Neatest**



*Lightest
Weight
Walkover
Steel Seat*

*Yet no higher in price than others
Specify H & K Seats for Your New Cars*

Hale & Kilburn Corporation
American Motor Body Company, Successors
PHILADELPHIA

New York

Chicago

Washington

Atlanta

San Francisco

Los Angeles

Experimenting is Expensive

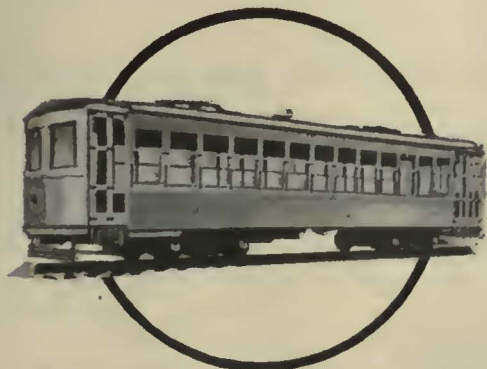
*We've done it for you on
the double truck one-man car*

THE UNIVERSAL SAFETY CAR

Don't waste your time and money drawing up plans for new cars. We have done the experimenting, testing, designing and building. Here it is—a standardized, 54-seat, double-truck, one-man or two-man car. Remember that standardization and quantity production means lower first cost and lower maintenance

Various arrangements of doors and platforms are optional.

Send for details and specifications.



St. Louis Car Company
St. Louis, Mo.

"The Birthplace of the Safety Car"



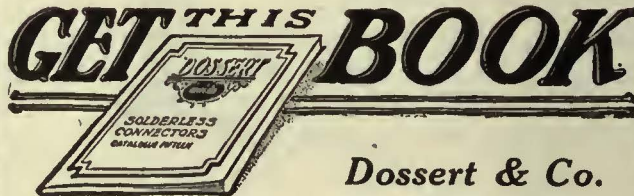
Connecting
a branch
to the main

How the big Power Co's do it

There is economy in making every electrical connection by the Dossert Solderless method—giving greater conductivity than the wire itself—and without the fuss, danger and damage to insulation that high heat imposes.

The Dossert 15th Year Book below illustrates and describes the services of the different connectors.

This is a
**DOSSERT
SOLDERLESS
Calbe Tap**



FREE

Dossert & Co.

242 West 41st St.
New York, N. Y.

ELRECO TUBULAR POLES



COMBINE

Lowest Cost **Lightest Weight**
Least Maintenance **Greatest Adaptability**

Catalog complete with engineering data sent on request.

ELECTRIC RAILWAY EQUIPMENT CO.
CINCINNATI, OHIO
New York City, 30 Church Street

Peirce Forged Steel Pins with Drawn Separable Thimbles

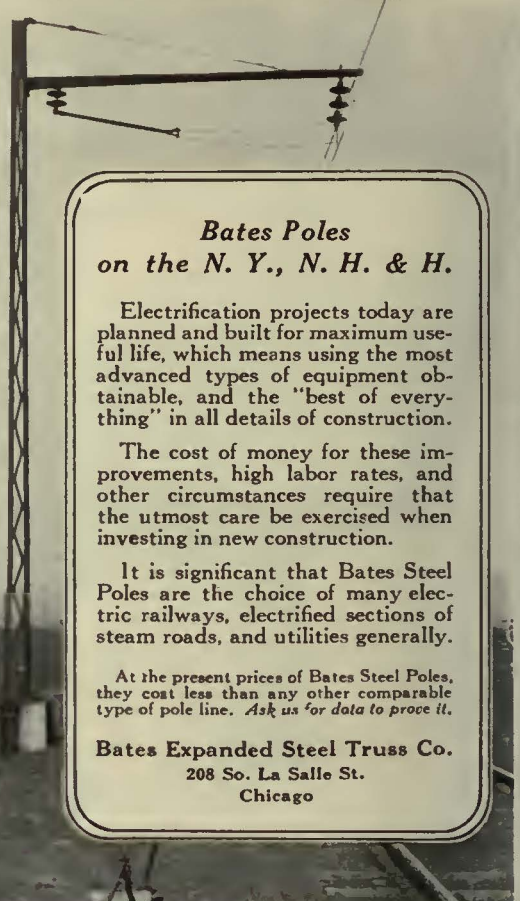
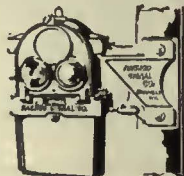
Your best insurance against insulator breakage

Hubbard & Company
PITTSBURGH, PA.

AUTOMATIC SIGNALS

Highway Crossing Bells
Headway Recorders

NACHOD SIGNAL COMPANY, INC.
LOUISVILLE, KY.



Bates Poles on the N. Y., N. H. & H.

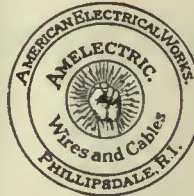
Electrification projects today are planned and built for maximum useful life, which means using the most advanced types of equipment obtainable, and the "best of everything" in all details of construction.

The cost of money for these improvements, high labor rates, and other circumstances require that the utmost care be exercised when investing in new construction.

It is significant that Bates Steel Poles are the choice of many electric railways, electrified sections of steam roads, and utilities generally.

At the present prices of Bates Steel Poles, they cost less than any other comparable type of pole line. Ask us for data to prove it.

Bates Expanded Steel Truss Co.
208 So. La Salle St.
Chicago



AMELECTRIC PRODUCTS

BARE COPPER WIRE AND CABLE

TROLLEY WIRE

**WEATHERPROOF WIRE
AND CABLE**

**PAPER INSULATED
UNDERGROUND CABLE**

MAGNETIC WIRE

Reg. U. S. Pat. Offs
Galvanized Iron and Steel
Wire and Strand
Incandescent Lamp Cord

AMERICAN ELECTRICAL WORKS
PHILLIPSDALE, R. I.

Boston, 176 Federal; Chicago, 112 W. Adams;
Cincinnati, Tractor Bldg.; New York, 233 B'way

NASHVILLE TIE COMPANY

Cross Ties: White Oak, Chestnut, and Treated Ties.
Oak Switch Ties.

Prompt shipment from our own stocks.

Headquarters—Nashville, Tenn.

A. D. Andrews, Terre Haute, Ind., Representative.



U. S. Electric Contact Signals for

Single-track block-signal protection
Double-track spacing and clearance signals
Protection at intersections with wyes
Proceed signals in street reconstruction work

United States Electric Signal Co.
West Newton, Mass.

"RIMCO" Insulated Screw Driver



The only SAFE Screw Driver for linemen and all high tension work

7 1/2" 8 1/2" 10 1/2"

Tested and passed at 5,000 volts by Electrical Testing Laboratories of N. Y. City.

Semi-soft rubber insulation bonded to metal by Elchemco process. Insulation cannot crack or work loose.



Rubber Insulated Metals Corporation
50 Church Street, New York City, U. S. A.
Distributed by The Electric Service Supplies Co., and other distributors
Export Distributor: International Western Electric Co.

International Creosoting & Construction Co.
Galveston, Texas

Plant—Texarkana Beaumont Galveston

MONEY SAVERS TO RAILWAYS

Treated railway ties, poles, piling, bridge timbers, etc.

See our full page advertisement in last week's issue.

American Rail Bonds

CROWN
UNITED STATES
TWIN TERMINAL
SOLDER
TRIPLEX

Arc Weld and Flame Weld

Send for new Rail Bond Book

American Steel & Wire Company
CHICAGO
NEW YORK

Chapman Automatic Signals

Charles N. Wood Co., Boston



AETNA INSULATION LINE MATERIAL

Third Rail Insulators, Trolley Bases, Harps and Wheels, Bronze and Malleable Iron Frogs, Crossings, Section Insulators, Section Switches

Albert & J. M. Anderson Mfg. Co.

289-03 A Street Boston, Mass.

Established 1877

Branches—New York, 135 B'way.

Philadelphia, 429 Real Estate Trust Bldg. Chicago, 105 So. Dearborn St.
London, E. C. 4, 38-38 Upper Thames St.



ANACONDA TROLLEY WIRE

ANACONDA COPPER MINING COMPANY
Rolling Mills Department
CHICAGO, ILL.



THE AMERICAN BRASS COMPANY
General Offices
WATERBURY, CONN.



INSULATED WIRES AND CABLES
JOHN A. ROEBLING'S SONS CO., TRENTON, NEW JERSEY

FLOOD CITY

Rail Bonds and Trolley Line Specialties

Flood City Mfg. Co., Johnstown, Pa.

Transmission Line and Special Crossing Structures, Catenary Bridges

WRITE FOR OUR NEW DESCRIPTIVE CATALOG

ARCHBOLD-BRADY CO.

Engineers and Contractors

SYRACUSE, N. Y.

Ramapo Iron Works
Established 1891

Ajax Forge Company
Established 1883

RAMAPO AJAX CORPORATION

Successor

HILLBURN, NEW YORK

Chicago New York Superior, Wis. Niagara Falls, N. Y.

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

STANDARD

Wires, Cables, Cable Accessories
Superior quality, economical prices
Standard Underground Cable Co.
Boston Philadelphia Pittsburgh Detroit
New York Washington Chicago S. Louis
San Francisco

THE INDIANAPOLIS SWITCH & FROG CO., SPRINGFIELD, OHIO
Indianapolis Economy Products That Make Dollars "Grow"

Indianapolis Solid Manganese:

Frogs, Crossings, Mates and Tongue-switches. Super-quality material. Par-excellent designs. Gives many lives to one, of ordinary construction, and when worn down, CAN BE RE-STORRED by INDIANAPOLIS WELDING.

Indianapolis Electric Welder:

Efficient, Rapid, ECONOMICAL, Durable. Price, \$2.00 (per day for three hundred days) thoroughly dependable every day in the year, upkeep about 75 cents per month. LAST A LIFE TIME.

Indianapolis Welding Steel:

Fluxated heat treated Metal Electrodes, insure Uniform Dependable Welds that are from 75 per cent to 100 per cent more efficient, than the "MELT," from the same High Grade basic stock, untreated.

Indianapolis Welding Plates:

Eliminate "Joints" and "Bonds" in Street Track. Higher in Strength and Conductivity than the unbroken Rail. Installed according to instructions, have proven THOROUGHLY DEPENDABLE, during 10 YEARS of "Time and Usage" TEST. Extensively used in 48 STATES and COUNTIES. Recognized as paramount MAINTENANCE ELIMINATORS.

Indianapolis Welding Supplies:

CABLES, HELMETS, LENSES, CARBONS.

Turntables:

Ball-bearing, for ash-pits, storage yards, etc.

Indianapolis "Economy" Products

are Pre-eminently "Money Savers," YES—"Money Makers" for Electric Railways.

THE WORLD'S STANDARD
"IRVINGTON"

Black and Yellow
 Varnished Silk, Varnished Cambric, Varnished Paper

Irr-O-Slot Insulation Flexible Varnished Tubing
 Insulating Varnishes and Compounds

Irvington Varnish & Insulator Co.
 Irvington, N. J.

Sales Representatives in the Principal Cities

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
 Kerwin Portable Crossovers
 Balkwill Articulated Cast Manganese Crossings
 ESTIMATES PROMPTLY FURNISHED

High-Grade Track Work

SWITCHES—MATES—FROGS—CROSSINGS
 COMPLETE LAYOUTS
 IMPROVED ANTI-KICK BIG-HEEL SWITCHES
 HARD CENTER AND MANGANESE
 CONSTRUCTION

New York Switch & Crossing Co.
 Hoboken, N. J.

SPECIAL TRACKWORK

Of the well-known WHARTON Superior Designs
 and Constructions

Steel Castings	Forgings	Gas Cylinder
Converter and	Drop Hammer	Seamless
Electric	and Press	Steel

Wm. Wharton Jr. & Co. Inc., Easton, Pa.
 (Subsidiary of Taylor-Wharton Iron & Steel Co.,
 High Bridge, N. J.)

ORIGINATORS OF
MANGANESE STEEL TRACKWORK

Corrugated Culverts

"ACME" (Nestable) and IMPERIAL Riveted Corrugated Culverts.
 Made of anti-corrosive Toncan Metal. Write for prices.



RWB DYNAMOTORS

FOR
 CARBON ARC RAIL JOINT WELDING
 CARBON ARC RAIL BONDING
 CARBON and METALLIC ARC GENERAL WELDING
 Rail Welding and Bonding Co., Cleveland, O.

FOSTER SUPERHEATERS

A necessity for turbine protection, engine cylinder economy and utilization of superheat for all its benefits

POWER SPECIALTY COMPANY, 111 BROADWAY, NEW YORK

Boston Philadelphia Pittsburgh Kansas City Dallas Chicago San Francisco London, Eng.

THE BABCOCK & WILCOX COMPANY

85 LIBERTY STREET, NEW YORK

Builders since 1868 of
Water Tube Boilers
of continuing reliability



Makers of Steam Superheaters
since 1898 and of Chain Grate
Stokers since 1893

BRANCH OFFICES

BOSTON, 49 Federal Street
PHILADELPHIA, North American Building
PITTSBURGH, Farmers Deposit Bank Building
CLEVELAND, Guardian Building
CHICAGO, Marquette Building
CINCINNATI, Traction Building
ATLANTA, Cadler Building
TUCSON, ARIZ., 21 So. Stone Avenue
DALLAS, TEX., 2001 Magnolia Building
HONOLULU, H. T., Castle & Cooke Building

BRANCH OFFICES

DETROIT, Ford Building
NEW ORLEANS, 521-5 Baronne Street
HOUSTON, TEXAS, Southern Pacific Building
DENVER, 435 Seventeenth Street
SALT LAKE CITY, 705-6 Kearns Building
SAN FRANCISCO, Sheldon Building
LOS ANGELES, 404-6 Central Building
SEATTLE, L. C. Smith Building
HAVANA, CUBA, Calle de Aguiar 104
SAN JUAN, PORTO RICO, Royal Bank Building

WORKS

Bayonne, N. J.
Barberton, Ohio



We make a specialty of
**ELECTRIC RAILWAY
LUBRICATION**

We solicit a test of TULC
on your equipment.

The Universal Lubricating Co.
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W & B
"Railroad Special"
Wrenches

Unexcelled for Heavy Duty
Practically indestructible
7 sizes, 6 to 21 inches.

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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

BUCKEYE JACKS

high-grade R. R. Track and Car Jacks.

The Buckeye Jack Mfg. Co.
Alliance, Ohio

STERLING VARNISH

Manufactured by electrical engineers who will understand your insulating problems and render intelligent service. Noted for uniformity and quality. It will pay you to get in touch with

The Sterling Varnish Co., Pittsburgh, Penna.

ALLIS-CHALMERS

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Electrical Machinery, Steam Turbines, Steam Engines, Condensers, Gas and Oil Engines, Air Compressors, Air Brakes

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Peerless Insulation Paper has 25 to 50 per cent higher electrical resistance.

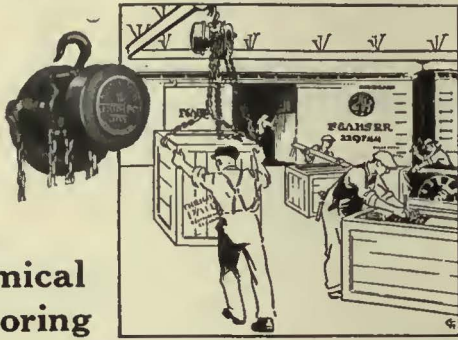


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ECONOMY EFFICIENCY
BLADES
GLADIUM CO. Inc. 34 Cliff St. New York

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Economical Stevedoring

A TRIBLOC, rolling smoothly along an overhead trackway, cuts distance and movements between car or platform and receiving or shipping room. It saves much time and labor from inter-departmental handling and rehandling. There is nothing to jam, clog, or backslide; nothing to confuse, strain, or irritate the workmen. Simply up, away, and down—swiftly, easily, safely!

Write for information on any type or capacity to 40 Tons.

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Car Seat and Snow Sweeper Rattan

For 60 years we have been the largest importers of rattan from the Islands in the Indian Ocean. 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.

High Grade Car Seats, cross or longitudinal, covered with Rattan, Plush or Leather.

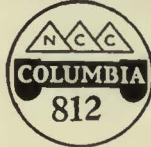
HEYWOOD-WAKEFIELD COMPANY

Factory: Wakefield, Mass.

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Grade 812 has been proved by test the most economical and satisfactory brush obtainable for standard flush or slotted commutator railway motors in local or moderate speed interurban service. One of a series of standard railway motor brushes.

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COST NO MORE — LAST LONGER

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Wednesday

For issue out Saturday

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THERMOSTAT CONTROL EQUIPMENTS

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is one 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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RAILWAY UTILITY COMPANY

Sole Manufacturers
"HONEYCOMB" AND "ROUND JET" VENTILATORS
for Monitor and Arch Roof Cars, and all classes of buildings;
also ELECTRIC THERMOMETER CONTROL
of Car Temperatures.

141-151 WEST 22D ST.
Chicago, Ill.

Write for
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1328 Broadway
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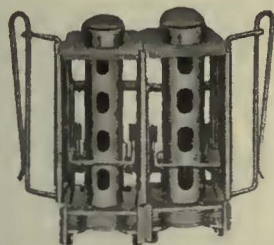
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ELECTRO-PNEUMATIC
DOOR OPERATING DEVICES



JOHNSON Universal Changer



Adjustable

The best changer on the market. Can be adjusted by the conductor to throw out a varying number of coins, necessary to meet changes in rates of fares.

Flexible

Each barrel a separate unit, permitting the conductor to interchange the barrels to suit his personal requirements, and to facilitate the addition of extra barrels.

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International Registers



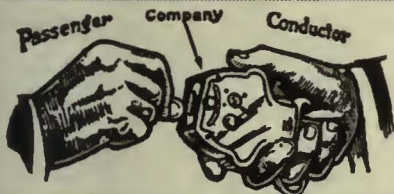
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Made in various types and sizes to meet the requirements of service on street and city system.

Complete line of registers, counters and car fittings.

Exclusive selling agents for
HEEREN ENAMEL BADGES.

The International Register Co.
15 South Throop Street, Chicago, Illinois



Direct Automatic Registration
By the Passengers
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Fare Boxes **Change Carriers**
COIN
COUNTERS **SORTERS** **WRAPPERS**
THE CLEVELAND FARE BOX CO.
CLEVELAND, OHIO
Canadian Branch, Preston, Ontario.



Every Service
A Style for
Send for Catalog
BONNEY-VEHSLAGE TOOL CO.
Newark, N. J.

The Most Successful Men in the Electric Railway Industry read the
ELECTRIC RAILWAY JOURNAL
Every Week

You're having brush trouble
CORRECT IT

USE LE CARBONE CARBON BRUSHES

They talk for themselves

COST MORE PER BRUSH
COST LESS PER CAR MILE

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345 Madison Avenue, New York
Pittsburgh Office: 634 Wabash Bldg.
San Francisco Office: 525 Market Street
Canadian Distributors: Lyman Tube & Supply Co., Ltd.,
Montreal and Toronto

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Mechanical Sanders
Ventilators, Smokestacks
Pneumatic Sanders
Selector Switches, Lanterns, etc.
THE NICHOLS-LINTERN CO.
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Car Seating, Broom and Snow Sweeper
Rattan, Mouldings, etc.
AMERICAN RATTAN & REED MFG. CO.
Brooklyn, N. Y.
AMERICAN means QUALITY
RATTAN SUPPLIES OF EVERY DESCRIPTION



Gets Every Fare
PEREY TURNSTILES
or PASSIMETERS
Use them in your Prepayment Areas and Street Cars
Perey Manufacturing Co., Inc.
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METER THE ENERGY
that's what you want to save
Then double the saving by inspecting cars on a kilowatt-hour basis instead of mileage or time-basis. Ask for data
ECONOMY ELECTRIC DEVICES COMPANY
L. E. Gould, 37 W. Van Buren St., Chicago
GENERAL AGENT: Lind Aluminum Field Coils
DISTRICT AGENTS: Peter Smith Heaters, Woods Lock Till Fare Boxes, Bemis Truck Specialties, Miller Trolley Shops.

SEARCHLIGHT SECTION

EMPLOYMENT-BUSINESS OPPORTUNITIES-EQUIPMENT

UNDISPLAYED—RATE PER WORD:
 Positions Wanted, 4 cents a word, minimum 75 cents an insertion, payable in advance.
 Positions Vacant and all other classifications, 8 cents a word, minimum charge \$2.00.
 Proposals, 40 cents a line an insertion.

INFORMATION:
 Box Numbers in care of any of our offices count 10 words additional in undisplayed ads.
 Discount of 10% if one payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED—RATE PER INCH:
 1 to 3 inches.....\$4.50 an inch
 4 to 7 inches..... 4.30 an inch
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 An advertising inch is measured vertically on one column, 3 columns—30 inches—to a page.

E. R. J.

POSITIONS VACANT

MAN, experienced in both line work and track work on fifteen mile Interurban railroad in New Jersey; salary \$150.00 per month. State your experience. P-479, Elec. Railway Journal, 10th Ave. at 36th St., New York City.

POSITIONS WANTED

AUDITOR or assistant. Eighteen years of experience in electric railway, light and power industry. Middle West preferred. PW-475, Elec. Ry. Journal, 10th Ave. at 36th St., N. Y.

GENERAL foreman of shops and car houses, with a proven record of eighteen years on large city, and interurban properties, desires to make a change; can furnish A-1 references as to character and ability; understand all details of mechanical department thoroughly; willing to go anywhere. PW-478, Elec. Railway Journal, 10th Ave. at 36th St., New York City.

MR. MANAGER—This is the age in which practical experience is of vital importance in the Electric Railway Industry. Are you in need of a capable, practical, experienced superintendent of transportation who is capable of taking over details and handling same in a manner that would be a credit to your property? Successful in public relations and recognized as an economical operator. At present with a large property but desire a change on account of personal reasons. Very successful in handling labor and have made a study of safety work. A proven record of 18 years on city, suburban and interurban properties with high grade references from leading men in railway field is back of this ad. Would prefer a large city and suburban property that requires careful attention. PW-470, Electric Railway Journal, Leader-News Bldg., Cleveland, Ohio.

MANAGER or superintendent railway, light and power properties; successful organizer and tactful in public relations; very resourceful in rehabilitating properties; excellent references. PW-481, Elec. Railway Journal, 10th Ave. at 36th St., New York City.

SUPERINTENDENT, with successful record as statistician and operating head; experienced in interurban, safety car and bus operation; can get desired results; satisfactory relations with present employer; personal reasons for desiring change. Address PW-477, Elec. Railway Journal, Leader-News, Bldg., Cleveland, Ohio.

WORKING barn foreman desires position. Can do any kind of wiring, wind armatures and controller repairs; 12 years' experience. PW-463, Elec. Ry. Journal, Real Estate Trust Bldg., Phila., Pa.

SALESMEN AVAILABLE

SALES manager or salesman who has had ten years' experience in track engineering and ten years' selling experience in the street railway field would like to make permanent connection; acquainted with street railway engineers throughout the States and Canada. SA-480, Elec. Railway Journal, Real Estate Trust Bldg., Philadelphia, Pa.

WANTED

Armature

One used Westinghouse 306 C. V. 4 armature wanted; must be in good operating condition. State price and where can be seen; give full particulars. W-482, Elec. Railway Journal, Real Estate Trust Bldg., Philadelphia, Pa.

3000 TONS
60 lb. Relaying Rail
A.S.C.E. Section
and Angles
 At Girard, Pa.

Buffalo Housewrecking
and Salvage Co.
 Buffalo, N. Y.

FOR SALE

1—75 Kw., 550 V., D.C., 6600 V.A.C. Motor Generator Set,
 Electrical Sundries—Insulators, Hangers, Frogs, Clamp Ears, etc.—all first class.
 Walter A. Zelnicker Supply Co., St. Louis
 Rails—Cars—Track Material—Machinery
 Ask for Bargain Bulletin No. 300

FOR SALE

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.

ELECTRIC EQUIPMENT CO.
 Commonwealth Bldg., Philadelphia, Pa.

"The House of Dependable Service"

NEW and RELAYING

RAILS

of all Sections.

HYMAN-MICHAELS CO.

Peoples Gas Building, Chicago, Ill.

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 2115 Railway Exchange Bldg., St. Louis
 1313 First Nat'l Bank Bldg., Pittsburgh

Write or wire when in the market to BUY or SELL

Please Mention this Publication

NEW FIELD COILS

In Stock

82—GE 52	391—GE. 1000
55—GE 57	8—GE 1200
20—GE 58	59—WH 12A
302—GE 67	15—WH 38
4—GE 73	25—WH 49
30—GE 247	54—WH 68
133—GE 800	6—WH 93A

25 per cent less than manufacturers current prices.

What have you for sale?

Transit Equipment Company

Cars—Motors

501 Fifth Avenue, New York.

Some One Wants to Buy

the equipment or machinery that you are not using. This may be occupying valuable space, collecting dust, rust and hard knocks in your shops and yards.

SELL IT BEFORE DEPRECIATION SCRAPS IT

The Searchlight Section is Helping Others

—Let It Help You Also

FOR SALE

5 New Electric Locomotives

Immediate Delivery



43 Tons, 1500 Volts, 376 H.P.

Hourly rating: 11,200 lbs. tractive effort at 12.7 miles per hour
Continuous capacity: 9,000 lbs. tractive effort at 13.7 miles per hour

Equipment:

Baldwin Class B Mechanical Parts.
Four Westinghouse No. 552 Field-Control Motors.
Westinghouse Double-End HLF Control.
Westinghouse Double-End 14-EL Air Brake.
Two Westinghouse D-3H Compressors (35 ft. each).

Can be changed for 600 or 600/1200 volt operation.

Address either Company

The Baldwin Locomotive Works
Philadelphia, Pa.

Westinghouse Electric & Manufacturing Co.
East Pittsburgh, Pa.



Make this modern plan

Terms of Sale—

Down-payment of 5 per cent.

Additional cash payment of 15 per cent when sale contract is executed.

Balance may be paid in equal annual or semi-annual installments, with interest at 5 per cent per annum, *within eight years* from date of sale.

Deed to be delivered by the Government when purchase price and interest are paid in full.

All payments cash, or certified check.

Possession given upon execution of sale contract, which shall be within one week after acceptance of bid.

Property to be sold "as is" and "where is."

The Government reserves the right to reject any or all bids.

Send for Illustrated Booklet!

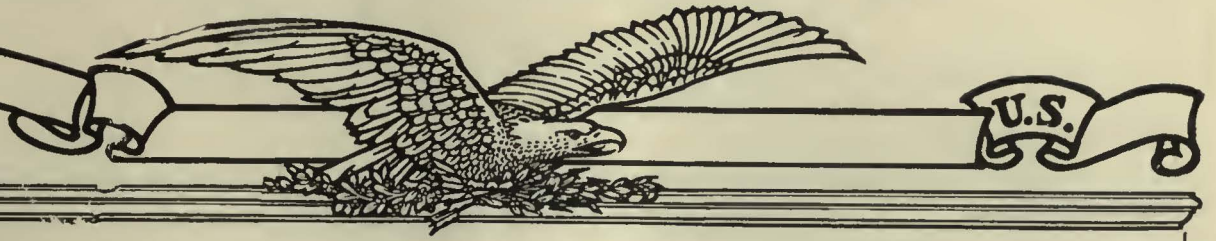
Address Chief, Construction Service,
Quartermaster General's Office
3335 Munitions Bldg., Washington, D. C.

or

Gerth's Realty Experts, Auctioneers
101 W. 42nd St., New York City



WAR DEE



your Industrial Home—

(The Government will finance 80% of the purchase price)

ON December 7, at 2:30 p.m., the War Department will offer at auction all the land and buildings comprising the Symington Gun Plant.

The auction will take place on the premises of the plant, 7400 South Ashland Ave., Chicago, Ill.

The real estate comprises 47.4 acres located between 73rd and 74th Streets on the north; the Chicago Belt Line Ry. on the south; S. Ashland Ave. on the east, and the P.C.C. & St. L. Ry. on the west.

The improvements are as follows:

Forge Shop, steel and brick; sand and gravel roof; steel sash; 425 ft. x 375 ft.; contains seven 10-ton and two 25-ton cranes.

Cooling Room, steel and brick; 240 ft. x 275 ft.; contains three 10-ton cranes.

Machine Shop, steel and brick; 1222 ft. x 250 ft.; contains two 5000-gal. tanks, suitable for gasoline, equipped with pumps.

Building "O," steel and tile; 433 ft. x 151 ft.; contains three 20-ton cranes.

Building "P," steel and brick; 380 ft. x 169 ft.; contains one 10-ton crane.

Power Plant Building, steel and brick; 302 ft. x 55 ft.; contains four 150-hp. boilers with smokeless furnaces, connected to 175-ft. brick stack.

Office Building, brick; 60 ft. x 215 ft.; three floors.

Water Tank Tower, with two tanks; one, 24 ft. x 36 ft.; the other, 18 ft. x 12 ft.

Storage Tanks, concrete; sunken; capacity of each, 1,000,000 gals. fuel oil.

Railroad Track, approximately 21,347 ft.; serves all buildings and connects with Belt Line railway; also 200,000-lb. track scale.

Plant will be offered for sale as an entirety, and also as two parcels, separated by S. Robey Street, which runs north and south through the property.



W A R D E P A R T M E N T

WHAT AND WHERE TO BUY

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., Barton G.
- Air Receivers, Aftercoolers
Ingersoll-Rand Co.
- Anchors, Guy
Electric Service Sup. Co.
Ohio Brass Co.
Standard Steel Works Co.
Westinghouse E. & M. Co.
- Armature Shop Tools
Elec. Service Supplies Co.
- Automatic Return Switch
Stands
Ramapo Ajax Corp.
- Automatic Safety Switch
Stands
Ramapo Ajax Corp.
- Axles
Bemla Car Truck Co.
Axles, Car Wheel
Bemla Car Truck Co.
Brill Co., The J. G.
Carnegie Steel Co.
St. Louis Car Co.
Westinghouse E. & M. Co.
- Axle Straighteners
Columbia M. W. & M. I. Co.
- Babbit Metal
Ajax Metal Co.
More-Jones Br. & Metal Co.
- Babbitting Devices
Columbia M. W. & M. I. Co.
- Bushes and Boltons
Electric Service Sup. Co.
Internat'l Register Co., The
- Batteries, Dry
National Carbon Co.
- Bearings and Bearing Metals
Ajax Metal Co.
Bemla Car Truck Co.
Columbia M. W. & M. I. Co.
General Electric Co.
Gilbert & Sons, B. F. A.
Le Grand, Inc., Nic
More-Jones Br. & Metal Co.
St. Louis Car Co.
Westinghouse E. & M. Co.
- Bearings, Center and Roller
Side
Stucki Co., A.
Bearing, Roller
Stafford Roller Bearing Car
Truck Corp'n
- Bells and Gongas
Brill Co., The J. G.
Columbia M. W. & M. I. Co.
Consolidated Car-Heating Co.
Electric Service Sup. Co.
St. Louis Car Co.
- Benders, Rail
Railway Track-work Co.
- Benders
Babcock & Wilcox Co.
- Bonding Apparatus
American Steel & Wire Co.
Electric Service Sup. Co.
Indianapolis Switch & Frog
Co.
Ohio Brass Co.
Rail Welding & Bonding Co.
Railway Track-work Co.
- Bonds, Rail
American Steel & Wire Co.
Electric Service Sup. Co.
General Electric Co.
Indianapolis Switch & Frog
Co.
Ohio Brass Co.
Rail Welding & Bonding Co.
Westinghouse E. & M. Co.
- Book Publishers
McGraw-Hill Book Co., Inc.
Brackets and Boas Arms
(See also Poles, Ties,
Posts, etc.)
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Electric Ry. Equip. Co.
Electric Service Sup. Co.
Hubbard & Co.
Ohio Brass Co.
- Brake Adjusters
National Ry. Appliance Co.
Westinghouse Tr. Br. Co.
- Brake Shoes
Amer. Brake Shoe & Fdry. Co.
Barbour-Slovak Co.
Bemla Car Truck Co.
Brill Co., The J. G.
Columbia M. W. & M. I. Co.
St. Louis Car Co.
- Brakes, Brake Systems and
Brake Parts
Allis-Chalmers Mfg. Co.
Bemla Car Truck Co.
Brill Co., The J. G.
Columbia M. W. & M. I. Co.
General Electric Co.
National Brake Co.
Safety Car Devices Co.
St. Louis Car Co.
Westinghouse Tr. Br. Co.
- Brooms, Track, Steel or Rat-
tan
Amer. Rattan & Reed Mfg.
Co.
- Bushes, Carbon
General Electric Co.
Jeandron, W. J.
Le Carbone Co.
- National Carbon Co.
Westinghouse E. & M. Co.
- Bushes, Graphite
National Carbon Co.
- Bushes, Wire Pneumatic
Ingersoll-Rand Co.
- Brush Holders
Anderson Mfg. Co., A. &
J. M.
Columbia M. W. & M. I. Co.
- Buses, Motor
Brill Co., The J. G.
- Bus Seats
Hale & Kilburn Corp.
- Bushings
Nat'l Fibre & Insulation Co.
- Bushings, Case Hardened and
Manganese
Bemla Car Truck Co.
Brill Co., The J. G.
- Cables (See Wires and
Cables)
- Cambria, Tapes, Yellow &
Black Varnished
Irvington Varnish & Ins. Co.
- Carbon Brushes (See Brushes
Carbon)
- Car Lighting Fixtures
Elec. Service Supplies
Car Panel Safety Switches
Consolidated Car-Heating Co.
Westinghouse E. & M. Co.
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Differential Steel Car Co.
Cars, Passenger, Freight
Express, Etc.
Amer. Car Co.
Brill Co., The J. G.
Kuhlman Car Co., G. C.
McGuire Cummings Mfg. Co.
National Ry. Appliance Co.
St. Louis Car Co.
Wason Mfg. Co.
- Cars, Second Hand
Electric Equipment Co.
- Cars, Self-Propelled
General Electric Co.
- Castings, Brass, Composition
or Copper
Ajax Metal Co.
Anderson Mfg. Co., A. &
J. M.
Columbia M. W. & M. I. Co.
More-Jones Br. & Metal Co.
- Castings, Gray Iron and
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Bemla Car Truck Co.
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St. Louis Car Co.
- Castings, Malleable and
Brass
Amer. Brake Shoe & Fdry.
Co.
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Columbia M. W. & M. I. Co.
Le Grand, Inc., Nic
St. Louis Car Co.
- Catchers and Retainers,
Trolley
Electric Service Sup. Co.
Ohio Brass Co.
Wood Co., Chas. N.
- Catenary Construction
Archbold-Brady Co.
- Circuit Breakers
General Electric Co.
Westinghouse E. & M. Co.
- Clamps and Connectors for
Wires and Cables
Anderson Mfg. Co., A. &
J. M.
Dossert & Co.
Electric Ry. Equip. Co.
Electric Service Sup. Co.
General Electric Co.
Hubbard & Co.
Ohio Brass Co.
Westinghouse E. & 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 Hoisting
Machinery)
- Coil Banding and Winding
Machines
Columbia M. W. & M. I. Co.
Electric Service Sup. Co.
- Colls, Armature and Field
Columbia M. W. & M. I. Co.
Economy Elec. Devices Co.
General Electric Co.
- Colls, Choke and Kicking
General Electric Co.
Westinghouse E. & M. Co.
- Coin-Counting Machines
Electric Service Sup. Co.
Internat'l Register Co., The
Johnson Fare Box Co.
- Commutator Slotters
Electric Service Sup. Co.
General Electric Co.
Westinghouse E. & 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 E. & M. Co.
- Compressors, Air
Allis-Chalmers Mfg. Co.
General Electric Co.
Ingersoll-Rand Co.
Westinghouse Tr. Br. Co.
- Compressors, Air, Portable
Ingersoll-Rand Co.
- Condensers
Allis-Chalmers Mfg. Co.
General Electric Co.
Ingersoll-Rand Co.
Westinghouse E. & M. Co.
- Condensor, Papers
Irvington Varnish & Ins. Co.
- Connectors, Solderless
Dossert & Co.
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- Controlling Systems
General Electric Co.
Westinghouse E. & M. Co.
- Converters, Rotary
Allis-Chalmers Mfg. Co.
General Electric Co.
Westinghouse E. & M. Co.
- Conveying and Hoisting Ma-
chinery
Columbia M. W. & M. I. Co.
- Copper Wire
Anaconda Copper Min. Co.
- Cord Adjusters
Nat'l Fibre & Insulation Co.
- Cord, Bell, Trolley Register,
etc.
Brill Co., The J. G.
Electric Service Sup. Co.
Internat'l Register Co., The
Roebing's Sons Co., J. A.
Samson Cordage Works
- Cord Connectors & Couplers
Electric Service Sup. Co.
Samson Cordage Works
Wood Co., Chas. N.
- Conplers, Car
Brill Co., The J. G.
Ohio Brass Co.
Westinghouse Tr. Br. Co.
- Cranes
Allis-Chalmers Mfg. Co.
- Cross Arms (See Brackets)
- Crossings
Ramapo Ajax Corp.
Crossing Foundations
International Steel Tie Co.
- Crossing Frog & Switch
Ramapo Ajax Corp.
Wharton, Jr., & Co., Wm.
- Crossing Manganese
Indianapolis Switch & Frog
Co.
Ramapo Ajax Corp.
- Crossing Signals (See Sig-
nals, Crossing)
- Crossings Track (See Track
Special Work)
- Crossings, Trolley
Ohio Brass Co.
- Crushers, Rock
Allis-Chalmers Mfg. Co.
- Culverts
Canton Culvert & Silo Co.
Curtains and Curtain
Fixtures
Brill Co., The J. G.
Electric Service Sup. Co.
Morton Mfg. Co.
St. Louis Car Co.
- Dealers' Machinery
Electric Equipment Co.
- Derailing Devices (See Track
Work)
- Derailing Switches
Ramapo Ajax Corp.
- Destination Signs
Columbia M. W. & M. I. Co.
Electric Service Sup. Co.
- Detective Service
Wish Service, P. Edward
- Doors, Inside
Williams & Co., J. H.
- Door Operating Devices
Con. Car-Heating Co.
Nat'l Pneumatic Co., Inc.
Safety Car Co.
- Doors and Door Fixtures
Brill Co., The J. G.
General Electric Co.
Hale and Kilburn Corp.
- Doors, Folding Vestibule
Nat'l Pneumatic Co., Inc.
- Draft Rigging (See Complexes)
- Drills, Rock
Ingersoll-Rand Co.
- Drills, Track
American Steel & Wire Co.
Electric Service Sup. Co.
Ingersoll-Rand Co.
Ohio Brass Co.
- Dryers, Sand
Electric Service Sup. Co.
- Ears
Ohio Brass Co.
- Electrical Wires and Cables
Amer. Electrical Works
American Steel & Wire Co.
Roebing's Sons Co., J. A.
- 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.
- tracting and Operating
Allison & Co., J. R.
Archbold-Brady Co.
Arnold Co., The
Beeler, John
Crossett Co., Jas. H.
Day & Zimmermann
Feustel, Robert M.
Ford, Bacon & Davis
Hemphill & Wells
Holst, Englehardt W.
Jackson, Walter
Parsons, Klapp, Brinkerhoff
& Douglas
Richey, Albert S.
Robinson & Co., Inc.,
Dwight P.
Sanderson & Porter
Smith & Co., C. E.
Stone & Webster
White Engineering Corp.,
The J. G.
Witt, Peter
- Engineers, Consulting, Con-
crete, Gas, Oil or Steam
Allis-Chalmers Mfg. Co.
Ingersoll-Rand Co.
Westinghouse E. & M. Co.
- Fare Boxes
Cleveland Fare Box Co.
Economy Electric Devices
Co.
Johnson Fare Box Co.
National Ry. Appliance Co.
- Fences, Woven Wire and
Fence Posts
American Steel & Wire Co.
- Fenders and Wheel Guards
Brill Co., The J. G.
Cleveland Fare Box Co.
Consolidated Car Fender Co.
Electric Service Sup. Co.
Le Grand, Inc., Nic
- Fibre and Fibre Tinting
Nat'l Fibre & Insulation Co.
Westinghouse E. & M. Co.
- Field Coils (See Coils)
- Flooring Composition
Amer. Mason Safety Tread
Co.
- Floor Plates
Amer. Abrasive Metals Co.
- Forgings
Carnegie Steel Co.
Columbia M. W. & M. I. Co.
Williams & Co., J. H.
- Frogs & Crossings, Tee Rail
Ramapo Ajax Corp.
- Frogs, Track
(See Track Work)
Wharton, Jr., & Co., Wm.
- Frogs, Trolley
Ohio Brass Co.
- Fuses and Fuse Boxes
Columbia M. W. & M. I. Co.
Consolidated Car-Heating Co.
General Electric Co.
Westinghouse E. & M. Co.
Williams & Co., J. H.
- Fuses, Refillable
Columbia M. W. & M. I. Co.
General Electric Co.
- Gages, Oil and Water
Ohio Brass Co.
- Gaskets
Power Specialty Co.
Westinghouse Tr. Br. Co.
- Gas-Electric Cars
General Electric Co.
- Gins Producers
Westinghouse E. & M. Co.
- Gasoline Tenders
Economy Electric Devices
Co.
- Gates, Car
Brill Co., The J. G.
- Gear Cases
Columbia M. W. & M. I. Co.
Electric Service Sup. Co.
Westinghouse E. & M. Co.
- Gears and Pinions
Bemla Car Truck Co.
Columbia M. W. & M. I. Co.
Electric Service Sup. Co.
General Electric Co.
National Ry. Appliance Co.
Nuttall Co., R. D.
Tool Steel Gear & Pinion
Co.
- Generating Sets, Gas-Electric
General Electric Co.
- Generators
Allis-Chalmers Mfg. Co.
Westinghouse E. & M. Co.
- Goggles, Eyes
Indianapolis Switch & Frog
Co.
- Smith Heater Co., Peter
Gongs (See Bells and Gongs)
Greases (See Lubricants)
Grinders and Grinding Sup-
plies
Indianapolis Switch & Frog
Co.
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.
- Ground Wires
Page Steel & Wire Co.
- Guard Rail Clamps
Ramapo Ajax Corp.
- Guard Rails, Tee Rail and
Manganese
Ramapo Ajax Corp.
- Guards, Trolley
Electric Service Sup. Co.
Ohio Brass Co.
- Hacksaws
Gladium Co., Inc.
- Hammers, Pneumatic
Ingersoll-Rand Co.
- Horns, Trolley
Anderson Mfg. Co., A. &
J. M.
Electric Service Sup. Co.
More-Jones Br. & Metal Co.
Nuttall Co., R. D.
Star Brass Works
- Headlights
Electric Service Sup. Co.
General Electric Co.
Ohio Brass Co.
St. Louis Car Co.
- Heaters, Car (Electric)
Consolidated Car Heating Co.
Economy Electric Devices
Co.
Gold Car Heating & Light-
ing Co.
National Ry. Appliance Co.
Smith Heater Co., Peter
- Heaters, Car, Hot Air and
Water
Smith Heater Co., Peter
- Heaters, Car (Stove)
Electric Service Sup. Co.
Sterling Varnish Co.
Westinghouse E. & M. Co.
- Helmets, Welding
Indianapolis Switch & Frog
Co.
- Holes and Lifts
Columbia M. W. & M. I. Co.
Ford-Chain Block Co.
Ingersoll-Rand Co.
- Hose, Bridges
Ohio Brass Co.
- Hydraulic Machinery
Allis-Chalmers Mfg. Co.
- Instruments, Measuring and
Recording
Economy Electric Devices
Co.
Electric Service Sup. Co.
General Electric Co.
Westinghouse E. & M. Co.
- Insulating Cloth, Paper and
Tape
General Electric Co.
Irvington Varnish & Ins.
Co.
- Nat'l Fibre & Insulation Co.
Standard Underground Cable
Westinghouse E. & M. Co.
- Insulating Compounds &
Varnishes
Sterling Varnish Co., The
Insulating Silk
Irvington Varnish & Ins.
Co.
- Insulating Varnishes
Irvington Varnish & Ins.
Co.
- Sterling Varnish Co.
- Insulation (See also Paints)
Anderson Mfg. Co., A. &
J. M.
Electric Ry. Equip. Co.
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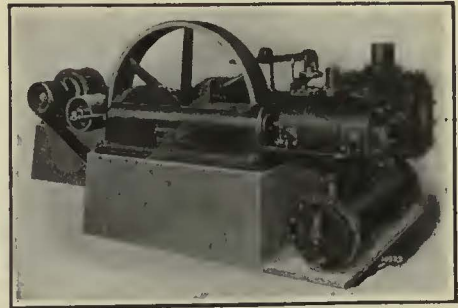
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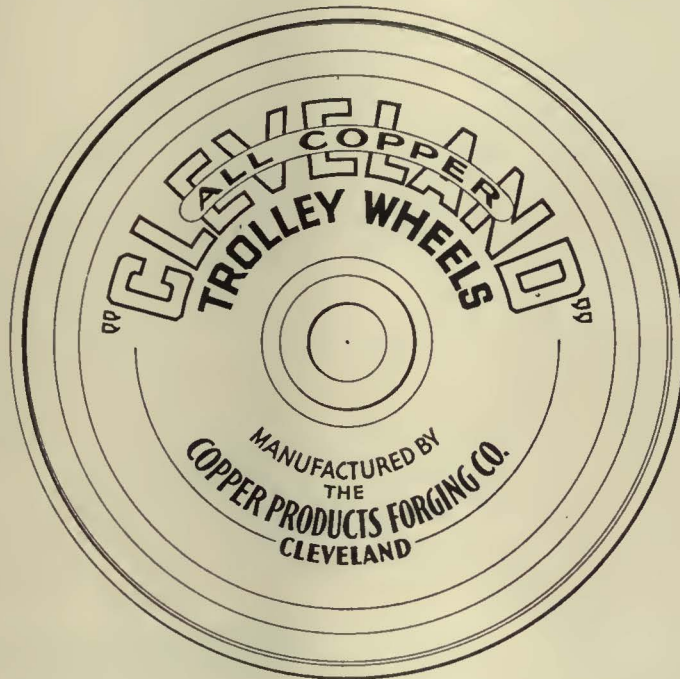


- Insulation, Slot**
Irvington Varnish & Ins. Co.
- Insulators**
(See also Lins Material)
Anderson Mfg. Co., A. & J. M.
Electric Ry. Equip. Co.
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Wharton, Jr. & Co., Wm.
Manganese Steel Guard Rails
Ramapo Ajax Corp.
- Manganese Steel Special Track Work**
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Ramapo Ajax Corp.
Wharton, Jr. & Co., Wm.
- Meters, Car, Water-Hour**
Economy Electric Devices Co.
- Motor Buses**
(See Buses, Motor)
- Motor Leads**
Dossert & Co.
- Motormen's Seats**
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Electric Service Sup. Co.
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Barbour-Stockwell Co.
Bemis Car Truck Co.
Columbia M. W. & M. I. Co.
Hubbard & Co.
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- Packing**
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Sching Varnish Co.
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- Paving Material**
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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**
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Electric Service Sup. Co.
Ohio Brass Co.
Westinghouse Tr. Br. Co.
- Pipe Fittings**
Power Specialty Co.
Westinghouse Tr. Br. Co.
- Planers** (See Machine Tools)
- Plates for Tee Rail Switches**
Ramapo Ajax Corp.
- Pliers—Rubber Insulated**
Electric Service Sup. Co.
Rubber Insulated Metals Corp.
Ingersoll-Rand Co.
- Pneumatic Tools**
- Pole Reinforcing**
Hubbard & Co.
- Pole Line Hardware**
Ohio Brass Co.
- Poles, Metal Street**
Bates Exp. Steel Truss Co.
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Hubbard & Co.
- Poles, Trolley**
Anderson Mfg. Co., A. & J. M.
Columbia M. W. & M. I. Co.
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- Poles, Tubular Steel**
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Electric Service Sup. Co.
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- Poles, Ties, Post, Piling and Lumber**
International Croscoating and Construction Co.
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Nashville Tie Co.
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General Electric Co.
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Westinghouse E. & M. Co.
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Ingersoll-Rand Co.
- Pumps, Vacuum**
Ingersoll-Rand Co.
- Punches, Ticket**
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International Reg. Co., The
Wood Co., Chas. N.
- Rail Bonds**
Page Steel & Wire Co.
- Rail Braces & Fastenings**
Ramapo Ajax Corp.
- Rail Grinders** (See Grinders)
- Rail Joints**
Carnegie Steel Co.
- Rail Joints, Welded**
Indianapolis Switch & Frog Co.
- Rails, Steel**
Carnegie Steel Co.
- Railway Safety Switches**
Consolidated Car Heating Co.
Westinghouse E. & M. Co.
- Rail Welding**
Rail Welding & Bonding Co.
Railway Track-work Co.
- Rattan**
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Electric Service Sup. Co.
Hale & Kilburn Corp.
McGuire-Cummings Mfg. Co.
St. Louis Car Co.
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Brill Co., The J. G.
Electric Service Sup. Co.
International Reg. Co., The
Rooks Automatic Reg. Co.
- Reinforcement, Concrete**
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Carnegie Steel Co.
- Repair Shop Appliances** (See also Coll Banding and Winding Machines)
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Electric Service Sup. Co.
- Repair Work** (See also Coils)
Columbia M. W. & M. I. Co.
General Electric Co.
Westinghouse E. & M. Co.
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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 E. & M. Co.
- Resistances**
Consolidated Car-Heating Co.
Retrievers, Trolley (See Catchers and Retrievers, Trolley)
- Rheostats**
General Electric Co.
Westinghouse E. & M. Co.
- Roller Bearings**
Stafford Roller Bearing Car Truck Corp.
- Sanders, Track**
Brill Co., The J. G.
Columbia M. W. & M. I. Co.
Electric Service Sup. Co.
Nichols-Lintern Co.
Ohio Brass Co.
St. Louis Car Co.
- Sash Fixtures, Car**
Brill Co., The J. G.
Sash, Metal, Car Window
Hale & Kilburn Corp.
- Scrapers, Track** (See Cleaners and Scrapers, Track)
- Screw Drivers, Rubber Insulated**
Electric Service Sup. Co.
Rubber Insulated Metals Corp.
- Seating Materials**
Brill Co., The J. G.
- Seats, Car** (See also Rattan)
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Brill Co., The J. G.
Hale & Kilburn Corp.
Heywood-Wakefield Co.
St. Louis Car Co.
- Second Hand Equipment**
Electric Equipment Co.
- Secret Service**
Corp. Service Bureau, The
- Shades, Vestibule**
Brill Co., The J. G.
- Shovels**
Allis-Chalmers Mfg. Co.
Brill Co., The J. G.
Hubbard & Co.
- Side Bearings** (See Bearings, Center and Side)
- Signals, Car Starting**
Con. 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.
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**
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- Sleet Wheels and Cutters**
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Columbia M. W. & M. I. Co.
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Electric Service Sup. Co.
More-Jones Br. & Metal Co.
Nuttall Co., R. D.
- Smokestacks, Car**
Nichols-Lintern Co.
- Snow-Plows, Sweepers and Brooms**
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Columbia M. W. & M. I. Co.
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McGuire-Cummings Mfg. Co.
Irvington Varnish & Ins. Co.
- Spikes**
Amer. Steel & Wire Co.
- Spilling Compounds**
Westinghouse E. & M. Co.
- Splicing Sleeves** (See Clamps and Connectors)
- Springs, Car and Truck**
Amer. Steel & Wire Co.
Bemis Car Truck Co.
Brill Co., The J. G.
Sprinklers, Track and Road
Brill Co., The J. G.
McGuire-Cummings Mfg. Co.
St. Louis Car Co.
- Steel Castings**
Wharton, Jr. & Co., Wm.
- Steels and Steel Products**
Morton Mfg. Co.
- Steps, Car**
Amer. Abrasive Metals Co.
Amer. Mason Safety Tread Co.
Morton Mfg. Co.
- Stokers, Mechanical**
Babcock & Wilcox Co.
Westinghouse E. & M. Co.
- Storage Batteries** (See Batteries, Storage)
- Strain Insulators**
Ohio Brass Co.
- Strand**
Roebling's Sons Co., J. A.
Superheaters
Babcock & Wilcox Co.
Power Specialty Co.
- Sweepers, Snow** (See Snow Plows, Sweepers and Brooms)
- Switch Stands**
Indianapolis Switch & Frog Co.
- Switch Stands and Fixtures**
Ramapo Ajax Corp.
- Switches, Selector**
Nichols-Lintern Co.
- Switches, Track** (See Track, Special Work)
- Switches and Switchboards**
Allis-Chalmers Mfg. Co.
Anderson Mfg. Co., A. & J. M.
Electric Service Sup. Co.
General Electric Co.
Westinghouse E. & M. Co.
- Switches, Tee Rail**
Ramapo Ajax Corp.
- Tampers, Tie**
Ingersoll-Rand Co.
- Tapes and Cloths** (See Insulating Cloth, Paper and Tape)
- Tee Rail Special Track Work**
Ramapo Ajax Corp.
- Telephones and Parts**
Electric Service Sup. Co.
- Terminals, Cable**
Standard Underground Cable Co.
- Testing Instruments** (See Instruments, Electrical Measuring, Testing, etc.)
- Thermostats**
Con. Car Heating Co.
Gold Car Heating & Lighting Co.
Railway Utility Co.
Smith Heater Co., Peter
- Ticket Choppers and Destroyers**
Electric Service Sup. Co.
- Ties and Tie Rods, Steel**
Barbour-Stockwell Co.
Carnegie Steel Co.
International Steel Tie Co.
Dayton Mechanical Tie Co.
- Ties, Wood Cross** (See Poles, Ties, etc.)
- Tungue Switches**
Wharton, Jr. & Co., Wm.
- Tool Holders**
Williams & Co., J. H.
- Tool Steel**
Carnegie Steel Co.
- Tools, Thread Cutting**
Williams & Co., J. H.
- Tools, Track and Miscellaneous**
Amer. Steel & Wire Co.
Columbia M. W. & M. I. Co.
Electric Service Sup. Co.
Hubbard & Co.
Railway Track-work Co.
- Towers and Transmission Structures**
Bates Exp. Steel Truss Co.
Westinghouse E. & M. Co.
- Trunk Expansion Joints**
Wharton, Jr. & Co., Wm.
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Railway Track-work Co.
Barbour-Stockwell Co.
Indianapolis Switch & Frog Co.
New York Switch & Crosaing Co.
Ramapo IronWorks
St. Louis Frog & Switch Co.
Wharton, Jr. & Co., Wm. Inc.
- Transformers**
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General Electric Co.
Westinghouse E. & M. Co.
- Trends, Safety, Strip Car Stop**
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Amer. Mason Saf. Tread Co.
Morton Mfg. Co.
- Trolley Bases**
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Electric Service Sup. Co.
General Electric Co.
Nuttall Co., R. D.
Ohio Brass Co.
- Trolley Bases Retrieving**
Anderson Mfg. Co., A. & J. M.
Electric Service Sup. Co.
General Electric Co.
Ohio Brass Co.
- Trolley Buses**
Brill Co., The J. G.
General Electric Co.
Westinghouse E. & M. Co.
- Trolley Materials, Overhead**
Flood City Mfg. Co.
More-Jones Brass & Metal Co.
Ohio Brass Co.
- Trolley Shoes**
Economy Elec. Devices Co.
- Trolley and Trolley Systems**
Ford-Chain Block Co.
Trolley Wheels and Harps
Flood City Mfg. Co.
More-Jones Brass & Metal Co.
- Trolley Wheels, (See Wheels, Trolley Wheel Bushings)**
Flood City Mfg. Co.
More-Jones Brass & Metal Co.
- Trolley Wire**
Amer. Electrical Works
Amer. Steel & Wire Co.
Anaconda Copper Min. Co.
Bridgeport Brass Co.
Roebling's Sons Co., J. A.
- Trucks, Car**
Bemis Car Truck Co.
Brill Co., The J. G.
McGuire-Cummings Mfg. Co.
St. Louis Car Co.
- Tubing, Yellow and Black**
Flexible Varnishes
Irvington Varnish & Ins. Co.
- Turbines, Steam**
Allis-Chalmers Mfg. Co.
General Electric Co.
Westinghouse E. & M. Co.
- Turbines, Water**
Allis-Chalmers Mfg. Co.
- Turntables**
Indianapolis Switch & Frog Co.
- Turnstiles**
Damon-Chapman Co.
Electric Service Sup. Co.
Ohio Brass Co.
Percy Mfg. Co.
- Upholstery Material**
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- Valves**
Westinghouse Tr. Br. Co.
- Vacuum Impregnation**
Allis-Chalmers Mfg. Co.
- Varnished Papers**
Irvington Varnish & Ins. Co.
- Varnished Silks**
Irvington Varnish & Ins. Co.
- Ventilators, Car**
Brill Co., The J. G.
National Ry. Appliance Co.
Nichols-Lintern Co.
Railway Utility Co.
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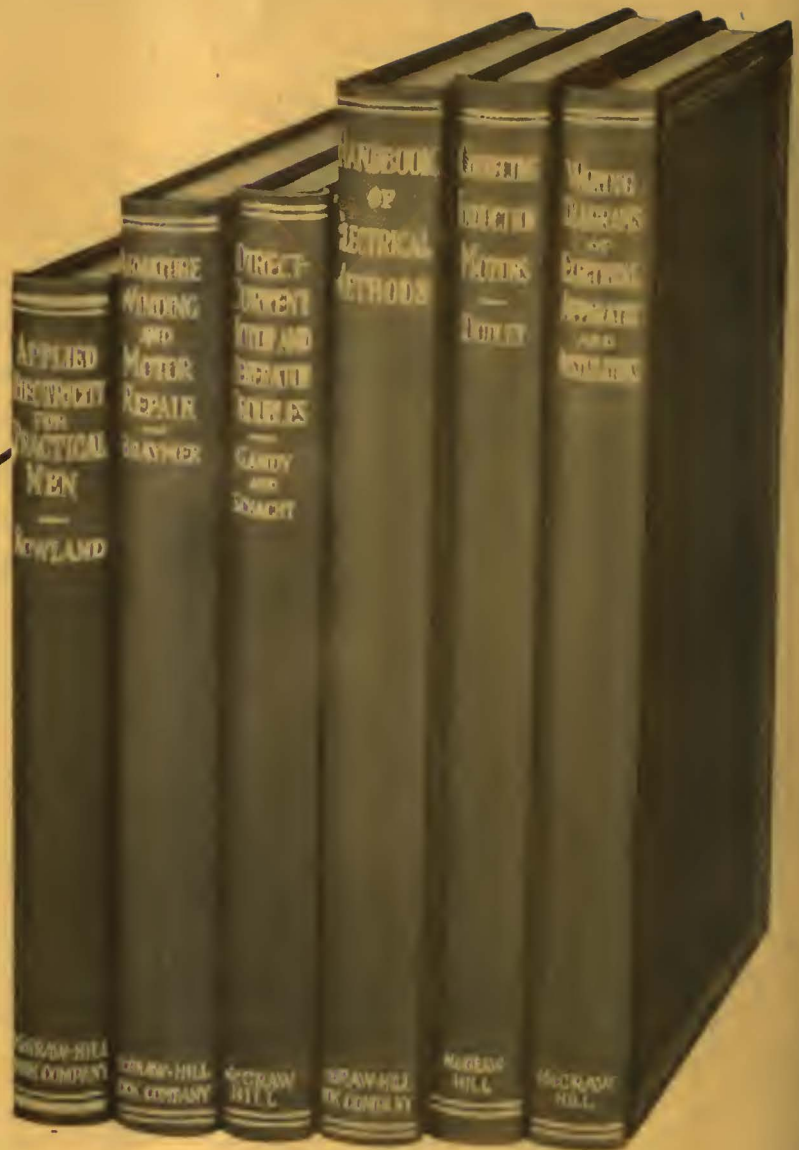
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