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ELECTRIC RAILWAY JOURNAL

Westinghouse Automatic Outdoor Switch Houses

Assure Uninterrupted Service

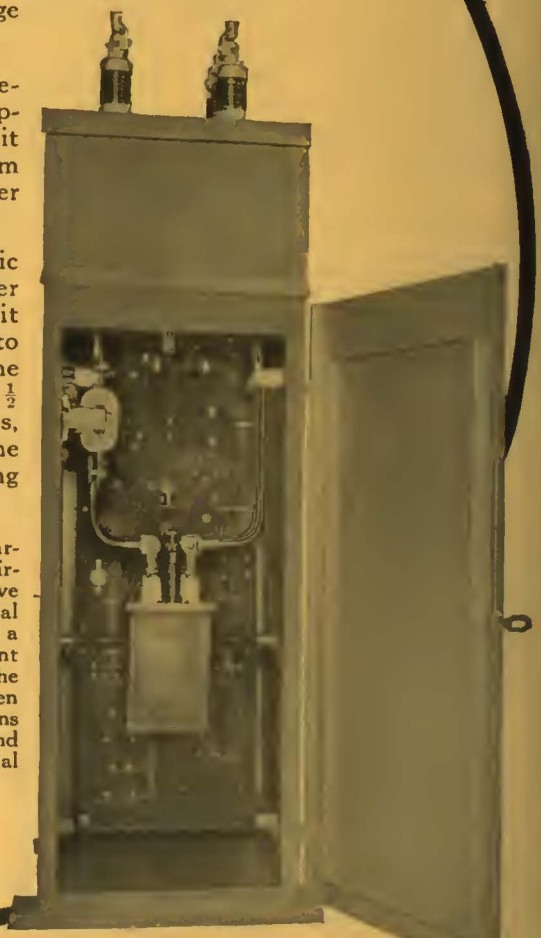
500-Ampere, 2300-Volts, 3-Phase, 60-Cycle Automatic Outdoor Switch House, Periodic Re-closing Feeder Equipment.-Front View.

The Westinghouse Company has developed two types of automatic outdoor switch houses; Service Restoring Feeder Equipment for control of circuits supplying a synchronous motor load, and small transformer banks; Periodic Reclosing Feeder Equipment for control of feeders on which the loss of the synchronous motor load is not important, and large transformer banks.

With the Service Restoring Feeder Equipment the circuit breaker closes in from one to two seconds after opening.

With the periodic Reclosing Feeder Equipment the circuit breaker can be set to close at definite time intervals between ½ minute and 2 minutes, depending upon the setting of the timing relay.

The equipments are arranged to reclose the circuit breaker three times after they have opened automatically under the initial short circuit. Should the breaker open a fourth consecutive time, the equipment will be locked out with the breaker in the open position. After the line has been cleared, the breaker is closed by means of the control switch, or push button, and the relay automatically reset for normal operation.



500-Ampere, 2300-Volts, 3-Phase, 60-Cycle Automatic Outdoor Switch House, Periodic Re-closing Feeder Equipment.-Rear View.

W WESTINGHOUSE ELECTRIC

Westinghouse Electric & Manufacturing Co.
East Pittsburgh, Pa.

Westinghouse

Vol. 60, No. 24 New York, December 9, 1922 *Pages 899-930*

ELECTRIC RAILWAY JOURNAL

HENRY W. BLAKE, Editor

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To Make the Journal a Larger Educational Force

THE *Journal* has been a very helpful source of education for the men in supervisory positions responsible for the maintenance of equipment. But to make it even more appealing to them, plans have been laid to have every issue contain a larger amount of the kind of material that deals with the every-day problems in all departments of keeping the wheels turning. By this is meant discussions on the maintenance of all kinds of equipment now in use, as distinguished from the engineering discussions having to do with the design and construction of new plant and new equipment.

In addition to more maintenance matter in all issues, the third issue of each month is to be devoted entirely to this kind of editorial matter, except only for the news section, and this issue is to be called the "Monthly Maintenance Number." We have found that many executives, general managers and department heads also take a keen interest in the published matter on these common maintenance problems—little things in themselves, but each having its important effect on the smoothness and reliability of operation. For this reason it has been deemed satisfactory to the higher officials who read the paper as well as the men under them to have one issue a month devoted entirely to this type of subject matter. Besides their direct interest, the higher officials will also be interested to note how the *Journal* staff is working to help their men handle maintenance more intelligently and more efficiently.

To make it easier for all operating supervisory men responsible for the maintenance of any kind of railway equipment to have the benefit of reading at least this once-a-month exclusive equipment number, we are going to sell it without the other editions, if desired, at such a low subscription rate that the cost will certainly not deter any responsible railway man from having his own copy to study in his off-duty leisure.

Circulation of this issue, 5,925

Advertising Index—Alphabetical, 40; Classified, 36, 38; Searchlight Section, 35

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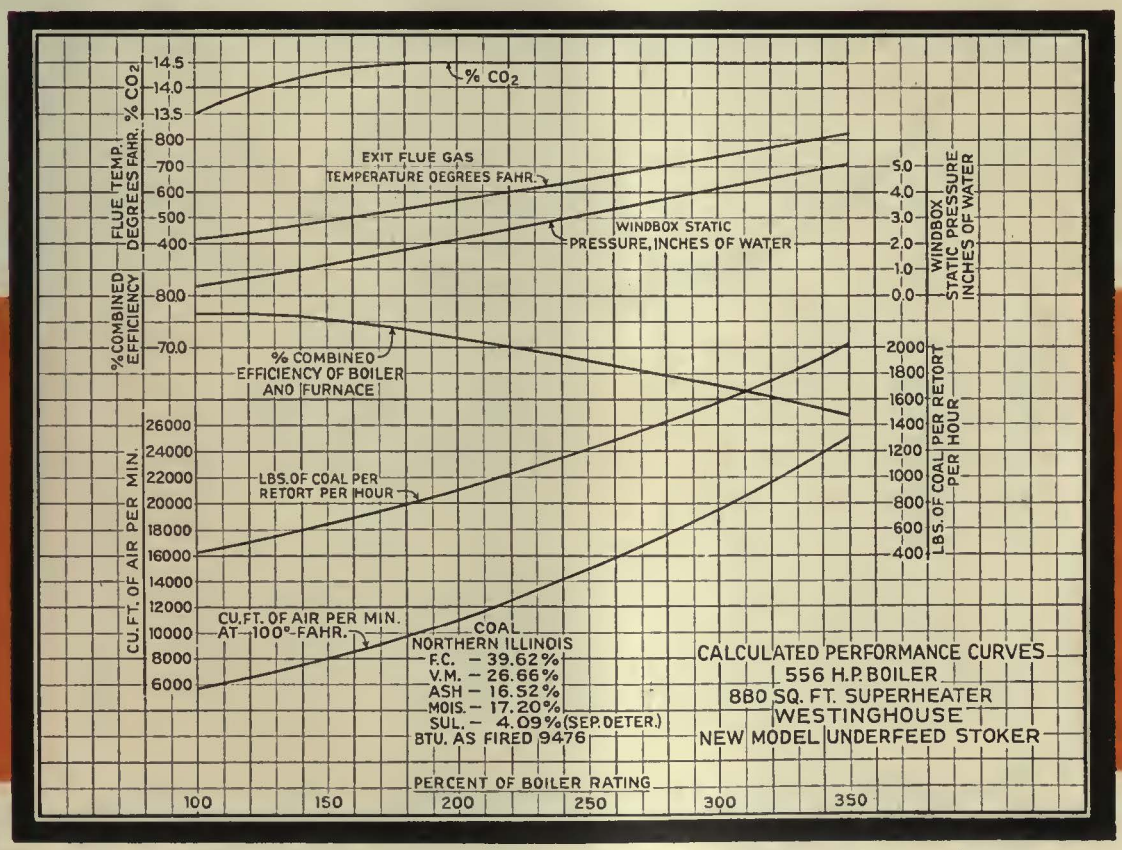

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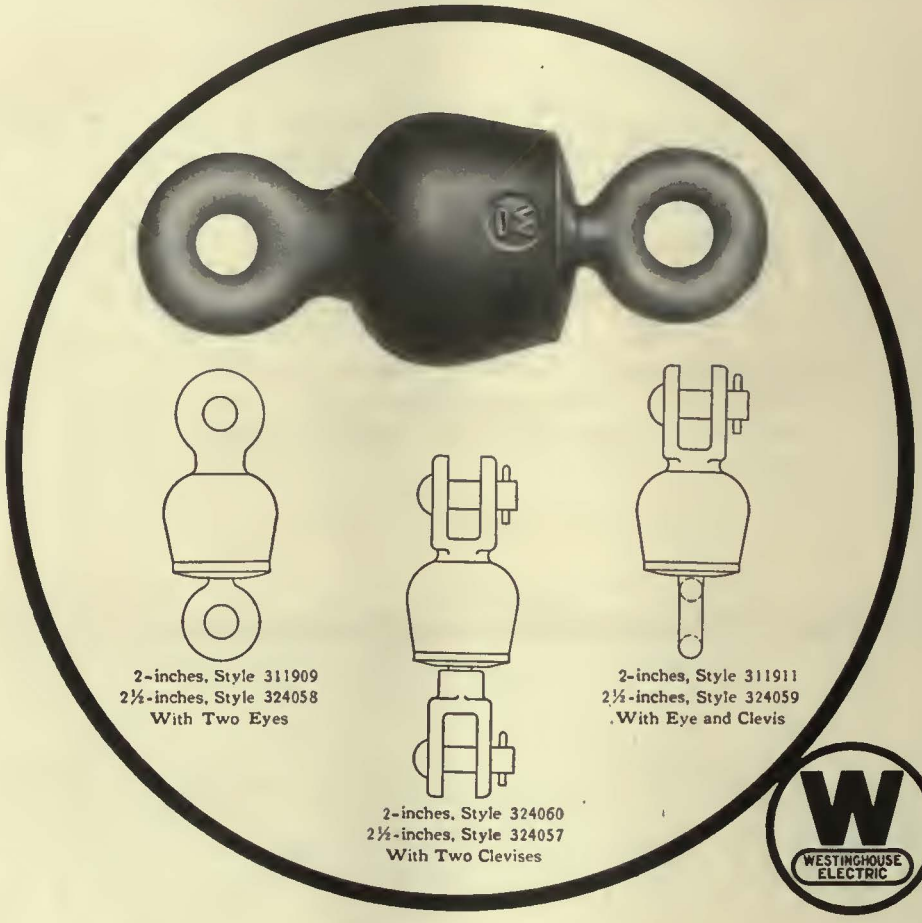

"Duro" Molded Strain Insulators are infusible and are unaffected by heat except under extreme temperatures. They will not shrink with age, or by exposure to the most severe weather conditions.

"Duro" insulators withstand the electrical test after the mechanical test has been made, as tabulated below:

Style Number	Test Voltage before Mechanical Test	Mechanical Test	Test Voltage after Mechanical Test
2" Style, 311909	10,000	4000	10,000
2½" Style, 324058	10,000	6000	10,000
2" Style, 324060	10,000	4000	10,000
2½" Style, 324057	10,000	6000	10,000
2" Style, 311911	10,000	4000	10,000
2½" Style, 324059	10,000	6000	10,000

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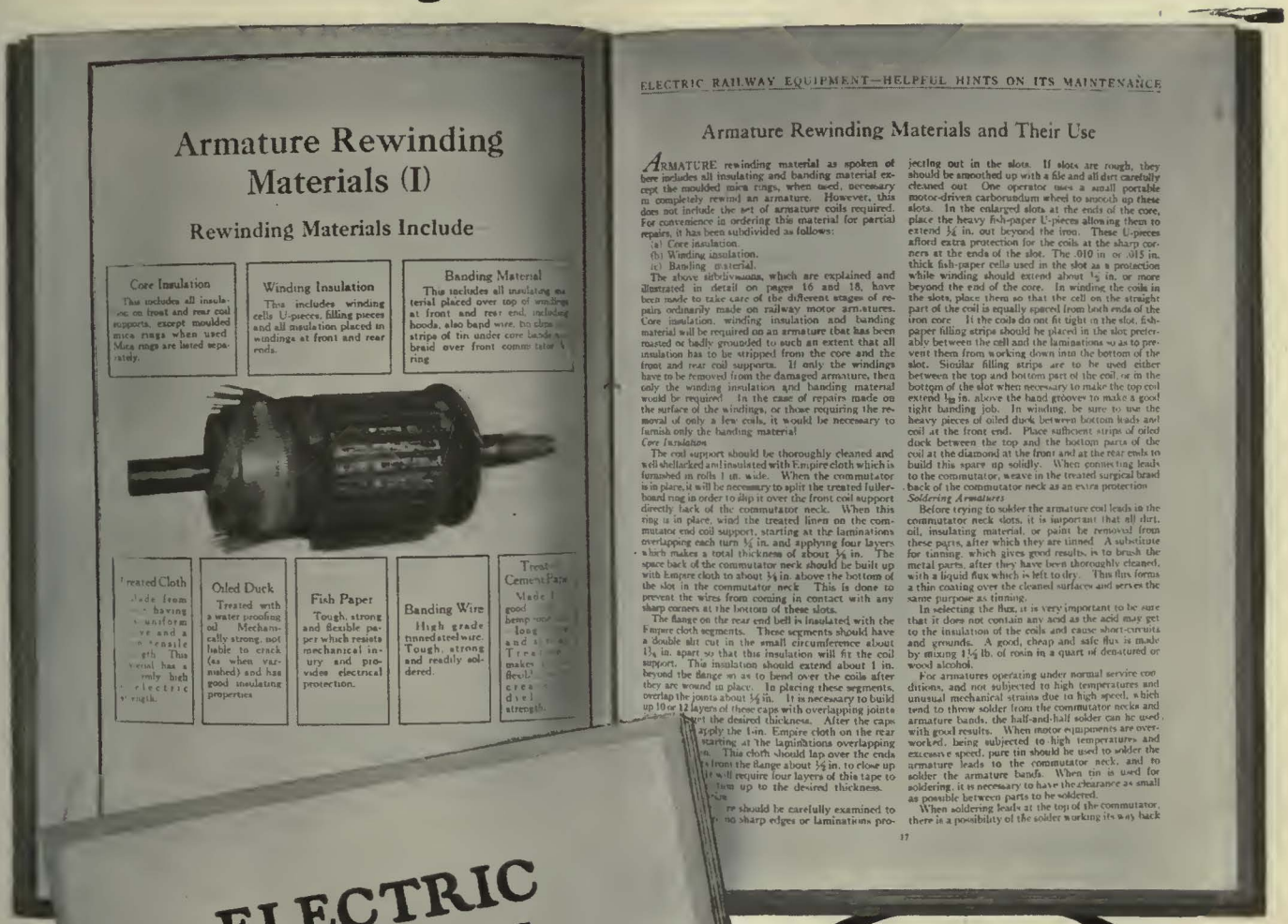
Westinghouse Renewal Parts



Send For This Publication No. 1656

It contains 108 pages of useful information, similar to that illustrated above on the maintenance of electric railway equipment.

Fifty-three of these pages are illustrated to show the superior features of the most modern equipment.

Ask our nearest district office for your copy.

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WESTINGHOUSE ELECTRIC

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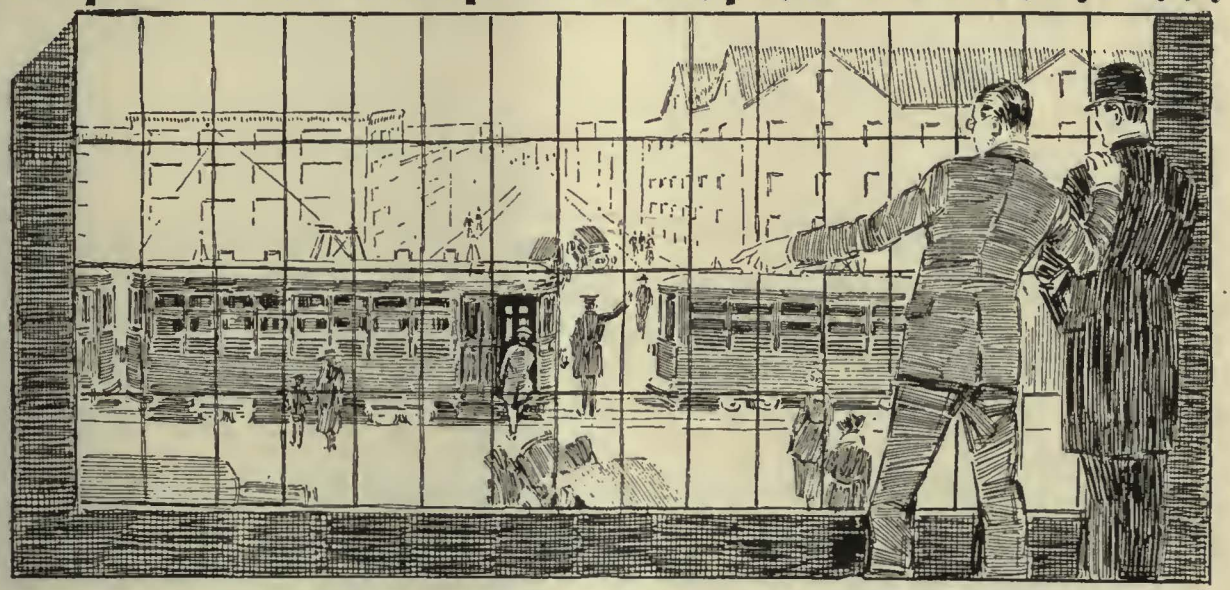

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IN operating double-passageway Safety Cars, why throw *both* doors open at *every stop?*

The new Selector Valve obsoletes this practice and adds greatly to the advantages of double-door operation by providing a quick, easy means of independent door control for entrance only, exit only, or both at once, as occasion requires.

Independent door control is a valuable aid to the motorman in regulating the flow of passengers in such manner as he deems best suited to the conditions of one-man operation.

And in cold weather especially, a material saving in heat, as well as better protection for passengers, will result from a system which makes it unnecessary to open both doors at every stop.

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.

We furnish the Air Brake and Safety Car Control Equipment which *makes* the Safety Car

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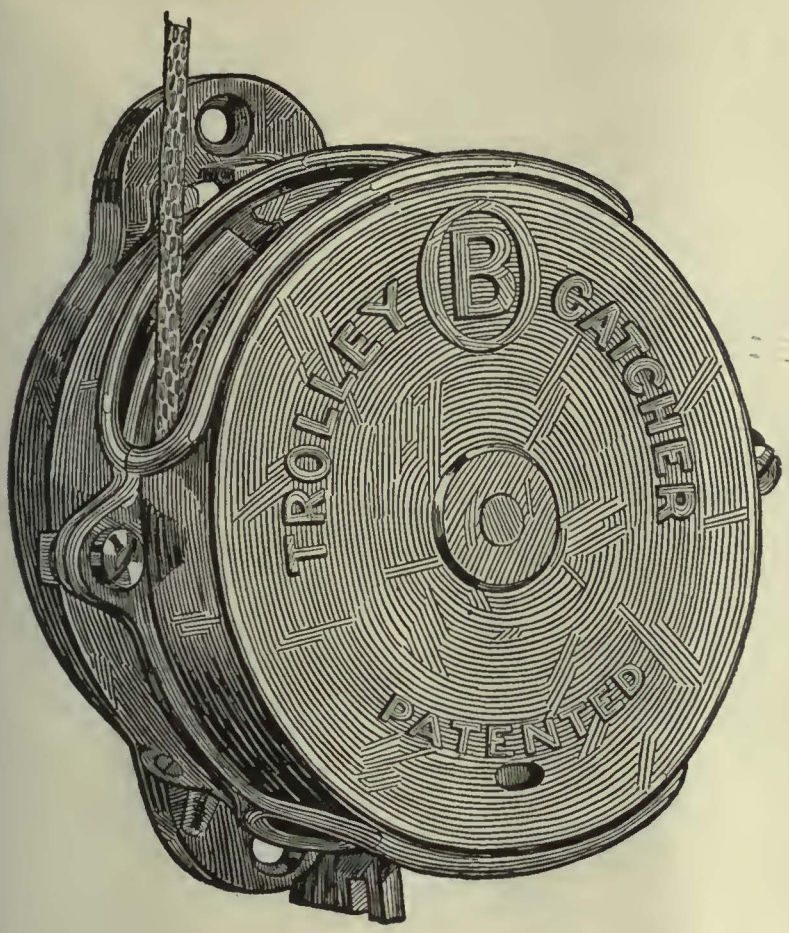

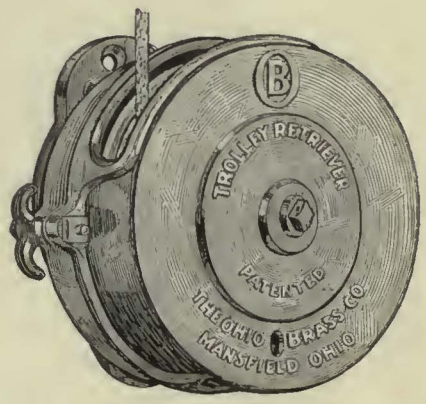

O-B Trolley Catcher Good for Continuous Duty

There is always work for the trolley catcher—and O-B Trolley Catcher is always ready for work.

All the time, through every kind of weather, O-B Catcher keeps the trolley rope reeled in and taut. Any instant that the wheel leaves the wire, O-B Catcher stops the flying pole promptly and positively—there can be no stepping-up of the pole.

Mechanical men invariably approve O-B Catcher because they know by experience that it bothers them little. And they have found that if repairs are necessary the new parts fit, and fit the first time. O-B Catcher parts are accurately machined to jigs and they are perfectly interchangeable.

O-B Trolley Retriever For High Speed Service

Built along the same sturdy lines as O-B Catcher. When the pole jumps O-B Retriever pulls it down below the trolley wire level so that the wheel does not foul the overhead.

May we tell you more about O-B Catcher?

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Products: Trolley Material, Rail Bonds, Electric Railway Car Equipment, High Tension Porcelain Insulators, Third Rail Insulators

Embodying several new features of car design, this light weight safety car of the Chicago Surface Lines has HASKELITE roof and linings.

Roof Fundamentals

Considered as to structure, the HASKELITE roof car has many advantages. The super-strength of the HASKELITE roof means longer, better service.

The upper left-hand illustration, showing eight men on a HASKELITE safety car roof, pictures the superior serviceability of HASKELITE construction. Workmen may walk on a HASKELITE roof without fear of causing damage or leaks.

The fundamental structural properties embodied in HASKELITE car roofs are illustrated in the small test shown at the right. In service, the framework of a car receives many stresses tending to twist the car just as the hands tend to distort the small models. Observe that the model with the strip covering is distorted, but the same model with a solid cover retains its original shape.

A similar comparison exists between the slat car roof and the HASKELITE unit type of roof. More than is usually recognized, torsional stresses bring about leaks, caused by nails working through the cloth. HASKELITE roofs possess unusual capacity to resist all forces of deterioration.

Companies Using HASKELITE

Cincinnati Traction Company
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Denver Tramways Company
Cataluna Railways, Ltd.
Milwaukee Electric Railway & Light Co.
Municipal Railways of San Francisco
Pittsburgh Railway Company
Indianapolis Street Railway Company
Twin City Lines
Illinois Traction System

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J. G. Brill Company
Cincinnati Car Company
National Safety Car & Equipment Co.

Write for our blue print booklet descriptive of the HASKELITE roof and for samples of 3/16 in. HASKELITE lining—the lightest weight head lining made today.

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HASKELITE MFG. CORPORATION

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Trained Eyes and Steel Ties

IN the course of experience an Engineer develops unconsciously a faculty of measuring the strength of materials with his eye—of checking without calculation by his visual preception the correctness of any construction—always when faced with this test Steel Twin Ties get the nod of approval.

THEY'RE big enough for the work they have to do—140 pounds of steel—156 square inches of bearing per track foot and this at no greater cost than wood ties in ballast—in many localities at a large first cost savings over wood ties in concrete.

See them in your 1923 construction

THE INTERNATIONAL STEEL TIE CO.
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Steel Twin Tie Track

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Standard Trolley Harps
Standard Trolley Wheels
Automatic Door Signals
Trailer Connectors

Leaders

of a Long List of Favorites

And why? Because operators who take pride in the appearance of their cars and in the matter of conveniences they offer the people who buy their service have found out that Keystone Car Specialties go a long way toward gratifying this commendable effort. Keystone Specialties are favorites of the men on the platforms as well. You will find them on nearly every car operated by the companies that believe in "safety first" and "service next."

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No. 2

OF A SERIES OF ARTICLES PICTURING THE INFLUENCE OF THE ENGINEER IN THE AFFAIRS OF THE WORLD. PRESENTED BY THE McGRAW-HILL COMPANY, INC., WHOSE PUBLICATIONS HAVE SERVED THE ENGINEER THROUGH HALF A CENTURY OF INDUSTRIAL PROGRESS

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Electric Railway Journal

Ingenieria Internacional (Printed in Spanish)

Chemical and Metallurgical Engineering

Journal of Electricity and Western Industry (San Francisco)

THE ECONOMY OF KNOWLEDGE

ONE of the greatest needs of the world today is for accuracy. Accuracy in its teachings, in its actions, in its beliefs. This can only come through a knowledge of economic facts.

¶ A man may learn to drive a nail precisely, but he is a dangerous man unless he knows the effect of the driving upon the materials into which the nail enters. Progress requires an exactness of information to meet the needs of this day when no man is independent of his fellows. Without this exactness, this accuracy, efforts at advancement are endangered, and progress becomes speculative.

¶ The great dependency of the world upon its industrial organization, not alone for comforts but for the very vitals of life, dictates that haphazard be replaced by knowledge.

¶ Industry exacts known values and processes for its operation. And there we have the potent reason for the ever-increasing supremacy of the engineer. But a few years ago, when demand paid whatever price was required, industry threw itself into a fury of production and thought this passing whirl-wind of effort was progress.

¶ The cost of this effort has put the world in pawn, and our pride of achievement has been pricked by the sharp point of reality. We *thought* we were right. It did not require the engineer to prove we were wrong. The inevitable backward swing of the balance did that.

¶ But it has necessitated the service of the engineer to show us wherein we were wrong; and how to set about reconstruction on the sound basis of facts.

¶ At a costly price industry now recognizes its need of the engineer; his judgments, his analyses, his technical knowledge founded on economic facts.

¶ And progress is now following the trails blazed by the engineer for the benefit of all men; for the engineer has proved the economy of knowledge.

McGRAW-HILL COMPANY · INC ·
NEW YORK

TOWER

OF PISA

IPSE DIXIT *and* GALILEO

There was much learning but little real knowledge in Galileo's time (1564-1642). Aristotle was swallowed in bad Latin translations. Ipse dixit. No one checked him by what seemed vulgar, coarse experiment.

Galileo fought against the dead hand of tradition. He did not argue about Aristotle, but put him to the test. Aristotle led his readers to believe that of two bodies the heavier will fall the faster. Galileo simply climbed to the top of the Leaning Tower of Pisa and dropped two unequal weights. The "best people" were horrified; they even refused to believe the result—that the weights reached the ground in equal times.

"Look at the world, and experiment, experiment," cried Galileo.

The biggest man in the 16th century was not Galileo in popular estimation, but Suleiman the Magnificent, the Ottoman Emperor, who swept through Eastern Europe with fire and sword and almost captured Vienna. Where is his magnificence now?

Galileo gave us science—established the paramount right of experimental evidence. Suleiman did little to help the world.

Hardly an experiment is made in modern science, which does not apply Galileo's results. When, for instance, the physicists in the Research Laboratories of the General Electric Company study the motions of electrons in rarified atmospheres, or experiment to heighten the efficiency of generators and motors, they follow Galileo's example and substitute facts for beliefs.

General Electric

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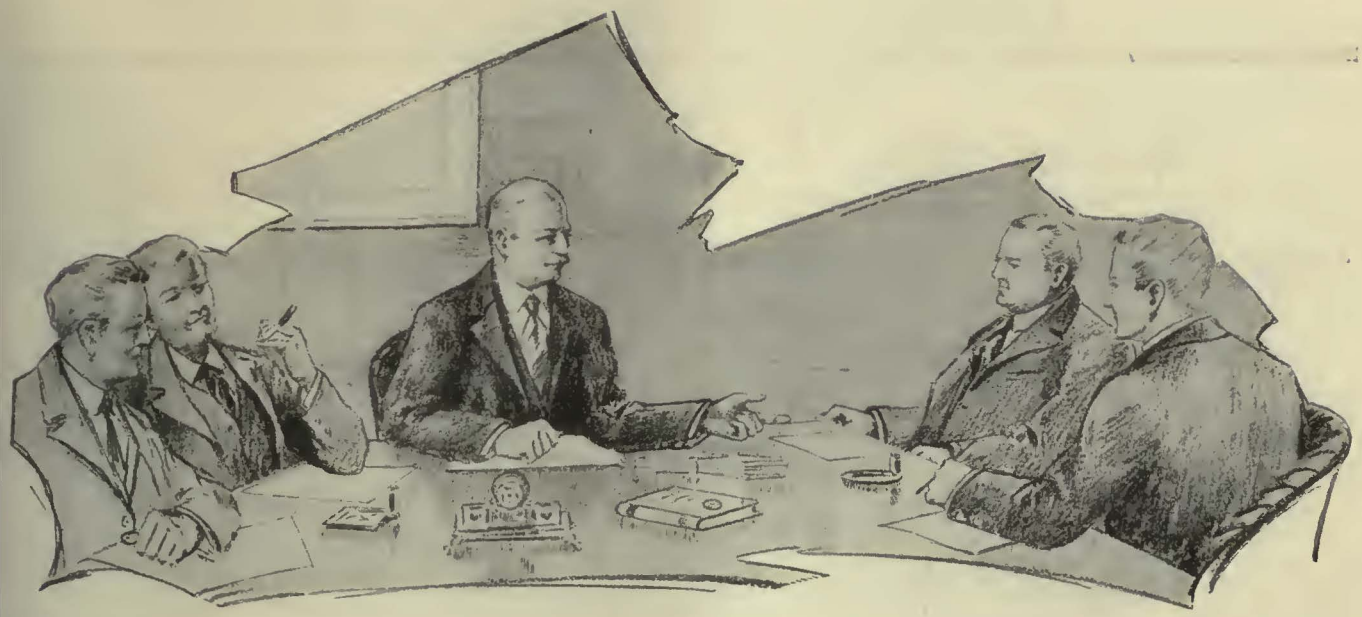

Lubrication is of Extreme Importance

EXECUTIVE officers of electric railways are awakening to the fact that lubrication is not only a determining factor in securing efficient service from power house and rolling equipment, but that many other important expense items are regulated largely by its quality.

The installation of efficient lubrication on your road is not the simple proposition of buying oil, nor does the purchase of cheap oil indicate economy in lubrication—in fact, quite the reverse.

Service is the one unfailing test of oil quality. Unless the lubricant is capable of demonstrating efficient service, it is dear at any price. And SERVICE is not a difficult quantity to measure—it shows in performance.

The subject is one worthy of careful consideration. The mechanical and operating departments—as well as the purchasing—are interested, and in a position to judge service values at first hand. Their opinion is indispensable to intelligent selection.

Lubrication costs will be found high or low, exactly in proportion to the service results obtained. With the inevitable poor service that marks the use of cheap oils, the small savings made through their lower first cost is lost many times over in the expenses of repairs and depreciation caused by their shortcomings.

When the lubrication question is considered from all angles—when efficient service and ultimate economy are the deciding factors—Galena Oils will be found the only logical choice. They are now used by over five hundred electric properties.

"When Galena Service Goes In
Lubrication Troubles Go Out!"

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One of the 15 New Trolley Buses

Serving the Public Well

A total of 22 trolley buses now in service on Staten Island makes that the most important installation to date. Trackless trolley bus operation there has already resulted in considerable new home building in the communities served.

It is of interest to note that the motive equipment on the 15 new buses recently put in operation duplicates that on the seven which have operated successfully for more than a year, viz., G-E 258 Light-Weight Motors with K-63 Control. G-E collectors and overhead material are also used.

There is an advantage to you in the fact that this G-E equipment which has proved its mettle on hundreds of electric railways under all operating conditions is recommended as standard equipment for trackless trolley lines.

General Electric Company

General Office Schenectady, N.Y.

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ELECTRIC RAILWAY JOURNAL

Consolidation of Street Railway Journal and Electric Railway Review
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Volume 60 New York, December 9, 1922 *Number* 24

The Engineer as an Industrial Leader

A SIGNIFICANT feature of the annual meeting of the A.S.M.E. in New York this week was the attention given to the economic and human side of engineering. An evening session was devoted to it and the same topic was emphasized in the presidential address of Dean Kimball, who strongly urged engineers to acquire a broader knowledge of human nature and the economic principles of industry and commerce. With this equipment he visualized the engineer as possessing many of the attributes for leadership in the modern state, which are lacking in the military man, the lawyer and the financial business men. Through the progress of civilization each of these types has successively been most prominent in directing human affairs, but with the growing technical complexity of modern life the rôle of industrial manager is being forced more and more on the engineer.

The changes that Dean Kimball described are evident in individual industries as well as in business in general, and the railway industry is no exception. Mass production is the order of the day in manufacturing, and the application of engineering principles in mass transportation are no less necessary in our large cities. When a transportation line consisted of a few miles of track and cars almost any one could direct its affairs. The next step was the consolidated property, for whose creation the banker and lawyer were necessary. But the main problems in city transportation now are not simply those of finance or law. The aid of the engineer is being sought in their solution to a greater and greater degree. The problems of finance and law remain, but they are becoming equaled by if not subordinated to those of equipment design and traffic movement. The chief executive in many of the largest electric railway properties now, in London and New York for instance, have risen to those positions through the engineering or transportation sides of the service rather than that of banking and law, and the same condition applies to many other properties.

Thus electric railway progress seems to be along the normal lines of development indicated by Dean Kimball.

The Charles A. Coffin Foundation— A Noteworthy Event

THE establishment by the General Electric Company of the Charles A. Coffin Foundation announced this week is most praiseworthy. It commemorates in a suitable manner the activities of one whose services in establishing the electrical industry on its present firm foundations have been of great value, and it encourages in a definite way advances in the application of electricity to the service of man. The electric railway industry is especially interested in this endowment, partly because Mr. Coffin has always taken a keen interest in technical improvements in railroad motive power from the time that the original Thomson-Houston Electric Company acquired the Van Depoele patents, and partly because the foundation specifically provides for an annual award to that electric railway company "which, during the year, has made the greatest contribution toward increasing the advantages of electric transportation for the convenience and well-being of the public and the benefit of the industry."

The four groups designated in the deed of gift for recognition by awards were well selected. They represent, first, the men in the employ of the General Electric Company, outside of its officers, heads of departments and others occupying similar executive positions, who make the most signal contributions toward the increase of the company's efficiency or the progress of art. Then come the two large electrical industries with which Mr. Coffin's activities as president of the General Electric Company and chairman of its board of directors were most intimately associated, namely, the electric railway and electric light and power. Then there is the fourth purpose of the foundation, the expansion of technical research. This is encouraged by annual awards to technical graduates who continue their research work in electricity, physics or physical chemistry, and to technical schools to expand their research work along these lines.

The Charles A. Coffin Foundation is a noteworthy gift to electrical science, typical in its generosity and broad nature of the man whose name it bears.

Time Control Not the Last Word in Handling Traffic

THERE seems to be a great tendency to praise and to copy the three-light signal and time-element control of the traffic on and across Fifth Avenue, New York City, without much consideration of how well it aids traffic in New York, or would help elsewhere. The Fifth Avenue system is rather spectacular, and it probably attracts attention because of its uniqueness. But as to facilitating the movement of traffic, that is more fiction than reality.

During the hours of the day when travel is very heavy, the system may serve to speed up traffic on this main north and south artery, but this is done at the expense of the crosstown travel, which is very much slowed up, as compared to the usual system of control. In the hours of lighter travel, the speed on Fifth Avenue is itself slowed up by the time-element control system, for the period of travel in one direction is determined by the conditions at Forty-second Street, the heaviest crosstown street. The result is that for long stretches of time often no use is being made of the other intersections all along the avenue, while many north and south vehicles wait patiently for the signal. Certainly an efficient use of the crossings cannot be claimed for the Fifth Avenue system.

Furthermore, the adherence to a certain time element

in changing direction of travel has spread to several other thoroughfares in New York, for the policemen follow the scheme even without the signal lights. The result is a slowing up of traffic generally, as compared to other large cities where the officer handles the traffic in shorter "takes" and does not wait for any time period to lapse before permitting the vehicle from the other direction to go, if the way is clear.

Do Motormen Realize that They Are Custodians of Valuable Property?

WHEN a man takes his place at the front end of his car and puts the car in motion he assumes responsibility for the safety of the car riders behind him and for the preservation of his employer's property. A realization of this fact cannot but tend to lend dignity to the position of motorman and thus promote the incumbent's self-respect. It should also make him careful, and carefulness is needed now as never before because of the congestion of street traffic by automobiles and the recklessness with which many of those vehicles are driven. The alarming increase in the rate at which vehicles are colliding with cars indicates an unusual need for caution.

It is true that a large part of the collisions between cars and automobiles are due to carelessness of the drivers of the latter. At the same time it is up to the motorman, who is a responsible employee of an established public service corporation, not only to avoid causing collisions himself but also as far as possible to prevent less careful drivers from running into his car.

Aside from the urgent and primary duty of minimizing injury to persons, which is "another story," the motorman has it in his power to safeguard costly physical equipment. If he is on an interurban car the value of this may run to $30,000 or more. It is difficult to visualize just what this means. That amount of money in real estate or grocery store stock would make quite a show. And a motorman on a train has behind him several times this value, possibly a quarter of a million dollars. Even when it is an inexpensive safety car that is being operated the principle is the same. Besides this, the motorman also in part determines the life of switches, crossings and other special trackwork, which also are more expensive than he usually realizes. It would be well for managers to impress the above line of thought upon their men at this time as a part of the campaign against the accident evil.

Higher Salaries Will Bring Young Men to the Industry

QUITE a lot of thought has been given to ways of interesting more young men in the electric railway business, particularly on the part of the A. E. R. A. committee on education. It was suggested that apprenticeship courses be revived, that joint study and practical work be arranged between technical schools and railway companies, etc. However good the suggestions of the committee may be, they are likely to avail little until a fundamental deficiency in this field is remedied. Probably the most pertinent reason why young college men are not coming to the electric railway field more plentifully is that they are not paid enough. In fact, the average run of salaries throughout the industry is lamentably low. In comparison with the electric railway field the inducements that come to these energetic young men from other industries include not only the interest of rapidly expanding fields but more money right from the start and in the future, if the man shows capabilities.

This is certainly not as it should be. Considering the great opportunity in the electric railway field for brains and skill to make tremendous savings, or the lack of them to make ruinous losses, there ought to be sufficient compensation to attract and hold the very best of talent. Taking into account the demands imposed on a man by seven-day, twenty-four-hour service to the public, the compensation ought to be relatively higher than in other lines where the conditions are less exacting.

Knowledge of this salary situation somehow penetrates college circles and the young men shy at apprenticeships in railway work (at small pay) and hire out to the automobile, the general manufacturing, or some other field.

The whole level of salaries of electric railway operating heads and their assistants is too low, on some roads ridiculously so. It is apprehended that if data were available for a comparison of the general rise in electric railway salaries as compared to the trend in level of wages in the field it would make it appear that brain is much less appreciated than brawn. Taking into account this condition, it is not altogether surprising that the personnel on some roads is failing to measure up to the opportunities. The good men in many cases have gone to better paying fields, for the salary situation not only deters the best young men from entering the field but makes it difficult to hold good men. The corrective measures are obvious.

While Others Talk Subway Rochester Quietly Builds One

THE city of Rochester, N. Y., is exhibiting initiative and foresight in utilizing the bed of the abandoned Erie Canal for subway purposes. Little publicity has as yet been given to the subway development in this city; there has been no blowing of horns about what was going to be done. At the same time construction has been going ahead at a good pace, as is evidenced from the construction pictures reproduced elsewhere in this issue. There will be in the subway accommodations for two interurban tracks and two freight tracks, with necessary sidings; the freight trains, of course, to be moved by electric locomotives. These facilities will greatly relieve congestion in the streets and permit higher speed to be made by the interurban cars. Further, the roof of the subway will be a broad street, which will further improve street transit conditions.

This work is facilitated by the fact that the canal site could be occupied exclusively for construction purposes, a condition not usually met in subway construction. This condition also largely eliminated interference with street traffic, which is one of the bugaboos of subway work in large cities.

The site of the abandoned Erie Canal presents an interesting problem in several cities. Its route lies naturally through their business and manufacturing districts, because the cities were built up commercially along the line of the canal. Hence the canal site presents great possibilities in the way of civic improvements. Rochester is utilizing her section by making a subway of it. In near-by Lyons the track of the Rochester & Syracuse Railroad, a high-speed interurban line, has been removed from the main streets to the bank of the old canal, permitting much faster and, therefore, better service through the town.

NEW GENERAL OFFICE BUILDING WHICH HOUSES ALL DEPARTMENTS OF DETROIT MUNICIPAL RAILWAY

Detroit Street Railway Moves Administration Center to New Buildings

Office Building, Car Storage Yard and Inspection Shop and Track and Line Building Located on 14-Acre Plot in Outlying District —Many Interesting Features in Design and Layout of Facilities

A RECORD of the progress made by the Department of Street Railways, city of Detroit, would be incomplete without a description of the new buildings which were erected during 1922 for office and shop use. A plot of land of approximately 14 acres was used. This extends from Shoemaker Avenue to Warren Avenue in one direction and from St. Jean Avenue to Lillibridge Avenue in the other. The buildings erected consist of an office, carhouse, heating plant and building for the track and line department. The original plans also provided for the erection of a large car shop, but when the city took over the Detroit United Railway property last May it was decided to use its shop and not erect a new maintenance shop at the present time.

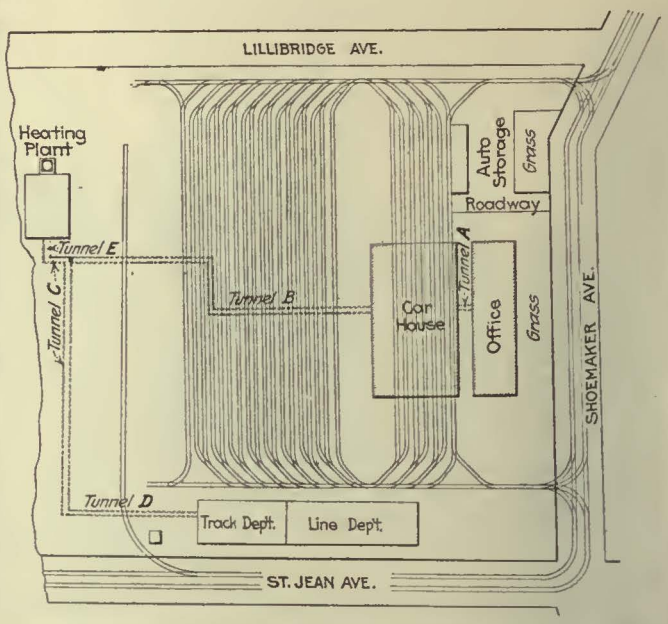
The office building faces on Shoemaker Avenue and is a three-story and basement building, 217 ft. 9¾ in. long by 61 ft. 9 in. wide. It is made of rough, red-faced brick, and the concrete walls of the basement extend to the bottom of the windows of the first floor. This adds materially to the fine appearance of the building. The front line of the building, which faces north, sets back 50 ft. from the street and this space, as well as large areaways at each end, is devoted to well-kept lawns. Attractive buildings and surroundings are a particular asset to the city, since they insure that other buildings erected in the locality will also be of high-class construction and the revenue obtained from taxes and from the increased valuation of other adjacent property will prove an advantageous source of income. There are two entrances to the office building on the front and one at the east end of the building. One of these, that at the front toward the west, is used as a general entrance; the other two are used for employees only. The main entrance leads into a spacious lobby with tile floor and at the end of this lobby is a stairway with an elevator to serve the other floors. Corridors run lengthwise of the building on each floor, off which entrance to the various offices is obtained. The offices on the first floor are devoted particularly to the transportation department. A fire stairway which is shut off from the other parts of the building forms a part at the east end. Washroom and toilet facilities are particularly extensive, and the heating, ventilating and lighting of the building incorporate all the latest improvements in office building construction. The ventilation of the toilets and the locker rooms is particularly interesting. In the locker room a duct is provided underneath the floor with screened openings from each locker leading into this. There are other openings at the front and top of each locker so that air is led in at the top and exhausted through the bottom of the locker so as to insure a complete circulation of air to carry off any offensive odors. A duct is also provided overhead in the toilet rooms which also insures very effective ventilation.

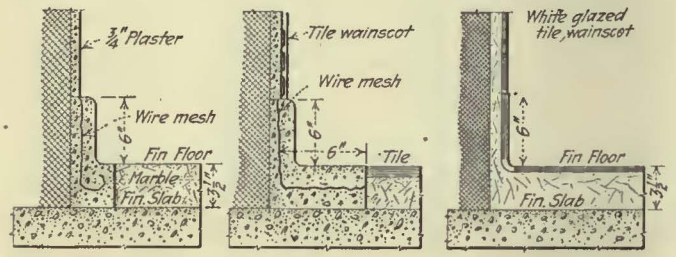
The heating pipes are brought into the office building through a tunnel which extends underneath the inspection shop and has a branch leading to the line and track department building. This tunnel has a cross-section of 5 ft. x 7 ft. and its location is shown in the accompanying layout of the buildings and yards.

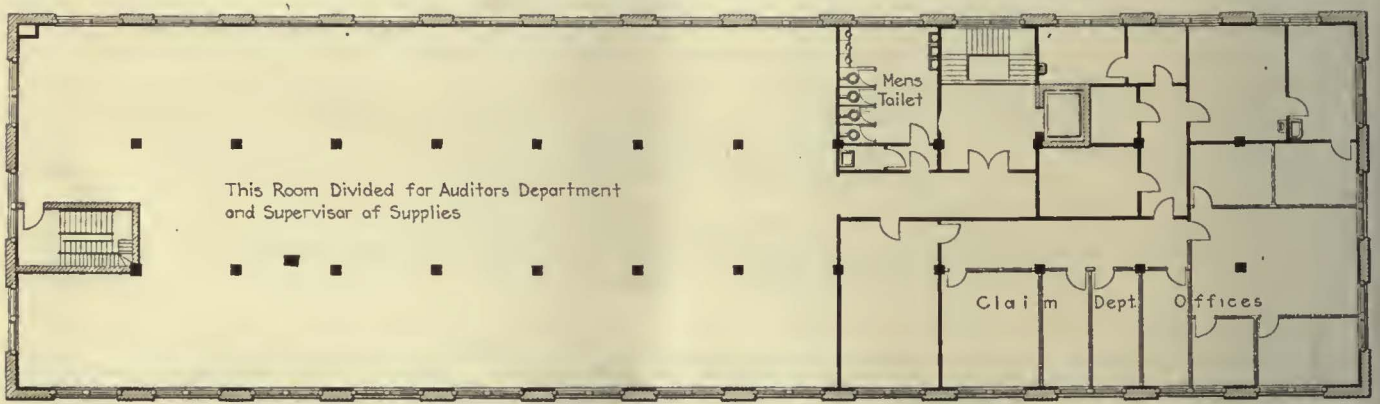
The floor and base construction used throughout the office building is of particular interest, as extreme care was used in the design to provide round sanitary corners and provision for washing without danger of damage to the walls. The floors are of cement, slate, tile or linoleum and the bases are of cement or tile. The

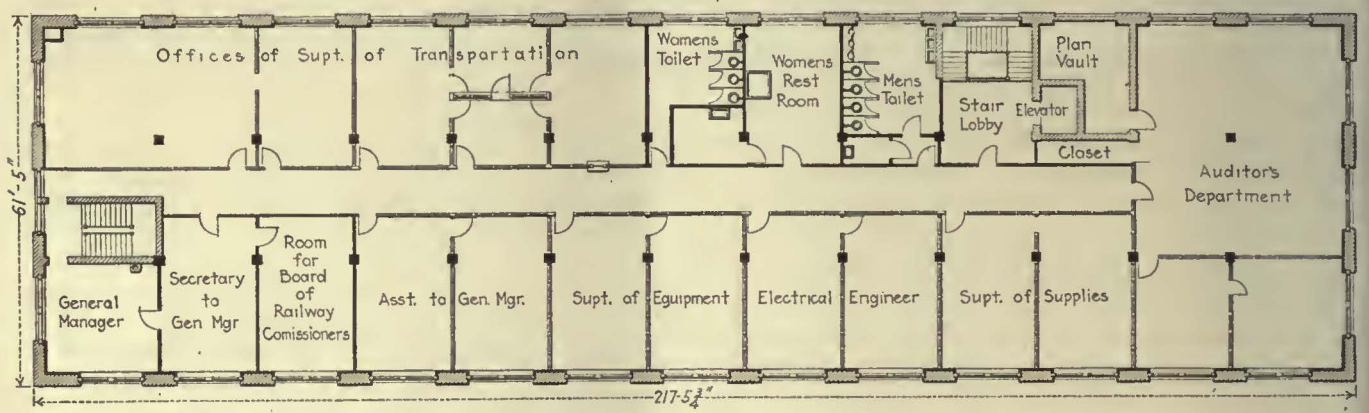
Building Layout and Plans of Office Building

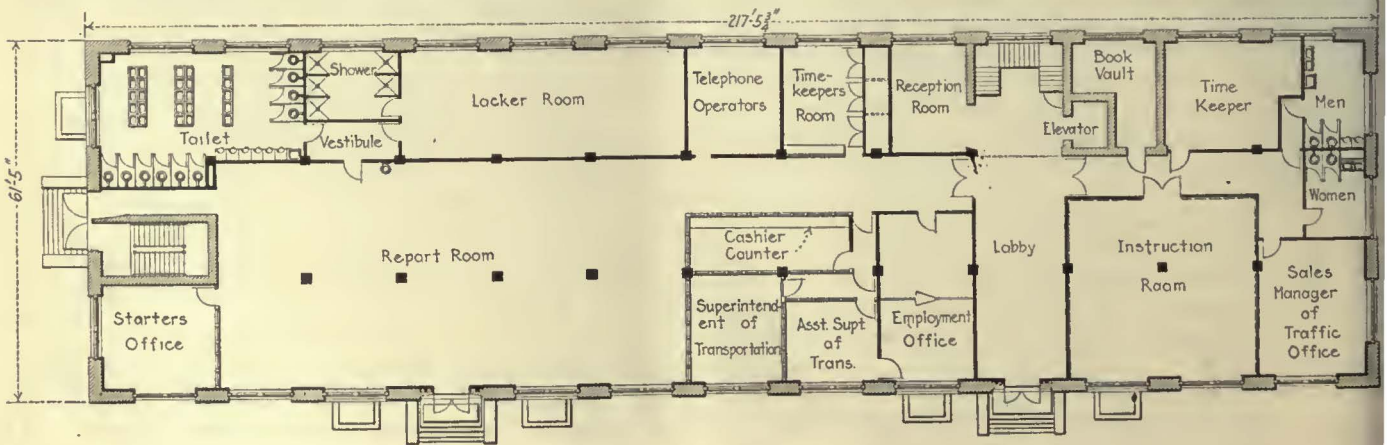
At right, track yard and building layout. Below, details of base and floor construction. At bottom, first floor plan of offices. Center, second floor plan of offices. At top, third floor plan of office building.









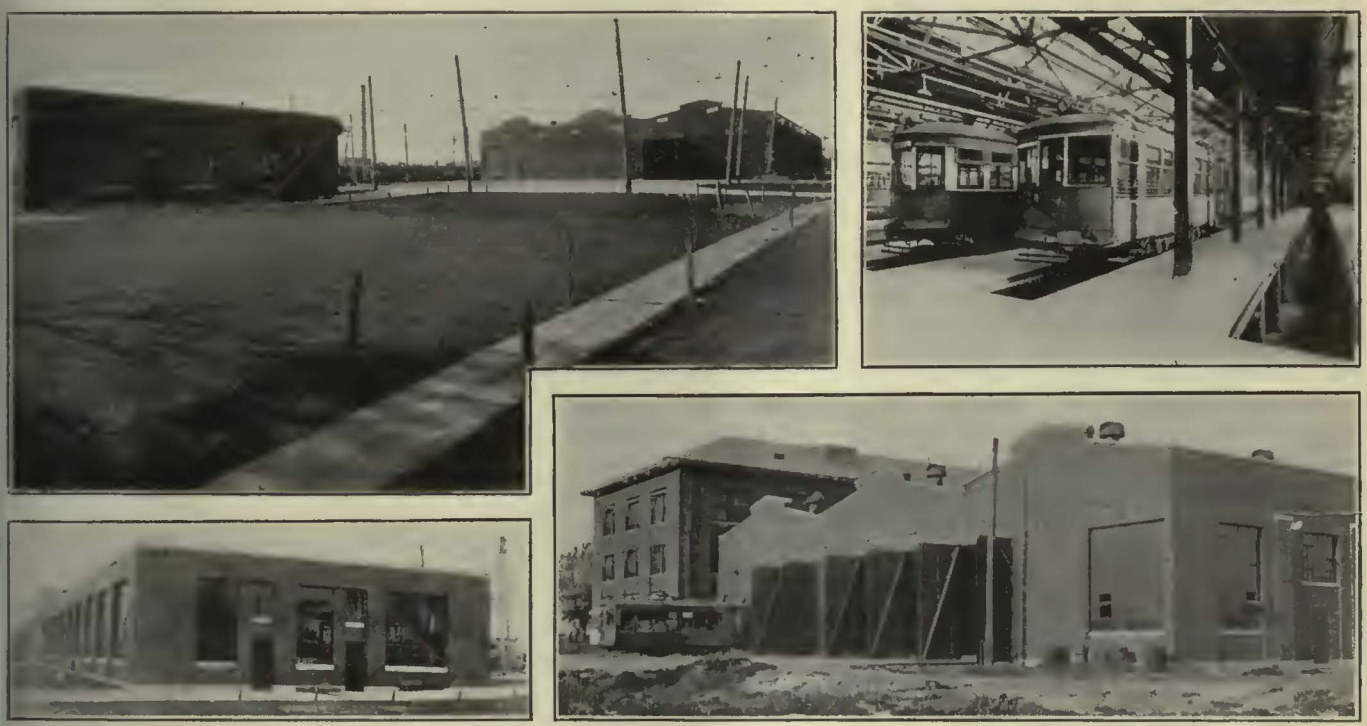


walls above the bases are of either plaster, tile wainscot, marble or a solid plaster preparation. A few cross-sections shown will give an idea of the construction.

The second floor is devoted to offices for the various officials. These include the general manager with various assistants, the superintendent of equipment, electrical engineer, supervisor of supplies, and the superintendent of transportation. The auditing department also occupies rooms at the west end of this floor. The principal part of the third floor is taken up by the auditor's department, the supervisor of supplies, and the claim department.

Carhouse Construction

The carhouse occupies a space of 124 ft. x 216 ft. immediately back of the office building. This is constructed with three bays. The center bay is 40 ft. wide and the outside bays 42 ft. and 40 ft. respectively.



NEW BUILDINGS AND YARDS OF THE DETROIT MUNICIPAL RAILWAY

Upper left—View of ground showing shop and building for line and track department.
Upper right—Interior of shop showing pit construction.
Lower left—Line and track department building.
Lower right—End of shop showing three-unit construction, with office building adjacent.

A space on the south side of the building 20 ft. wide and running the entire length is partitioned off for use as an office, storeroom, machine shop, oil room, sand room and toilet. A particular feature of this is that the wall which separates these departments from the inspection shop extends up only to the roof truss. This is of particular advantage as this construction does not shut off any of the light, as would otherwise be the case.

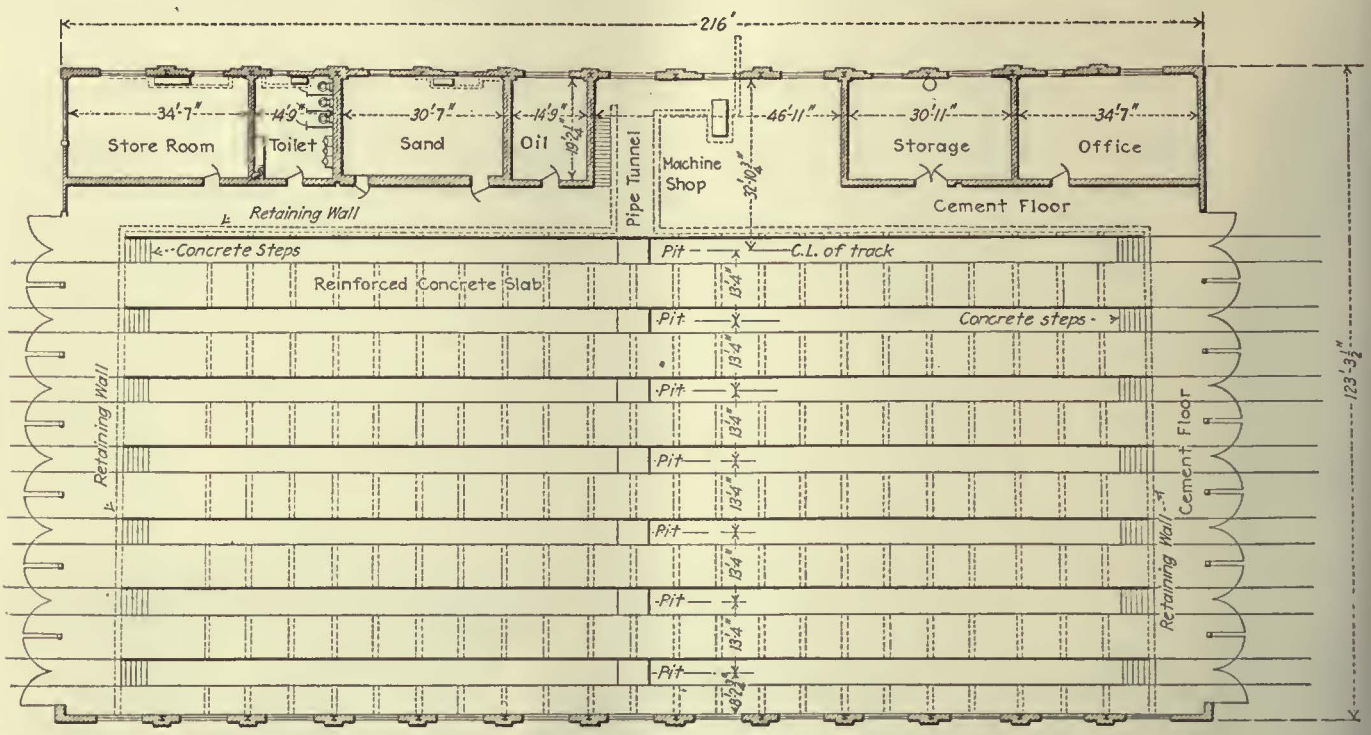
Provision has been made throughout the construction to provide plenty of light, and one of the outstanding features is that of the roof construction. Fifty per cent of the roof is skylight, and the remainder is concrete slab covered with Barrett roofing. The entire construction throughout the carhouse is fireproof, steel concrete and brick being used. In the layout and arrangement of facilities, many improvements utilized in modern carhouses throughout the country have been incorporated in the design and construction. In order to provide for the use of chain hoist for hoisting car bodies or lifting equipment, the roof truss is figured for a 1-ton load at each panel point on the lower chord.

There are seven tracks running through the building, each being provided with a pit for the entire length. The tracks are located with a center to center distance of 13 ft. 4 in. and the pits are 5 ft. deep.

The floor and pit construction is of particular interest. It consists of structural steel support piers incased in concrete. The track rails are used as the top members. The concrete between adjacent tracks is supported by partitions and not by the rail. The rail, however, which is 7-in. 91-lb. T-rail, forms the support for the cars. The supporting piers are located at 8-ft. centers and passageways are left between these to give free access to adjacent pits. The inner rails of adjacent tracks are supported in pairs by vertical structural steel members diagonally braced. Two angles 2½ in. x 3½ in. x ¼ in. are used for the vertical members, and angles of the same size serve for diagonal braces. This construction leaves the pit entirely unobstructed and gives a very satisfactory arrangement. Accompanying cross-sections and photographs will give a clear idea of the construction used.

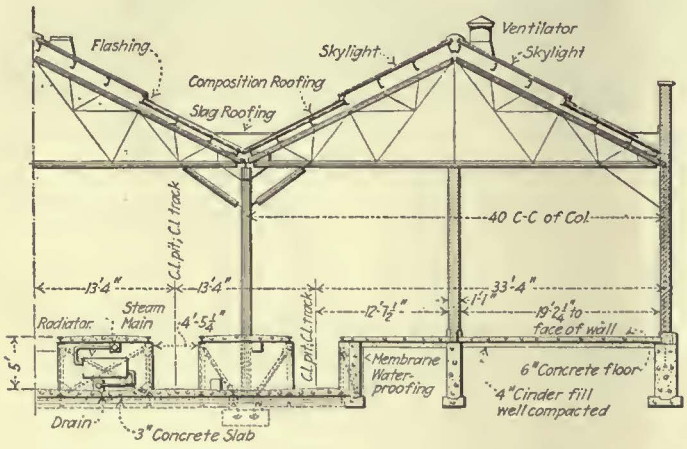
Heating is provided by radiators installed between adjacent pits, there being eighteen radiators in the entire length of the building between two pits. The steam mains are brought into the building through a tunnel as already referred to, and this tunnel extends through the center of the shop and runs to the office building. The system of steam pipes and fire lines has been worked out very carefully.

The door construction has not followed the usual practice for electric railway shops, which is that of using rolling doors for carhouses. Each track of the Detroit shop is provided with two swinging doors, which open outward.



FLOOR PLAN OF CARHOUSE

The track layout for the carhouse and storage yard is shown in an accompanying illustration. A ladder track arrangement is used with through tracks the entire length between these. The ladder track at the east side is approximately 120 ft. from the end of the carhouse and that on the west side 230 ft. from the shop. As single-end operation is used for the cars in Detroit the track facilities were designed particularly to handle this type of equipment. The scheme in general provides for cars to enter from Shoemaker Avenue, although on the east end there is also a connection to St. Jean Avenue. Cars which are to pass through the



CROSS-SECTION TO SHOW SHOP CONSTRUCTION

carhouse for inspection or light repairs can proceed in either direction from the ladder track, either from the street or storage yard, and after passing through the house completing the loop they can be returned to any desired location. The arrangement of the track layout, while providing a complete loop for either the storage yard or from the street, also gives facilities so that cars can be turned without interfering with regular traffic through the use of the Y provided at the entrance to each end of the carhouse yard. The yard has been designed with pavement which insures cleanliness and provides favorable working conditions. The drainage has also been carefully worked out. Five 6-in. drains are provided between tracks lengthwise of the yard. These connect the cross drains which lead to 12-in. and 18-in. main sewers. The latter also provide drainage outlets for the carhouse and office building. The work of excavating and constructing foundations was done by contract by forces of the department of street railways and superstructures. W. C. Markham, construction engineer, was in charge of the general layout and supervision of this work under the direction of J. S. Goodwin, general manager. The general shop facilities were developed by A. C. Colby, superintendent of equipment.

Repair Shops Nearly Double in Size in Five Years

THE fourteenth United States census of manufactures gives some very interesting facts on the growth of electric railway repair shops in a bulletin just issued by the Department of Commerce. In 1919 the value of the materials used and amount of wages paid had more than doubled over the figures in 1914, and while the value of the products had not increased in quite the same ratio, it was almost 200 per cent of that in 1914. The figures for 1919, 1914 and 1909 follow:

ELECTRIC RAILROAD REPAIR SHOPS

	1919	1914	1909
Number of establishments	624	649	541
Persons engaged	33,120	28,215	23,699
Primary horsepower	53,830	44,989	35,794
Capital	$82,557,905	$63,613,741	$38,898,686
Salaries and wages	42,052,521	20,559,383	15,690,228
Salaries	2,979,367	1,914,538	1,204,219
Wages	39,073,154	18,644,845	14,486,009
Paid for contract work	118,335	24,596	23,480
Rent and taxes	765,463	581,657	351,626
Cost of materials	32,025,484	17,609,574	15,167,899
Value of products	72,210,701	38,576,565	31,962,561
Value added by manufacture*	43,185,217	20,966,991	16,794,662

* Value of products less cost of materials.

Richmond Finances Analyzed

A Report Prepared by John A. Beeler for the Richmond City Council Shows a Number of Interesting Facts—Economical Operating Methods Found

THE first portion of a report which John A. Beeler is preparing on the Richmond Railway division of the Virginia Railway & Power Company has just been made public. It contains about 7,500 words and many tables and relates to the financial condition and history of the company. A second part will follow on capital accounts and investment in connection with the valuation of the property, while service and operating methods will be considered in a third volume. The report is being made by the Beeler Organization for the committee on streets of the Richmond City Council. Among other interesting facts disclosed by the report it is found that the Richmond Railway division is making an operating profit on total operating revenues of only about 33 cents a car-mile, in spite of the fact that its taxes amount to nearly 10 per cent of its gross receipts.

TABLE I—INCOME STATEMENT, RICHMOND RAILWAY DIVISION

Year	Gross Earnings	Operating Expenses	Net from Operations	Operating Ratio
1910	$1,237,274.24	$836,475.21	$400,799.03	.676
1911	1,341,330.71	880,619.24	460,711.47	.657
1912	1,380,043.66	947,414.45	432,629.21	.687
1913	1,473,555.72	953,185.07	520,370.65	.647
1914	1,487,579.47	983,939.67	503,639.80	.662
1915	1,390,708.27	953,719.44	436,988.83	.686
1916	1,526,357.19	1,073,340.67	453,016.52	.704
1917	1,597,777.78	1,154,196.01	443,581.77	.722
1918	1,657,895.52	1,370,559.00	287,336.52	.826
1919	1,939,050.24	1,698,869.32	240,180.92	.876
1920	2,321,559.61	2,064,487.35	257,072.26	.889
1920 *a*	1,345,027.33	1,298,111.19	46,916.14	.965
1921 *b*	2,553,284.76	2,441,734.97	111,549.79	.956

a Six months period ended Dec. 31.
b Fiscal years ended June 30, except 1921 ended Dec. 31.

Mr. Beeler finds the income during the last twelve and one-half years was as shown in Table I.

Almost the entire operating receipts of the company are derived from passenger earnings. Other sources of revenue, totaling less than 1 per cent, are chartered cars, advertising and minor items. From July 1, 1908, to Feb. 13, 1919, the fare was 5 cents, with tickets sold at the rate of six for 25 cents, good any time, and labor tickets good before 7 a.m. sold for 2½ cents. From Feb. 14, 1919, to July 31, 1920, the fare by cash or tickets was 5 cents and labor tickets were sold six for 25 cents. Since Aug. 1, 1920, all fares have been 6 cents.

TABLE III—EXPENDITURES FOR MAINTENANCE OF WAY FOR LAST TWELVE AND ONE-HALF YEARS

Year	Current Maintenance	Per Cent of Gross Revenue	Cents per Car-Mile	Track* Mileage	Average Maintenance per Track-Mile
1910	$81,388.25	6.58	1.40	69.270	$1,175
1911	84,405.90	6.29	1.43	69.270	1,218
1912	103,849.83	*7.53	1.73	*c* 71.430	*c* 1,454
1913	104,654.19	7.10	1.74	72.714	1,439
1914	114,264.27	7.68	1.86	73.540	1,554
1915	95,327.25	6.85	1.55	77.956	1,223
1916	84,038.64	5.51	1.21	82.612	1,017
1917	78,472.43	4.91	1.13	82.714	949
1918	94,633.37	5.71	1.40	83.168	1,138
1919	142,320.83	7.34	2.13	83.290	1,709
1920	173,898.78	7.49	2.20	83.228	2,089
1920 *a*	92,988.99	6.91	2.30	83.228	2,234
1921 *b*	211,871.35	9.30	2.75	83.818	2,527

* From annual reports to stockholders
a Six months period ended Dec. 31.
b Fiscal years ended June 30, except 1921 ended Dec. 31.
c Mileage is given in annual report as 81,430.

Table II shows operating revenues and expenses for the period in cents per car-mile and cents per car-hour.

Mr. Beeler finds that the maintenance of way has been kept up well as shown by Table III. A considerable part of the increase, as compared with the early years, is undoubtedly due to the increase in material prices and labor rates. The figures for maintenance of equipment are shown in Table IV. The figures for the last two or three years undoubtedly in equipment maintenance include some deferred maintenance and this account should now be lower. Power is obtained at cost from the light and power division of the company. Conducting transportation cost last year 39.81 per cent of the gross earnings and 41.69 per cent of the operating expenses. Nevertheless the rate of wages paid has been very conservative in comparison with those that are paid in other cities. Table V gives the figures since 1910.

"General and miscellaneous" were 18.1 per cent of the gross earnings and 18.9 per cent of operating expenses. The figures given in the report included only $12,655 chargeable to the railway division for the

TABLE II—OPERATING REVENUES AND EXPENSES RICHMOND RAILWAY DIVISION, 1910–1921

	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920	1920*a*	1921*b*
Cents per Car-Mile													
Car earnings	21.18	22.59	22.75	24.25	24.00	22.39	21.66	23.00	24.48	29.01	29.31	33.12	32.85
Miscellaneous earnings	0.07	0.08	0.24	0.26	0.25	0.22	0.39	0.08	0.08	0.07	0.08	0.21	0.28
Total operating revenue	21.25	22.67	22.99	24.51	24.25	22.61	22.05	23.08	24.56	29.08	29.39	33.33	33.13
Maintenance way and structures	1.40	1.43	1.73	1.74	1.86	1.55	1.21	1.13	1.40	2.13	2.20	2.30	2.75
Maintenance equipment	1.73	1.39	1.34	1.23	1.27	1.17	1.09	1.35	1.65	2.63	2.94	4.44	3.44
Power	1.03	1.24	1.28	1.10	1.06	1.04	1.04	1.43	2.27	2.39	2.52	3.20	3.02
Conducting transportation	5.71	5.96	6.31	6.43	6.43	6.43	6.54	7.08	8.85	11.23	10.91	13.42	13.21
Traffic	0.07	0.03	0.06	0.06	0.06	0.04	0.06	0.05	0.06	0.07	0.06	0.04	0.08
General and miscellaneous	1.44	1.51	1.11	0.98	1.05	1.16	1.33	1.06	1.15	1.20	1.23	1.37	1.69
Injuries and damages	0.74	0.79	0.80	0.85	0.85	0.79	1.08	1.15	1.23	1.45	1.47	2.33	2.32
Depreciation and renewals	0.51	0.76	1.38	1.47	1.45	1.36	1.32	1.39	1.47	1.75	1.76	2.00	1.99
Taxes	1.68	1.76	1.77	1.99	2.01	1.97	1.83	2.03	2.23	2.63	3.05	3.06	3.18
Total operating expenses	14.36	14.87	15.78	15.85	16.04	15.51	15.50	16.67	20.31	25.48	26.14	32.16	31.68
Net earnings from operations	6.89	7.80	7.21	8.66	8.21	7.10	6.55	6.41	4.25	3.60	3.25	1.17	1.45
Cents per Car-Hour													
Car earnings	167.65	175.91	176.63	186.18	183.80	170.64	169.69	180.25	194.09	231.62	234.34	260.34	260.81
Miscellaneous earnings	0.52	0.59	1.89	1.97	1.94	1.68	3.01	0.62	0.62	0.56	0.61	1.61	2.23
Total operating revenue	168.17	176.50	178.52	188.15	185.74	172.32	172.70	180.87	194.71	232.18	234.95	261.95	263.04
Maintenance way and structures	11.06	11.11	13.43	13.36	14.27	11.81	9.51	8.88	11.11	17.04	17.60	18.11	21.83
Maintenance equipment	13.70	10.80	10.39	9.43	9.71	8.89	8.53	10.56	13.05	20.97	23.48	34.87	27.30
Power	8.57	9.69	9.96	8.42	8.10	7.96	8.16	11.18	18.02	19.11	20.10	25.17	23.99
Conducting transportation	45.21	46.38	48.98	49.33	49.22	48.99	51.19	55.51	70.16	89.67	87.20	105.42	104.88
Traffic	0.45	0.22	0.46	0.49	0.48	0.27	0.44	0.37	0.50	0.53	0.51	0.34	0.65
General and miscellaneous	11.43	11.83	8.59	7.54	8.01	8.85	10.44	8.35	9.07	9.54	9.85	10.76	13.43
Injuries and damages	5.89	6.18	6.25	6.58	6.50	6.03	8.48	9.04	9.74	11.61	11.75	18.34	18.41
Depreciation and renewals	4.06	5.96	10.71	11.29	11.14	10.34	10.36	10.85	11.68	13.93	14.10	15.72	15.78
Taxes	13.31	13.71	13.78	15.26	15.42	15.03	14.33	15.91	17.63	21.02	24.34	24.08	25.28
Total operating expenses	113.68	115.88	122.55	121.70	122.85	118.17	121.44	130.65	160.96	203.42	208.93	252.81	251.55
Net earnings from operations	54.49	60.62	55.97	66.45	62.89	54.15	51.26	50.22	33.75	28.76	26.02	9.14	11.49

a Six months period ended Dec. 31. *b* Fiscal years ended June 30, except 1921 ended Dec. 31.

TABLE IV—EXPENDITURES FOR MAINTENANCE OF EQUIPMENT FOR LAST TWELVE AND ONE-HALF YEARS

Year	Current Maintenance	Per Cent of Gross Revenue	Cents Per Car-Mile	Average Active Cars in Service	Average Maintenance Per Car
1910	$100,811.04	8.15	1.73	125	$806
1911	82,109.81	6.12	1.39	126	651
1912	80,330.80	5.82	1.34	128	627
1913	73,875.83	5.01	1.23	128	577
1914	77,771.35	5.22	1.27	131	594
1915	71,770.42	5.16	1.17	131	548
1916	75,384.31	4.94	1.09	148	509
1917	93,236.88	5.83	1.35	148	630
1918	111,077.81	6.70	1.65	144	771
1919	175,158.49	9.03	2.62	142	1,233
1920	232,009.91	10.00	2.94	168	1,381
1920 *a*	179,066.35	13.31	4.44	168	2,140
1921 *b*	264,970.62	10.37	3.44	168	1,577

a Six months period ended Dec. 31.
b Fiscal years ended June 30, except 1921 ended Dec. 31.

salaries of president, vice-presidents, general counsel, assistant general counsel, secretary and treasurer, assistant secretary and treasurer, auditor, general manager, purchasing agent, electrical engineer and assistant engineer. These charges are considered by Mr. Beeler as "remarkably small for a company doing its business. Had the property been operated as a separate unit it would have been necessary to have an independent set of officers and clerks, which would have cost much more than under the present arrangement. It is possible, of course, that such an organization, while costing more, might have obtained greater attention to the problems of the railway system, but this is problematical."

Injuries and damages for a number of years were charged at 5 per cent, but at 7 per cent from July 1, 1920, to Dec. 31, 1921. It was then decreased 5 per cent.

A depreciation reserve was begun July 1, 1909, and since July 1, 1911, 6 per cent of the gross has been charged to that reserve. This basis is not considered by Mr. Beeler so desirable as one on historical accumulated investment. On such a basis, for the conditions in Richmond, Mr. Beeler considers 2½ per cent proper. During the last three years this would have corresponded pretty closely to the amount actually accrued, but prior to that time the amount accrued by the method then followed by the company would be very much less. The taxes in 1921 were 9.6 per cent of the revenue, which is considered high.

TABLE V—EXPENDITURES FOR CONDUCTING TRANSPORTATION FOR LAST TWELVE AND ONE-HALF YEARS

Fiscal Year	Conducting Transportation	Cents Per Car-Mile	Cents Per Car-Hour	Per Cent Gross Earnings	Per Cent Operating Expense
1910	$332,664.07	5.71	45.21	26.88	39.77
1911	352,459.61	5.96	46.93	26.28	40.02
1912	378,634.91	6.31	48.98	27.44	39.96
1913	386,394.11	6.43	49.33	26.22	40.54
1914	394,171.40	6.43	49.22	26.50	40.06
1915	395,422.37	6.43	48.99	28.43	41.46
1916	452,434.57	6.54	51.19	29.64	42.15
1917	490,405.35	7.08	55.51	30.69	42.48
1918	597,433.45	8.85	70.16	36.03	43.59
1919	748,843.55	11.20	89.66	38.10	44.08
1920	861,652.81	10.91	87.20	37.11	41.73
1920 *a*	541,329.16	13.42	105.42	40.25	41.70
1921 *b*	1,018,051.80	13.21	104.88	39.81	41.69

a Six months period ended Dec. 31.
b Fiscal years ended June 30, except 1921 ended Dec. 31.

TRAFFIC STATISTICS

The revenue riders have increased 31 per cent in eleven and one-half years in spite of the increase in fares. The car-miles have increased over 32 per cent, though the speed has not shown any change of moment. While the revenues of the Richmond division have increased approximately 100 per cent in the past twelve and one-half years, the net earnings have decreased 75 per cent.

Transit Commission Standardizes Time-Table

After an Examination of Time-Tables Used in Many Cities, a Standard Form Is Recommended by the New York Transit Bureau

THE New York Transit Commission has found that the time-tables of the various surface railway companies in New York City vary widely, and for no adequate reason. As the object of all is the same, to guide transportation employees in the operation of cars, it is thought that a standard form of time-table will be of advantage not only to the companies but to the Transit Commission as well. In consequence the commission has proposed to the companies to adopt the standard form, illustrated herewith. An explanation of this time-table, as compiled from the report submitted to the commission by Edward A. Roberts, its chief of transit bureau, follows:

A time-table may be divided into the following four parts: (a) The heading, (b) The details of runs, (c) The run guide, (d) Information on running time, time points and headways.

The heading is a simple statement giving the name of the line, serial number of the time-table, date in effect, serial number of the superseded time-table, terminals of the line and a brief statement of the route followed. It is also desirable to show in the heading the name of the operating company, and the carhouse from which the line is operated.

The details of runs is the major part of the time-table and shows the time that each car or crew starts out of the carhouse, the time it leaves terminals on each trip, and the time the car goes back into the carhouse or is turned over to another crew. The details of runs usually occupies the upper left section of the time-table. The variations in the details of runs on different styles of time-tables in New York City are:

1. The movements of individual cars or crews are written horizontally on some tables, vertically on others.
2. The continuous columns of either horizontal or vertical figures represent in some tables the day's movements of an individual car, and in others the continuous day's work of a crew.
3. There are variations in the symbols and abbreviations used to denote certain standard car movements, such as "car is taken out of barn," "crew is relieved," etc.

The run guide usually appears in the upper right section of the time-table. It is a summary of working hours, showing for each crew the time for reporting to work, the time for relief from work, and the total hours of the day's work. The manner of stating this information varies slightly with different companies, due to variations in the form of the details of runs.

The miscellaneous information is generally placed in the lower part of the time-table. No general information at all is presented in the time-tables of some companies, whereas a complete statement should include: running time, time points, explanation of symbols, summary of intervals between cars at all periods of the day, and number of cars required for operation at various periods of the day.

On many street railways in New York City the use of a formal time-table is comparatively recent.

The time-table drafted by the commission is based on an extended study of time-tables used in different cities, and of the recommendations of the time-table

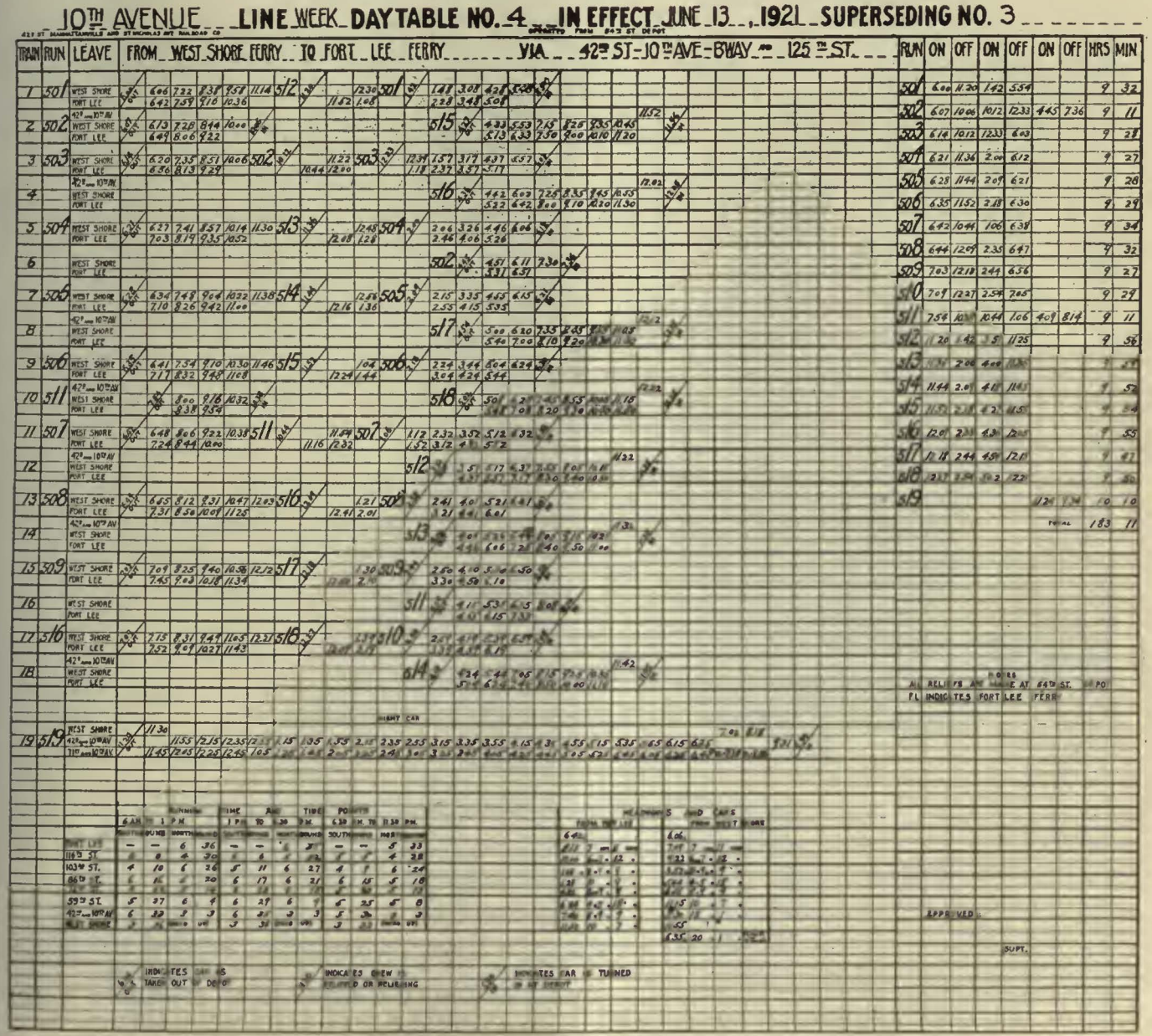
committee of the American Electric Railway Transportation & Traffic Association. Hence, no claim for originality is made for it, as it consists simply of what were considered to be the best features of the large number of time-tables examined.

The details of runs are read horizontally, and each section of the details of runs represents the movements of an individual car or train during the day. The movements of each individual crew are indicated by run numbers written with bold figures, so that the various pieces of work of each individual crew may readily be picked from the time-table. By using this method, the time-table permits one to follow all movements of cars as well as crews, a feature which is not easily possible when each horizontal section of the details of runs refers to the day's movements of an individual crew rather than of an individual car.

The symbols used in the details of runs to indicate cars going in and out of carhouses and crews being relieved are in the simplest possible style and are fairly well recognized as standard. The indication of terminals, in connection with the work of each run, is a feature which, it is thought, will eliminate much of the mystery of the street railway time-table and make it as easily read as the ordinary steam railroad public time-table. On routes where operations are not complicated, the details of runs could be arranged on the time-table in such a way that, when read vertically, it constitutes an almost perfect headway sheet showing the time that successive cars leave their terminals.

The run guide in the recommended form is the same as on all time-tables in which each horizontal section represents the day's movements of an individual car.

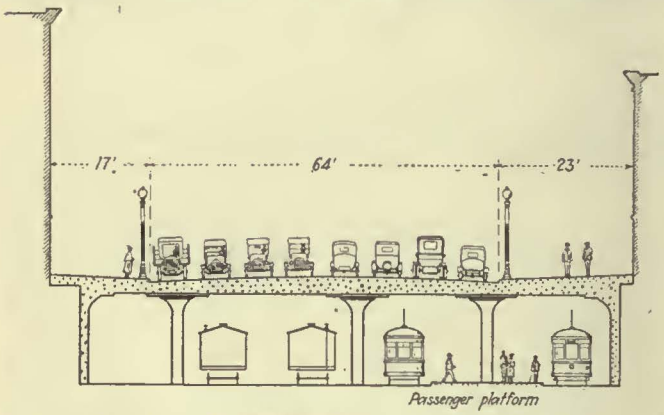
The other information called for in the recommended form includes a statement showing the running time in each direction between terminals and between intermediate time points. Provision is made for varying the running time during the different hours of the day in accordance with variation in street traffic conditions. The intermediate time points, at each of which motormen are supposed to ascertain whether or not they are running in accordance with the schedule, should be spaced not more than ten minutes apart. A statement is also included in the lower section of the time-table showing the interval between cars and the number of cars in operation during all periods of the day.



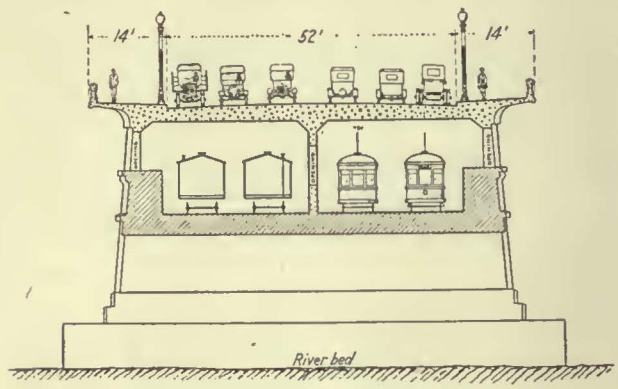
THE NEW YORK TRANSIT COMMISSION PROPOSES THIS STANDARD FORM OF TIME-TABLE

CONSTRUCTING STREET OVER SUBWAY—VIEW FROM ABOVE

THE WHOLE CONSTRUCTION EQUIPMENT IS HERE IN PLAIN SIGHT



CROSS-SECTION OF ROCHESTER SUBWAY AT CITY HALL STATION



CROSS-SECTION OF ROCHESTER SUBWAY AT FORMER ERIE CANAL AQUEDUCT

Rochester to Utilize Erie Canal Bed for Transportation

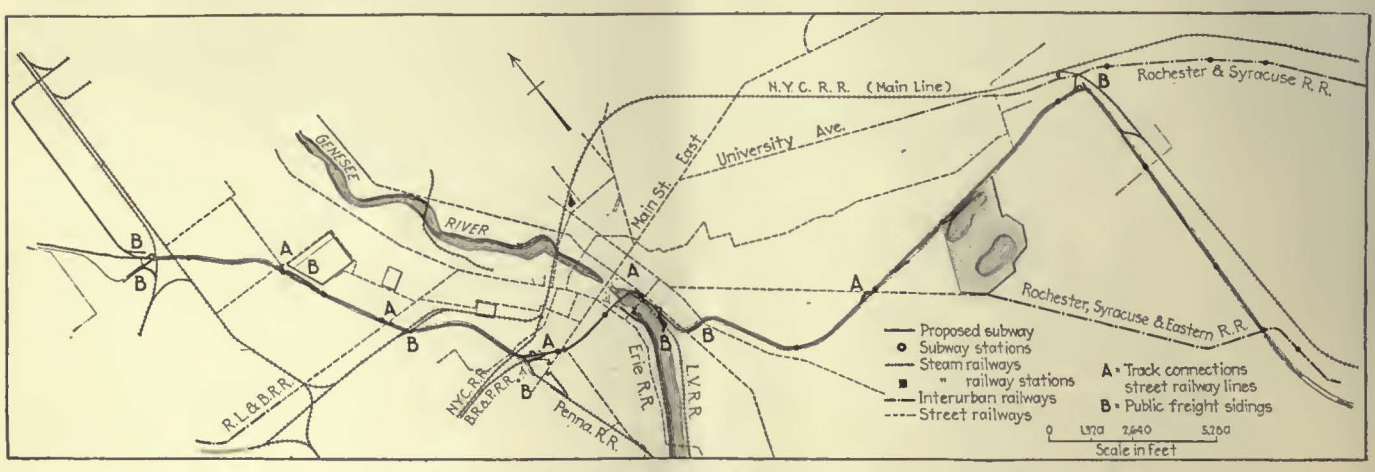
Passenger and Freight Service to Be Provided for in Subway Being Built in 13-Mile Section of Erie Canal Purchased by the City

THE city of Rochester, N. Y., has begun the construction of a rapid transit and industrial railway in the bed of the abandoned Erie Canal. Through the construction of the Barge Canal south of the city a 13-mile section of the Erie Canal has been vacated. This has been acquired by the city at a cost of about $1,500,000, for use as a subway.

Two tracks for passenger service and two for freight service will be constructed. Tracks will connect with all the steam railroads for transferring freight to the various manufacturing concerns along the canal. The interurban trolley lines will be diverted from the streets and the running time to outside points reduced considerably. Three main stations, located in the business section of the city, will be served by the several interurban lines.

The contract recently let to Scott Brothers of Rome, N. Y., for $1,183,780, comprises about ¾ mile. This section will be covered by a street parallel with Main Street. This street will be 60 ft. wide between curbs, excepting the portion over the Genesee River aqueduct, where the width will be 52 ft.

The trunk of the aqueduct is to be used for the



PLAN OF THE PROPOSED RAPID TRANSIT AND INDUSTRIAL SUBWAY FOR ROCHESTER, N. Y., OF WHICH AN IMPORTANT SECTION IS UNDER CONSTRUCTION

CROSS-SECTION OF SUBWAY AT OAK STREET—AT LEFT, SIDING TO WAREHOUSE ABOVE; NEXT, PASSENGER TRACK; BOTH SIDES OF MIDDLE ROW OF COLUMNS, PLATFORM MAIN STREET STATION; NEXT, PASSENGER TRACK; AT RIGHT, FREIGHT TRACK

EXTENDING ARCHES OF AQUEDUCT, STREET TO BE ABOVE SUPPORTED ON GRACEFUL SHORT-SPAN ARCHES WITH RAILWAY TRACKS LAID IN THE BED OF THE OLD CANAL. CROSS-SECTION OF COMPLETED STRUCTURE IS SHOWN ON PAGE 908.

tracks, the street being carried above the parapet walls. Catenary trolley construction with steel bridges will be used and the freight will be handled with 50-ton electric locomotives.

The detailed study of the project and preparation of the plan were made by LeGrand Brown, engineer of subway, under the general direction of Edwin A. Fisher, consulting engineer, and City Engineer C. Arthur Poole. Prof. George F. Swain of Boston examined and reported favorably on the entire project.

One-Man Cars for Hydro-Electric Railways

Passenger Comfort Has Been Considered as Most Essential in the New Cars, Which Have Double Doors, Long Platforms, Trucks with Long Wheelbases and Seats with Spring Cushions and Backs

THE Hydro-Electric Power Commission of Ontario has recently placed in service at Windsor and Guelph, Ontario, twenty-five one-man cars. The car bodies and trucks were furnished by the Canadian Brill Company, and as several departures in design have been made from the Birney safety car, a review of the new features will be of interest. A seating capacity of thirty-four has been provided and in addition there is comfortable standing room for thirty passengers. The cars are double ended and weigh, completely equipped, 26,175 lb. This is approximately 10,000 lb. heavier than the Birney car and when consideration is given the features which go to make up this increased weight, it is evident that the question of light weight and low power consumption were not regarded as of so great importance as that of passenger comfort. The cars are mounted on Brill No. 79-E-2 trucks, with a 9-ft. wheelbase, and 26-in. diameter wheels. In general appearance, the cars are quite similar to the Birney cars, but are of increased dimensions and weight. The seats are of the Brill "Waylo" reversible type and have spring cushions and backs with rattan covers.

SOME FEATURES OF THE DOOR CONTROL EQUIPMENT

The Hydro cars are of the two-stream type having separate entrance and exit doors and steps. These are selectively controlled by the operator by means of the brake valve handle and the Westinghouse "selector valve." Either door may be operated separately or both doors may be operated simultaneously. This selective control gives the motorman command of the situation and prevents passengers from boarding through the exit door. It is also a vital factor in the conservation of heat, which is a most important consideration during the Canadian winters. At approximately 75 per cent of the stops, only one-half of the total doorway (either the entrance or exit, as the case may be) is opened.

The folding door and step mechanism is the National Pneumatic Company's standard ball-bearing type throughout, and embodies all of the latest improvements. The engines are mounted in a pocket above the doors, which protects them from dust and dirt, and also reduces the possibility of freezing due to the high drainage position. They are mounted on a steel base plate and bolted through the header. The door

DOUBLE-DOOR OPENINGS ARE A FEATURE OF THE HYDRO-ELECTRIC CARS

shafts pass up through this steel base plate and the door shaft top bearings are riveted to the plate, the engines being connected with rods less than 2 ft. long. This base plate construction makes the engine and the door shafts a complete mechanical unit which will operate properly regardless of vibration. The door-shaft mechanism is ball bearing with taper-thrust collars which allow free movement even though the car platforms may sag or twist and throw the equipment out of line.

The folding step mechanism is also ball bearing with

the same advantage of free movement should the step be knocked out of line. Another advantage of the ball bearings is the ease with which they are renewed. The thrust collar keeps the wear off the shaft, while with a plain or sleeve bearing both the shaft and housing wear. The step mechanism is connected to the door shafts by means of the National Pneumatic Company's slide bar device, which insures perfect adjustment when new and provides for adjustment to take up wear from time to time as required.

The engine connecting rods are connected to the door shafts through adjustable levers, which provide for perfect adjustment of doors both open and closed and the proper movement of both doors in unison. These levers also provide for taking up the slack due to wear so that the doors may be kept in the same operating condition regardless of the length of time the car is used.

The bottom door guides and catches insure the proper locking of the doors at the bottom, keep the door panels

REVERSIBLE TYPE SEATS HAVE SPRING CUSHIONS AND BACKS

from twisting and are so designed that passengers will not catch their clothing or strike their toes or knees when boarding or alighting from the car.

The control and motor equipment was built by the English Electric Company of Canada, Ltd. Two D.K.84-A, 40-hp., 600-volt ventilated box frame motors are used. These motors are of the standard English Electric design arranged for mounting on axles up to 5 in. in diameter. They are of the four-pole series-interpole type and are self-ventilated by a fan mounted on the armature shaft at the pinion end which produces a dual flow of air through the machine, one current passing through the armature core and the other along the surface of the armature and through the field coils. The frame being of the box type, the motor leads are brought out on the suspension bar side, the two armature leads at the commutator end, and the two field leads at the pinion end. Among other desirable features to be found in the motor is the type of brush-holder, which is provided with a serrated clamping face, thereby securing absolute rigidity and making it impossible for the holder to slip down on to the commutator. The interpole and main field coils are secured against movement by the insertion of a flat spring between the coil and the frame, the coil being protected by a sheet steel tray.

The gears were supplied by the Tool Steel Gear & Pinion Company and the R. D. Nuttall Company, each company furnishing 50 per cent of the order. The gears are of the helical type, the teeth having a 7½ deg. angle and a 5-in. face. The gear cases are of pressed steel, and are almost entirely free from any riveting or welding, the weight complete being 70 lb.

The controllers are standard Dick-Kerr system two-motor controllers, for use with the Safety Car Devices' apparatus, and are supplied with standard notching device and Zweigbergh patent magnetic shield blow-out coil. The winding of the blow-out coil is short circuited

DIMENSIONS OF THE HYDRO-ELECTRIC ONE-MAN CARS

Length over bumpers	30 ft. 3 ¼ in.
Length over vestibules	29 ft. 3¼ in
Length over body	17 ft. 7¼ in.
Height from underside sill of top of roof	8 ft. 3 5/16 in.
Height from rail top to roof	10 ft. 4 5/16 in.
Height from rail top of trolley boards	10 ft. 7 11/16 in.
Height from rail top of car floor	29 11/16 in.
Height from rail top to first step	14 ¼ in.
Height from first step to platform	13 ¼ in.
Ramp in floor	2 5/16 in.
Width over all	8 ft. 6¾ in.
Width over side sheets	8 ft. 4 in.
Width of aisle	28 ¼ in.
Door opening both ends	4 ft. 6 in. clr.

on the two running positions, thereby preventing overheating of the coil. The power and reverse drum segments are built up on square steel spindles which are insulated with a thick covering of mica, a maximum amount of clearance being provided between segments, so as to facilitate cleaning and to overcome the depositing of greasy dust. The cutting out of the motors is done by a crank at the back of the controller, which is operated by the reverse key and which raises or lowers the reverse drum, the movement cutting out either No. 1 or No. 2 motor as desired.

The circuit breakers are of a standard English Electric design and are for mounting in the vestibule roof. They are type "D," form "A" and have a continuous current capacity of 100 amp. The frame of the breaker is of cast iron, the contacts and arc tips being contained in a chamber of molded insulation. All working parts are of cast brass. A main contact and arcing tip is provided and the breaker is so designed that the arc tip makes before and breaks after the main contact brush, which is made up of laminated copper strip. The whole breaker is covered by a black japanned cover with polished brass lettering.

Automatic Substation with Remote Control for New York Central

THE New York Central Railroad has contracted with the General Electric Company for the first automatic substation installation to be used on its electrified division. While the equipment furnished will provide for full automatic operation, the operator at Mott Haven substation will have the new station under his supervision through pilot wires providing for remote control. This equipment will furnish power for train operation at a point where the growth of traffic developed a load center which did not exist at the time of the original installation.

The new substation will be located beneath the elevated tracks at 110th Street and Park Avenue, near the point where they emerge from the Park Avenue tunnel.

The equipment will consist of a 2,000-kw. motor-generator set operated directly from the 11,000-volt transmission, and with the generator tied into the 660-volt third-rail system.

The set may be floated on the line all day or closed down during the periods of light traffic, at the discretion of the operator at the Mott Haven Junction substation. To start the station the operator simply operates a control switch and the automatic control in the new substation takes care of starting the motor-generator set and bringing it onto the line. He can follow the output of the machine and its load conditions at any time of the day and, from his knowledge of train movements, he is in a position to know when the set may be unnecessary. Indicating equipment on his meter panel gives another check on the line load.

In the event of a service interruption, due to failure of the high-tension supply, the automatic station will of itself shut down and be ready to come onto the line again with the resumption of service from the power station.

The automatic station control is laid out so as to present the characteristics of a constant-current generator, in that the control can be adjusted so that the generator will supply continuously any value of current below the rated output for as long as the operator may anticipate the concentration of load will continue, or for such a period as is possible without overheating.

Preparing for Snow in Boston

There Is a Heavy Snowfall Annually and the Company Has to Remove Much of the Snow as Well as Clear Its Tracks—Increasing Dependence Is Being Placed in Machinery, Particularly Tractors

RAILWAY TRACTOR HAULING ROAD WAGON TO BREAK UP ICE ON STREET

THE Boston Elevated Railway has long been required on narrow streets to remove the snow which it cleared from its tracks and not simply to push it to one side. This requires a much more extensive organization than in cities where the company needs simply to run a sweeper or plow over the track and let the city take away the surplus snow. This year a slightly different plan will be followed as the result of an arrangement made with the city authorities. Certain streets have been definitely set aside which the company will clear from curb to curb, while on other streets the city has undertaken to remove the snow which the company clears from its tracks.

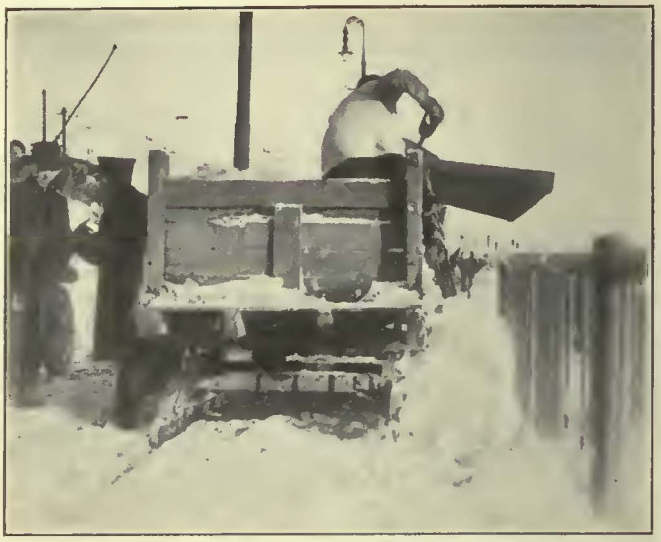
Boston has a heavy snowfall in winter and formerly the Boston Elevated Railway owned a large number of horse-drawn sleds for hauling away the snow. Latterly greater dependence has been placed on gondola cars and auto trucks, but the greatest development during the past two years in snow-fighting equipment has been with tractors and other snow-fighting machinery. The company is entering this winter with the following snow-fighting equipment:

Sweepers: Two single-truck, 14 double-truck. Plows: Wason, 22; Taunton, 59; Russell, 8; other types known as steel plows, 74. Tractors: Holt, 3; Cletrac, 1. Snow removers (Bradley) horse-drawn, 18.

TEAMS USE THE RAILWAY RIGHT-OF-WAY BECAUSE IT IS CLEAR OF SNOW

This is in addition to various road machines and plows designed to be hauled by the tractors, dump cars, sleds, heavy steel brushes attached to the trucks of the elevated cars to clear the third rail from sleet, etc.

All snow work comes under the general direction of the general manager and superintendent of transportation, and the co-operation of the municipal authorities of all towns and cities



DUMPING SLEDS AND DUMPING CARS FOR HAULING SNOW IN BOSTON

through which the elevated operates is solicited and obtained.

In the late summer of each year the company, through its superintendent of transportation, posts a notice in the carhouses that applications for snow work will be received from the trainmen and by Oct. 1 usually sufficient applications have been received so that the organization can be completed. Besides the rapid transit or elevated division there are four operating divisions of the company to include the surface lines, and the division superintendent of each surface division is responsible for the work of plowing and carting away the snow on his division. This means that he must (1) arrange to get the necessary dumps, (2) see that the snow-fighting equipment is in proper repair, has been tested on the street and is in readiness to put into use, (3) make out a list of the different snow routes and have it posted in the lobbies of the carhouses, and (4) be sure that the men applying for snow work are familiar with these routes. Under the division superintendents, either the station masters at the different carhouses or some duly appointed snow foremen are in charge of the snow work for the districts for which their stations are headquarters. These men see that snow foremen are appointed to follow up the work on streets. A certain number of blue uniformed men are also appointed to act as foremen, timekeepers and paymasters for the shovelers. A considerable part of this latter help is made up of regular maintenance of way men, supplemented, where that supply is insufficient, by outside labor.

Arrangements have also to be made by the division superintendent for sufficient dumping places for the snow. Docks and bridges are secured for this purpose whenever available. Permits to use sewer manholes are also obtained. Open areas, either owned by the municipalities through which the lines of the company run or by private individuals and corporations, are made available. Full details as to all arrangements of this kind made are filed by each division superintendent with the superintendent of transportation, together with a list of the men who have been accepted for snow duty with their residence and telephones, if any.

Two of the accompanying illustrations show a tractor at work breaking up a layer of ice or hardened snow at the side of the track. In one case a road machine is being used and in the other an ordinary hand plow. The former is considered preferable, and in the truck used in Boston the tongue of the road wagon is so arranged that it does not have to be hauled directly after the tractor, but will run at some distance to one side or the other if that should be desired. Another view shows one of the horse-drawn dumping sleds and another a train of dumping cars being loaded by hand. These cars are usually run in trains of not more than

TRACTOR CLEARING PACKED SNOW BY USING PLOW

A HEAVY DRIFT IN A BOSTON SUBURB

three cars each, the reason being that the dumps are arranged for three cars as a maximum number.

The two other views illustrate some of the difficulties of winter operation in Boston. The lower view at the right on page 912 was taken after a snowstorm in 1920 on one of the outlying lines of the company. The one at the bottom of page 911 illustrates what trucks and automobiles do in Boston after a heavy snowstorm where the company has cleared its right of way, but the rest of the street is still covered with snow. A fact which makes this picture even more notable is that the tracks at this point are not laid in the street but on a reservation in the center of the street, with no paving between the rails. The result is that after a day or two of this use of the reservation by heavy trucks the company finds most of its tie rods broken and other damage done to its right-of-way.

Improved Underfeed Stokers for P.R.T. Boiler Plant

Forced Draft Substituted for Natural Draft Under Twelve Boilers of the Company's Principal Peak-Load and Reserve Power Station—Steam-Operated Dump Plate a Feature

THE Philadelphia Rapid Transit Company in part generates the electrical power needed for its lines, purchasing the remainder from the Philadelphia Electric Company. Two-thirds of the power requirements are purchased in off-peak hours and one-third in the peak-load period. Several power plants, fairly well distributed over the city, are operated, the most modern of which is located on the Delaware River somewhat more than a mile north of Market Street. This station contains five steam turbines, one Westinghouse of 15,800-kw. capacity, two Westinghouse of 9,500-kw. capacity each, one Westinghouse of 6,000-kw. capacity and one General Electric of 2,000-kw. capacity.

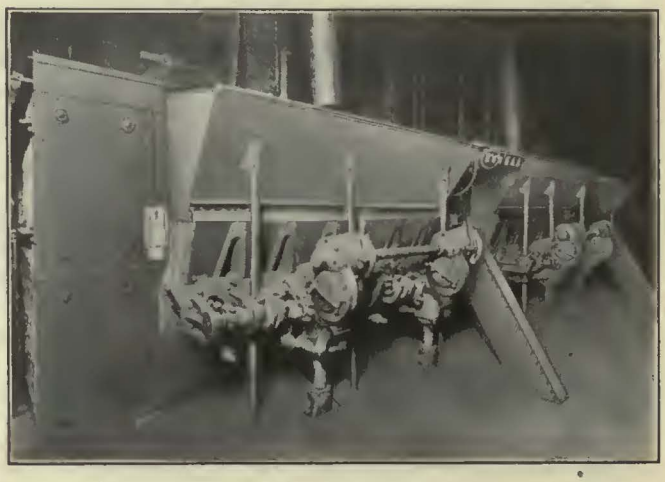
Coal is received at the plant by rail and water, being dumped into hoppers, from which it is delivered to bunkers by means of bucket type elevators and flight conveyors made by the Webster Manufacturing Company. Ashes are removed from the boilers to hoppers in a basement beneath, whence they drop into cars from which they are taken by means of a Morse & Williams dumping bucket elevator to an elevated ash bin. From this they go into electrically operated ash cars.

In studying the general power system of the company, the engineers some time ago decided that money could profitably be invested in changing over some of the boilers in this plant for forced-draft combustion. The boiler room contains sixteen 800-hp. Parker boilers and twelve Babcock & Wilcox boilers, all formerly equipped for natural draft.

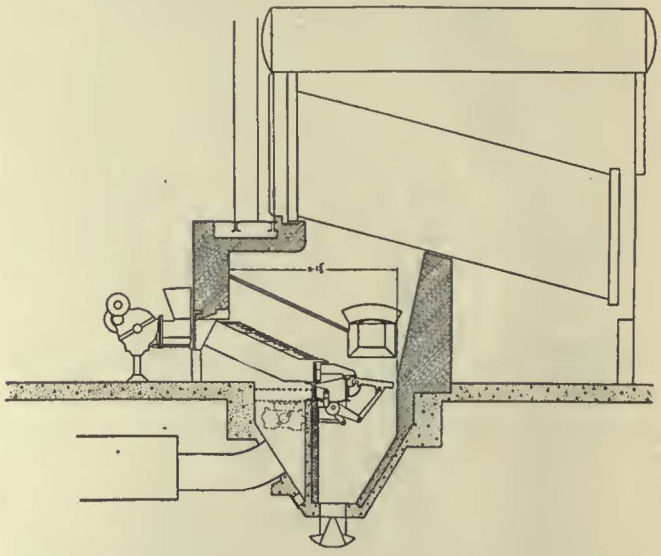
It was decided to change the stoker equipment of the twelve B. & W. boilers from the Roney overfeed type to the Taylor underfeed type. These boilers are of the marine type, six rated at 627 hp., four at 680 hp., and two at 450 hp. The Taylor stokers are of the new seventeen-tuyere, "H" type and are guaranteed to burn sufficient coal to develop 250 per cent of boiler rating continuously, and 300 per cent of rating for two hours. One hundred and thirteen square feet of stoker grate area is installed under each of the ten larger boilers and 81 sq.ft. under the two smaller boilers.

While this type of Taylor stoker is no departure in basic principles of operation from the well-known Taylor stoker, it has many improvements. Features of the fuel-feeding mechanism and air supply make possible exceptionally high fuel-burning rates per unit of stoker grate area. Advantage of the possibilities of this design was taken materially to increase the furnace volume by setting the stoker low in relation to the floor line without sacrificing operating accessibility. A furnace depth of 9 ft. 2 in. was obtained, with little change in existing ashpit construction, by using a short arch.

Among the novel features of this stoker is the use of a spur-gear power box, said to give a much higher power transmission efficiency than the worm-gear box in general use on underfeed stokers. A 50 per cent variation in the ratio between driving-shaft speed and crankshaft speed is obtained without shifting of gears or the use of clutches. All driving shafts are completely guarded. Hoppers are designed to eliminate arching of wet coal. A special feature of this design is the ease of renewing all parts subject to replacement with the minimum loss of material in so doing. A reciprocating extension grate for burning the fixed carbon from the ash is provided. The stoker is equipped with a steam-operated dump plate giving maximum free discharge opening when the plate is dropped. The plate swings above the horizontal by steam power to free the bridge wall from clinker adhesions. A cross-section of the installation is shown in the accompanying line cut and the reproduction of a photograph shows the front of the boilers and stokers.



THESE STOKERS HAVE NEW TYPE OF POWER BOX. OPERATING MECHANISM IS LARGELY WITHIN THE BOILER SETTING



CROSS-SECTION OF BOILER SETTING, WITH NEW UNDERFEED STOKER, IN DELAWARE AVENUE POWER PLANT OF PHILADELPHIA RAPID TRANSIT COMPANY

Letters to the Editors

Discussion on Depreciation

BALTIMORE, MD., Dec. 5, 1922.

To the Editors:

I have looked over with much interest your report of the Detroit meeting of the National Association of Railway and Utilities Commissioners, published in the *Journal* of Nov. 25, page 851, and desire to call your attention to one point with regard to the discussion on depreciation.

I am inclined to think that any one reading this report would infer that the sense of the meeting was in favor of the setting up of a straight reserve based upon cost less scrap and accurate life tables.

This ignores the very important statement made by Mr. Jackson and received with apparent approval by the delegates, in which he called attention to the fact that on account of the equalization of renewals the accumulation of a depreciation reserve on the method outlined above resulted in building up an enormous fund for which the utility would at no time during its future life find a legitimate use.

This fact, while it has been recognized for some time by a number of the more careful students of depreciation theories, has not, so far as I know, been publicly emphasized, and Mr. Jackson's statement was to me one of the most important ones made during the entire convention. W. H. MALTBIE.

Every Street Intersecting an Electric Railway Is a Grade Crossing

BOSTON ELEVATED RAILWAY,
BOSTON, MASS., Dec. 4, 1922.

To the Editors:

The editorial on the vehicle situation which appeared in the issue of the *Electric Railway Journal* for Dec. 2 was read with much interest. The tremendous increase from year to year in numbers of vehicles on the highways and the result to street railways of a proportionate increase in vehicle collisions should direct the attention of all concerned to trying to reduce in some manner the numer of these accidents.

A few weeks ago the Massachusetts Safety Council made a study of vehicle collisions that had occurred on Massachusetts street railways during the first eight months of the present year and came to the following conclusions:

1. Collisions with automobiles coming out of side streets without warning, or at improper speed, constitute the most serious group.

2. Automobiles turning out from the curb without signaling constitute another large but less serious group.

3. Turning in front of a car, or cutting in in front of it, is a frequent cause of serious collisions.

4. On suburban or interurban lines, where trolley cars operate at a relatively high speed, automobiles stop on the track or too close to it, and resulting collisions almost always involve serious personal injury.

The publication of this report caused an interesting editorial discussion which accomplished something toward informing the public as to the nature of this hazard. I believe that it is our duty to present these facts again and again to motorists in every state until their significance is driven home.

That the seriousness of the situation extends beyond the confines of the cities is indicated by the fact that the steam railroads of the country have this year conducted a campaign to reduce collisions with automobiles occurring at grade crossings. Our investigations on this railway have shown that automobiles and trucks coming out of side streets without warning and at high speed produce our greatest and most serious class of vehicle collisions.

Practically every side street entering a highway on which we operate street cars establishes a grade crossing over our tracks. The absolute disregard of the average driver of a motor vehicle in approaching these tracks from side streets, together with his high speed and disregard of the use of his warning signal, constitutes, in my judgment, a greater element of danger than exists at steam railroad grade crossings. This is due to the greater frequency of our cars and the greater frequency of these side street crossings. Our task is to educate the driving public to an understanding of this fact.

According to the morning press reports, in the matter of vehicle accidents and particularly in that of cross-street vehicle accidents, the street railways are up against a world-wide problem.

In a statement to the press, President Harding declares that he believes that the world in general, and the United States in particular, is finding it difficult to adjust itself to the automobile age. He thinks that this country is moving at an automobile pace and generally needs a policy of caution at the crossroads and the turnings of its future. H. B. POTTER,
Chairman Committee on Accident Prevention,
American Electric Railway Association.

Through the Gotthard Tunnel in Comfort

IN A REPORT to the Department of Commerce, Consul-General James J. Murphy declares that, in the light of experience with electrification up to the present time, the electrification of the Gotthard line, through the tunnel connecting Italy and Switzerland, may from a technical point of view be considered as entirely successful. The movement of trains is just as regular as with steam locomotives; the passengers and the railroad personnel appreciate highly the elimination of smoke; and there is no doubt that this is an important step forward, hygienically. Strain on the rolling stock is lessened and wear on the removable parts has been found to be considerably reduced. Experience shows, on the other hand, that the greater speed obtained apparently causes a more rapid wear of the outer rails on the curves. With the greater speed attained it has been possible to make improvements in the time-tables. The efficiency of the crews engaged in maintaining tracks and tunnels has increased noticeably.

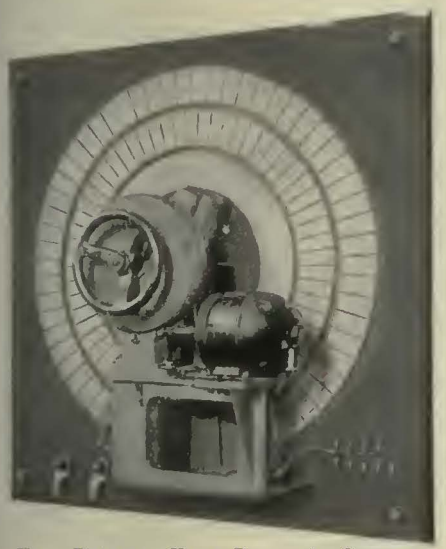
South African Railways Power Plant

AFTER numerous surveys Colenso has been chosen by the South African Railways as the best site for the new power plant which will generate the power for the electrification of the railway line. For this the locomotives have already been ordered. Colenso is about midway between the two termini of the Glencoe and Maritzburg-Colenso electrified section. Colenso will therefore probably be an important power center.

What's New from the Manufacturers

New Voltage Generator of Rheostatic Type

THE Westinghouse Electric & Manufacturing Company has installed in a number of recent power plants a type of voltage regulator differing fundamentally from the vibrating type, or "Tirrill" regulator. The new regulator maintains a constant alternating-current voltage by means of the generator field rheostat, the exciter voltage being kept at a constant value. The new regulator is not intended to supersede the Tirrill, but rather to meet conditions to which the latter is not inherently well adapted. It is particularly applicable to installations where the time constant (or rate of response to change in voltage on the field of a generator) is slow, where exciters are of large capacity and low speed, thus having heavy field currents beyond the capacity of the vibrating regulator contacts, or for synchronous condenser application, where the excitation voltage across the field of the condenser must be lowered to a value below the residual voltage of the exciter, as is very often the case.



FACE PLATE OF FIELD RHEOSTAT, OPERATED BY HIGH-SPEED MOTOR

CONTROL ELEMENT AND REVERSING CONTACTORS

The regulator equipment comprises the following: (1) A control element mounted in a glass case, and located either on a panel of the main switchboard, or on a bracket or a pedestal. (2) A pair of reversing contactor switches actuated from the main contacts of the control element. The reversing switches are for operating the rheostat motors in one direction or the other, and may be mounted on the same panel with the control element or on a separate base in the rear of the switchboard. (3) A special generator field rheostat, operating at a high rate of speed. The motor of the rheostat is quickly brought to rest by so connecting the reversing switches as to employ dynamic braking the moment the control element ceases to cause a change in the excitation current.

The control element consists essentially of a set of contacts jointly actuated by an alternating current and a direct current coil. These contacts control the direction of rotation of the rheostat motor through two reversing contactor switches. The alternating-current coil is connected to the generator lead through the use of a suitable potential transformer. The direct-current coil is connected across the terminals of the generator field. A current coil is also provided together with a suitable number of taps for compensation purposes.

Anti-hunting features, incorporated in the design, consist of auxiliary contacts on the reversing switches which automatically change the strength of the current in the alternating-current coil at the moment there is a change in excitation voltage on the machine.

The operation of the rheostatic regulator is exactly the same as if the station operator were regulating the voltage by hand. When the line voltage is at the correct value, the regulator is in equilibrium, and consequently there are no moving parts. Should the voltage deviate from the correct value, the regulator will operate the generator rheostat to bring the voltage back to normal.

The regulator is either put in or out of service by means of a single-drum control switch.

Flashing Light Highway Crossing Signal

THE General Railway Signal Company, Rochester, N. Y., has developed a flashing-light highway crossing signal which is simple, dependable and which requires little maintenance. A special lens is used to spread an intense flashing red light which is clearly visible under adverse sunlight conditions at all distances up to 1,500 ft. The lens is protected from mechanical injury by a wire mesh guard. A double filament lamp is so placed that the effective light from both filaments is in the focal center of the lens, thereby giving the maximum intensity of light for the combined wattage of both filaments. The lamp and lamp receptacles are so made that no adjustment for focus is necessary in changing lamps. The two filaments of the double filament lamp are so made that they will not burn out simultaneously.

FLASHING HIGHWAY CROSSING SIGNAL

At left, front of signal. At right, rear view. Bottom, slow-acting, double-acting relay.

Thirty flashes per minute are produced by the use of a simple slow-acting double relay. The relay is designed to break a current of 3 amp. continuously with-

out injury to contacts, whereas in electric railway service, a current of less than 1 amp. is all that is required. The signal is equipped with a small clear glass on each side so that its operation may be checked from the track. Provision is made for easy alignment with the highway, a sighting device being included in each signal for convenience in making this adjustment. The light unit is mounted on top of a 4-in. pipe mast or by the use of a bracket it may be mounted on an existing pole. Backgrounds are furnished lettered as shown in the illustration or as specified by the railroad.

Electric Railway Publicity

Uses Track Construction to Emphasize Interest in City

CONSTRUCTIVE advertising of a new and distinctive type is being done by the Tri-City Railway, Davenport, Iowa. It is calling attention to its municipal improvement work in the laying of 4,200 ft. of double tracking and offering for sale the 7 per cent prior preferred stock of the United Light & Railways Company, its financing corporation.

The company has erected signs between the tracks along the mile of double tracking in the central district. These signs are heavy canvas between steel pole uprights. They call attention to the $77,000 of improvement, and emphasize the fact that of this amount $23,000 will be paid out to labor. The sign states that the Tri-City Railway is undertaking this big improvement because it believes in the city and realizes that it is only by such improvements that it can give the public the best service.

In addition to this general or institutional appeal the sign gives the interesting information that 363,000 paving brick, 7,000 tons of excavation, 1,300 tons of sand, 6,900 sacks of cement, 4,200 creosoted oak ties, and 260 tons of rail and fastenings are to be used in the construction of this loop surface car artery.

Past these signs runs the steam shovel employed by the company in its excavation work. On the side of this shovel, in plain view of the thousands of spectators who watch it at work daily, is this advertisement: "Buy United Light & Railways 7 per Cent Prior Preferred Stock and Keep This Shovel Moving."

Proverbs XII-19

THE Philadelphia Rapid Transit Company was recently beset with an agitation on the part of the local newspapers to do away with the skip-stop plan of operation. The newspapers had carried the agitation to extremes and were taking every possible opportunity to reflect discredit on the skip stop. Whenever an accident occurred, for example, some such headline as this was likely to appear: "Another Murder Caused by Skip Stop." At the peak of the agitation, every car on the system appeared one morning with a dash poster which had on it only the Bible reference in large letters "Proverbs XII-19."

The Bible verse reads as follows:

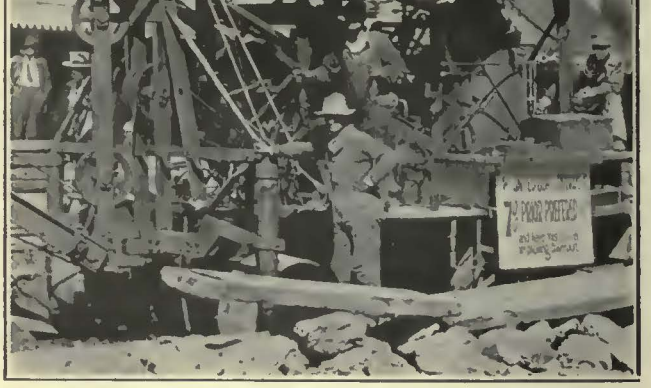
> "The lip of truth shall be established forever: but a lying tongue is but for a moment."

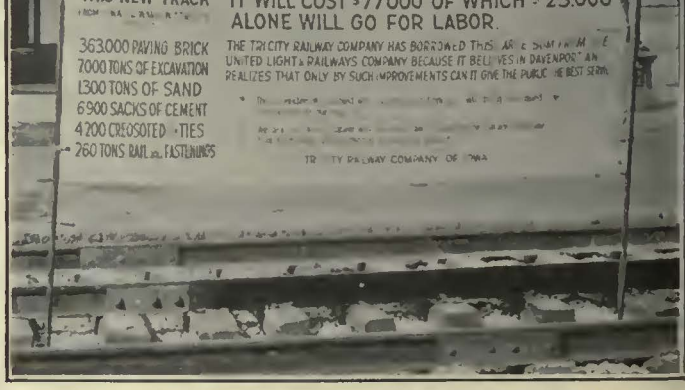
The effect was almost electrical. By noon probably 2,000,000 people, a far greater audience than any newspaper reached, had noticed and renoticed this peculiar dash sign and curiosity did the rest. One of the local Bible Institute offices was besieged with telephone calls inquiring about the reference.

The message of the poster was unassailable, and it politely told the newspapers what they were doing without calling them what they were. They apparently got the point, for it is said that the agitation was suddenly and completely dropped.

Louisville Railway Wants Representatives in City's Associations

THE Louisville (Ky.) Railway is placing men in the various clubs, business organizations and associations. This means that when any railway subject comes up for discussion in any one of these associations the representative of the railway who is a member should be able to place the case of the company properly before its members. Officials and department managers of the railway are now active in a large number of local organizations, which of course is resulting in more friends for the company, and good will is the one thing the company needs.





AT LEFT, STEAM SHOVEL SPREADS THE MESSAGE OF 7 PER CENT PRIOR PREFERRED STOCK. AT RIGHT, TRI-CITY RAILWAY OF IOWA BUILDS GOOD WILL AND A TRACK SIMULTANEOUSLY

Samuel Riddle, vice-president Louisville Railway, was recently elected a director of the Board of Trade.

Before the election, President Barnes sent a letter to every member of the Board of Trade calling attention to the nomination of Mr. Riddle. He explained that as a member of the directorate he would be in better position to understand the problems of the community.

Stop Guide for Electric Railway Cars

THE Metropolitan Electric Tramway, Ltd., of London, England, is trying out a car road guide in one of its tramway cars. The indicator is manufactured by the Road Guides, Ltd., London, and is a box arrangement of approximately 36 in. x 14 in. This contains a chart of the route being traveled by the car. Midway along the glass dial is a pointer which indicates to the passenger the exact position of the car at all times. As the car moves along the chart unwinds itself from one spool to another. The moving chart has printed on it all the features of the journey, such as streets, compulsory stops, museums, places of business, etc. The top portion of the chart is used for advertising to announce current events and interesting news.

Two indicators are used on each car, one on either side, so placed that the passengers can see them quite comfortably. The indicator is automatic and requires no adjustment except when the car diverges from a given route or when going in or out of service. It can be neutralized by moving a lever and can be set to any point on the route by turning another small hand lever. It is driven through reduction gears from a friction wheel which operates on the rim of one of the car wheels. Provision is made for changing the chart in a convenient manner.

Mr. Mitten to Stand Four-Square

THE familiar phrase, "Mitten Men and Management," is hereafter to include owners and public. The owners were recently added to this working combination, and the Philadelphia (Pa.) Rapid Transit Company is now out to win the public. What the company wants is intelligent interest on the part of the public. This it will attempt to gain by inviting suggestions from car riders as to improvements in service and methods. Suggestion cards will be carried by conductors, who are to write down criticisms or suggestions of the riders. In announcing the new plan, the following statement was made:

> The men and management for eleven years have been proving the value of working together. The stockholders by their recent vote and since by the use of suggestion cards, have come splendidly into line, thus completing three sides of the square which is emblematic of street railway perfection.
>
> Viewing our joint accomplishments, is it too much to hope that there may also be developed a spirit of public co-operation which shall complete the entire square—men, management, owners, public?
>
> To this end conductors should use their suggestion cards to report not only their own suggestions, which are the fruit of their observations and first-hand knowledge, but also those of their passengers, which are from the standpoint of those we are here to serve.
>
> We have been keeping our eyes open to improvements to service with splendid results. Let's keep our ears open, that we may also have the advice of our car riders.

Transformer and Busbar Standards Adopted by Electric Power Club

THE Electric Power Club, the headquarters of which are located in the Kirby Building, Cleveland, Ohio, held its regular fall meeting at Grove Park Inn, Asheville, N. C., recently.

Of the proceedings of particular interest in the electric railway field the following are the most important:

Requirements for high-potential test guarantees applying to transformers having single-voltage ratings from 550 to 50,000 inclusive were adopted as follows: High-voltage winding to low voltage winding and core, maximum high voltage rating from 550 to 4,500 volts, 10,000; above 4,500 to 50,000 volts, twice the highest rated voltage of the high-voltage winding, plus 1,000 volts; above 50,000 volts twice the normal voltage of the circuit to which the low-voltage winding is connected, plus 1,000 volts.

Busbar Ratings

The club made some revisions of its rules on application and rating of busbars and connection bars. The standard now specifies that busbars shall be rated on a basis of temperature rise instead of current density, and curves are given to cover the current-carrying capacities of the usual sizes of copper buses. These show the reduction in permissible amperes per square inch with increase of number of laminations and with increased width of bar. The capacity of alternating current is, of course, much lower than that for direct current, on account of the "skin effect," etc. A contact pressure of 250 lb. per square inch is prescribed as a minimum in bolted or clamped connections, and all contact surfaces and connections are to be cleaned by sandpapering or other suitable means immediately before bolting. The maximum temperature for proper buses is specified at 70 deg. C. in general, or 80 deg. under specified exceptional conditions.

In addition to the above, standard voltage ratings of oil circuit breakers, together with standard interrupting capacities, were adopted. Up to 73,000 volts oil circuit breakers and other switching equipment are to have ratings based on maximum values as follows: 750, 2,500, 4,500, 7,500, 15,000, 25,000, 37,000, 50,000 and 73,000. Above 73,000 volts, the standard voltage ratings corresponding to standard normal system voltages are specified as follows: 88,000, 110,000, 132,000, 154,000 and 220,000.

The standard interrupting capacities for oil circuit breakers are specified as follows, the arc amperes and the rated voltage being given respectively in all cases: 3,200 amp., 4,500 volts; 2,500 amp., 7,500 volts; 2,000 amp., 15,000 volts; 3,000 amp., 15,000 volts; 4,500 amp., 15,000 volts; 7,000 amp., 15,000 volts; 10,000 amp., 15,000 volts; 14,000 amp., 15,000 volts; 20,000 amp., 15,000 volts; 30,000 amp., 15,000 volts; 40,000 amp., 15,000 volts; 60,000 amp., 15,000 volts.

A number of definitions covering standard nomenclature for oil circuit breakers were also adopted. These will greatly assist in furthering clarity in specifications.

Management and Administration Experts Meet

A MEETING of the Taylor Society was held in New York City, Nov. 22-24, beginning with an informal dinner and the annual business meeting.

Each of six public discussions was devoted to a particular topic, covered principally by presentation of cases. The topics were: The Organization and Management of a Medium-Sized Plant; Statistical Compilation—Some of Its Uses as a Function of Scientific Management; Shaping Your Management to Meet Developing Industrial Conditions; Master Budget of Sales and Production; Reduction of Waste Through Research Studies in the Operating Department of Retail Stores; Supervision of Personnel.

Arkansas Association Meets

THE Arkansas Association of Public Utilities held its fifteenth annual meeting at Hot Springs National Park on Nov. 9. Seventy-five registered members of the association attended. A feature of the meeting was an address by Ex-Governor Charles H. Brough on the development of the state. The convention was also ad-

dressed, among others, by E. F. Wickwire, Mansfield, Ohio. It was voted to hold the 1923 meeting at Pine Bluff. The following officers were elected: President, S. A. Lane, general manager Bell Telephone Company of Arkansas, Little Rock; first vice-president, J. L. Lorgino, Pine Bluff; second vice-president, Arthur E. Main, Mammoth Springs; secretary-treasurer, R. L. Brown, Little Rock, who was re-elected.

Kentucky Association Meets on Dec. 12

AS PREVIOUSLY announced in this paper, the Kentucky Association of Public Utilities will meet in Lexington on Dec. 12. The program includes a number of addresses on public relations and allied topics, beginning with an address by President L. B. Herrington, vice-president Kentucky Utilities Company, Louisville. In the list of speakers are the names of James P. Barnes, president Louisville Railway; Samuel Insull, president Commonwealth Edison Company, Chicago; Dean F. Paul Anderson, University of Kentucky, and C. N. Manning, president Security Trust Company, Lexington. The sessions will be held at the Phoenix Hotel and the University of Kentucky, and will probably be well attended, judging by the interest that was shown last year.

Pacific Railway Club Admits Manufacturers

AT ITS November, 1922, meeting the Pacific Railway Club adopted the recommendation of its board of governors and amended the club's constitution to admit supply men. This is done under the classification "Associate Membership," which includes persons not eligible for active membership but who are actively engaged in occupations where they co-operate with men in railroad service for the advancement of the science of railroading and the best interests of the railroad profession. Associate members will have all privileges except those of voting and holding office, and their dues are $3 per year.

American Association News

Dinner Committee Meets

THE first meeting of the mid-year conference special dinner committee was held in the office of the chairman, J. H. Hanna, in Washington, D. C., on Dec. 6. The general preliminaries were gone over. It was decided to hold the meeting and banquet at the Willard Hotel on Friday, Feb. 16, where there is available a meeting room which will seat 500 and a fine new banquet hall which will provide for 800. The price of the dinner tickets was set at $10, and tentative plans for music, entertainment, decorations and a separate dinner party for the ladies were agreed upon.

Those present were Chairman Hanna, Secretary J. W. Welsh, H. B. Flowers, C. C. Peirce, W. F. Ham, Harry L. Brown and J. N. Shannahan, chairman of the meetings and subjects committee, which has general charge of the mid-year conference.

Advertising to the Automobile Owner

THE advertising section of the American Electric Railway Association has just gotten out fifteen publicity cards for use in newspapers and directed at the automobile owner. The text of each is that he would do much better to store his car in the garage until next April and depend on the electric car for his transportation.

The cards are of uniform size, 2 in. x 6 in., or suitable to use in a daily newspaper column, and the association is prepared to furnish mats for these cuts without charge to member companies. The drawings are designed so that it is possible to mortise out room enough at the bottom of most of them for the company's name, if desired. It is suggested, however, that the "ads" had better be run without signature. A few of these are reproduced.

Pamphlets Issued

THE American Electric Railway Association has recently sent to member companies five printed addresses or reports in pamphlet form. One is the address of President Jackson at the annual convention of National Association of Railway and Utilities Commissioners in Detroit, Nov. 14. The second is the report of the committee on motor vehicle transportation, presented at the same convention. Two others are papers or reports presented at the recent Chicago convention; one the report of the committee on uniform motor vehicle regulation, the other the paper on the preparation and administration of a budget, read before the Accountants' Association by Harry A. Snow. The fifth pamphlet is a reprint of an address on the responsibility for the cost of paving read by A. T. Davison, Third Avenue Railway System, before the Engineers' Club of Philadelphia. This reprint is distributed with the compliments of the Third Avenue Railway.

Distribution of 1922 "Proceedings"

IT IS expected that the 1922 *Proceedings* will be available for distribution on or about Jan. 1, covering the American and the four affiliated associations. In view of the fact, however, that the manufacturer members, as a rule, do not care to receive the *Proceedings* of the Accountants, the Claims and the Transportation & Traffic Associations, only the American and Engineering Association *Proceedings* will be sent them unless they specifically request the others. Railway members will receive one copy of the *Proceedings* of each association and individual members will receive copies of the *Proceedings* of the association with which they are respectively affiliated.

PUBLICITY MATTER PREPARED BY THE A. E. R. A. ADVERTISING SECTION TO ENCOURAGE AUTOMOBILE OWNERS TO USE THE TROLLEY

News of the Electric Railways

FINANCIAL AND CORPORATE :: TRAFFIC AND TRANSPORTATION
PERSONAL MENTION

Arrests and Convictions in Buffalo —No Results from Fare Conference

Ernest J. Jaggard, president of the Buffalo Jitney Owners' Association, charged with conspiring with officials of the Manhattan Transit Company of New York to evade the transportation corporation law in the operation of jitneys in Buffalo, was found guilty by a jury in City Court and was fined $100. After the conviction he resigned from the organization. Joseph H. Hoadley of New York, president of the Manhattan Company, was discharged in City Court following a trial on a charge of conspiracy growing out of the same case. The prosecution failed to show any criminal intent. Henry D. Chapin of New York, vice-president of the Selden Motor Truck Company, Rochester, and the company's New York manager, also was discharged after trial on a conspiracy charge. It was not proved that Chapin was an official of the Manhattan Transit Company.

The trial and conviction of Jaggard is the result of evidence obtained by the International Railway, Buffalo, in connection with its intensive campaign to rid the city of jitneys which are running in defiance of court injunctions and the state law. It is estimated by officials of the International in charge of the jitney service investigation that close to 2,500 jitneys are operating daily over scheduled routes in the city of Buffalo. Many officials of the claims department of the Philadelphia Rapid Transit Company, Philadelphia, have been detailed to the work of getting evidence and checking jitney drivers throughout the city. Arrests are being made daily but nominal fines are being imposed by the City Court judges. Few are getting penitentiary sentences, except in contempt of court cases and the evidence in these cases is exceptionally difficult to obtain.

The police guard has been withdrawn from all local and interurban cars on the lines of the International Railway with the exception of the "owl cars" on the local lines in Buffalo. Police authorities stated that the emergency now has passed and there is no more danger of rioting although loyal employees of the company are being assaulted, dragged off their cars and stripped of their clothing every few days. Cars also are being stoned in outlying sections of the city.

As a result of a conference held in the Mayor's office it was disclosed that the law covering public utilities prohibits a charge for transfers. The Mayor had proposed to the International the restoration of the 5-cent fare and a 1-cent transfer. Among those who attended the conference on behalf of the International were Thomas E. Mitten of Philadelphia, chairman of the board of the International; Herbert G. Tulley, president, and Edgar J. Dickson, vice-president in charge of operation. Mr. Mitten promised to present a new plan on or before Jan. 10.

The conference was the second of a series between three members of the City Council and three representatives of the International. It was productive of no results although it continued almost all day. Officials of the International were asked by the Mayor to drop the prosecution of jitney drivers but this was flatly rejected. The conference was behind closed doors. The Socialist member of the City Council is making a fight to have the negotiations in the open.

Resolution Adopted for Investigation of Return to Five-Cent Fare

Crops have started to mature from the seed sown at the election in November, so far as the Schenectady situation is concerned. With Mayor George R. Lunn of Schenectady, elected Lieutenant-Governor on the Democratic ticket, having decided to continue to hold the office of Mayor also, the Common Council of Schenectady on Dec. 4 passed a resolution without a dissenting vote to make a searching investigation of the feasibility of abolishing the 7-cent fare granted by the Public Service Commission and restoring the 5-cent limit contained in franchises under which the railway lines are operated.

The resolution was presented by Alderman Frank X. Shay, president pro-tem. He preceded presentation of the resolution with a brief review of the Council investigations and of legislation in May, 1920, at the time Edward M. Bemis was employed by the city to investigate the advisability of allowing the company an increase in fare from 6 to 7 cents to permit it pay increased wages.

The resolution provides for an immediate investigation by the Council and will include, in addition to the fare question, inquiry into the safety and convenience of one-man cars and the adequacy of the service.

"The great probability of legislative action soon after Jan. 1, restoring power to the Common Council and the city authorities to compel compliance with franchise provisions," is the reason given in the resolution for the immediate action.

Thus time is apparently being seized by the forelock, for in the event that the public service commission law is amended to confer regulatory power upon municipalities, Schenectady will be ready and waiting so far as street railway regulation is concerned.

Arbitrators for Rental Issue Named

An arbitration board has been named to decide the rate of rentals to be paid to the city of Detroit by the Detroit (Mich.) United Railway for the use of the city-owned tracks by the corporation's interurban cars. The arbitration proceedings will be confined to the question of rentals alone and will not include the several points which the Detroit United Railway officials had desired arbitrated.

Professor Henry E. Riggs of the University of Michigan has been named by the Detroit United Railway as its representative; H. M. Gould, electrical engineer of the Department of Street Railways, will represent the city and William E. Davis of Cleveland, Ohio, has been agreed upon by the first named arbitrators as the third man to complete the board.

Elliott G. Stevenson, president of the Detroit United Railway, had announced that the company would contend that the same board of arbitrators should decide a number of other questions, including the matter of the amount the city should pay to the company for a quantity of miscellaneous equipment taken over by the city on May 15, last, when the city purchased the company's lines and equipment.

Another point which the company contended should be settled at the same time concerned the differences over the day-to-day agreement under which the city operated cars over certain of the company's lines prior to May 15.

Investigation to Be Resumed

Mayor George P. Carrel's Street Railroad Committee of Cincinnati, Ohio, will resume its investigation into the affairs of the Cincinnati Traction Company and its affiliated corporations, while awaiting a definite report from the conference committee of the traction company and the Cincinnati Street Railway on negotiations between them for a financial reorganization of the former company.

This point was one decided upon by the Mayor's committee on Dec. 1, after representatives of the two companies, meeting with the Mayor and his committee, had asked for further time. The hearings of the Mayor's committee will be resumed on Monday, Dec. 11.

Walter A. Draper, vice-president of the Cincinnati Traction Company, expressing himself at the meeting, said he felt confident it would be possible to inform the committee definitely "before the end of this year" whether an agreement between the two companies is possible.

Boston Must Pay Traction Deficit

United States Supreme Court Rules City Is Liable for Assessment to Meet Costs of Public Operation—City Contended $2,000,000 Depreciation and $2,000,000 Maintenance Charges Were Excessive

THE taxpayers of Boston must pay the $4,000,000 deficit from the 1919 operation of the Boston Elevated Railway, including the city-owned subways and other traction properties. This in effect is the ruling of the United States Supreme Court in the case decided by it on Dec. 5 against the city in its suit against State Treasurer James Jackson and the trustees of the railway to test the legality of an assessment under the special act of 1918 to meet the deficit. The case was up on an appeal from the Massachusetts Supreme Judicial Court, which had reversed the decision of the court below in favor of the city. The United States Supreme Court affirmed the ruling of the Massachusetts Supreme Court, the decision being handed down by Chief Justice Taft.

Chief Justice Taft, in delivering the opinion, said:

This is a writ of error to a decree of the Supreme Judicial Court of Massachusetts sustaining a demurrer to a bill in equity against the treasurer and receiver general of the Commonwealth of Massachusetts, the Boston Elevated Railway and the trustees who are operating the railway under a special statute of the Commonwealth, and dismissing the bill for want of equity, the defendants not wishing to plead further. It now comes before us on a motion by the Attorney General of Massachusetts to dismiss or affirm.

The case as made by the bill is an impeachment of the validity of the special act of 1918. By acts of 1902 and 1911 the city of Boston was given power to construct and did construct subways and tunnels at a cost of $31,000,000 and by the same authorities leased these and also others built by it under earlier statutes to the Boston Elevated Railway for a fixed rental until July 1, 1936, and the whole property and its rents and profits are by the express terms of the statute held by the city, "in its private or proprietary capacity, for its own property," never to be taken by the commonwealth except upon payment of just compensation. The railway got into financial difficulty. It served the residents of Boston and other towns of the commonwealth.

Act to Relieve the Situation

The General Court in the public interest passed the special act of 1918 to relieve the situation. In general, the act provided for the appointment of trustees who were to take the railway out of the hands of the company and operate it under the leases to the company by the city of Boston on condition that the stockholders of the railway accepted the provisions of the act.

These provide for the payment of dividends on the stock of the company, the repair and maintenance of the railway, the raising of $3,000,000 by the company for the improvement of the property and a reserve fund, and the payment of any deficit in operation out of the treasury of the commonwealth.

If the commonwealth is called upon to make payments, to meet deficits or diminution of the reserve fund, such amounts are to be assessed upon the several cities and towns in which the railway operates, as an addition to the regular state tax, in proportion to the number of persons in said cities and towns using the service of the company at the time of the payment as determined by the trustees. The trustees are to fix the fares to meet the cost of service, including taxes, rentals and interest on the indebtedness of the company, fixed dividends on the preferred stock, and 5 per cent on the common stock for two years, 5½ per cent for the next two years and 6 per cent for the remainder of public operation, which is for a period of ten years and thereafter, as the commonwealth shall determine.

Trustees Take Charge

The company's stockholders having accepted the act, the trustees took over the possession and operation of the railway. They found the railway in bad repair and charged $2,000,000 depreciation and $2,300,000 for maintenance and repair in the year 1919. This led to a deficit for that year of $4,000,000, although in previous years the company had not expended more than $100,000 a year on such account. The treasurer and receiver general under the act of 1918 paid the deficit out of the treasury of the commonwealth and was about to include the same in the state taxes to be collected by the city of Boston and the other towns through which the railway runs in the proportion fixed by the act. The object of the bill was to prevent this levy and collection and further proceedings under the act.

The motion to dismiss is urged, first, on the ground that Charles L. Burrill as treasurer and receiver general was the defendant in the original bill and that the present defendant, Jackson, his successor in office, has been substituted without legal sanction. The substitution took place in the Supreme Judicial Court of Massachusetts before that court considered the case on its merits and in the court's opinion the objection to the substitution was noted and overruled. This settles conclusively so far as we are concerned that the state law authorized the substitution.

The second ground urged for dismissal is that the tax for 1919 sought to be enjoined has been collected from the taxpayers of the city by the city and paid over to the treasurer of the commonwealth so that the case here becomes a moot one. The action of the state court upon such a matter relieves us from its consideration.

What the State Did

Having disposed thus of the ground presented for dismissing the writ of error, we come to the alternative prayer for affirmance. The plaintiff in error comes to this court because, as it says, the statute of 1918 of the commonwealth, by which the trustees took over and are now operating the railways, impairs the obligation of the contract of lease of its property in the tunnels and subways to the railroad and so violate the contract clause of the federal constitution.

As to this and other contentions the opinion says: We are relieved from full detailed consideration of these grounds urged for reversal by the satisfactory opinion of the Supreme Judicial Court in this case.

What the commonwealth did was to help the people of the towns which the railway served when the railway's finances threatened its collapse, by taking over the lease of the railway for a valuable consideration. The law provided for keeping the property in good repair and the payment of the rentals due the city. There was nothing in the contract of assignment which in the slightest degree impaired the obligation of the company to the city under the lease. Indeed, it secured the performance of those obligations.

To the contention that the contract was impaired because the law took away or impaired its beneficial interest in the profits of the contract of lease and its property, the Supreme Judicial Court of Massachusetts is quoted as saying that the tax was not imposed on Boston in its proprietary capacity in which it built the subways and leased them. The taxes were collected with state taxes to achieve a state purpose and Boston in its public and political character was a mere state tax agency for collection. The taxpayers were to be called upon to bear the burden of the public purpose of the state in furnishing this important service of transportation in and between the communities in which they lived.

State May Confer

In disposing of this objection we have in effect disposed of those objections to the act of 1918 based on the fourteenth amendment. If the constitution and laws of Massachusetts authorize the commonwealth to operate a railway for the public benefit, there is nothing in the fourteenth amendment to prevent. Nor is there anything in it preventing the State from using the trustees as agents to operate the railway and in such operation to determine the needed expenditures to comply with the obligations of the lease or the requirements of adequate public service. This is delegating to proper agents the decision of a proper administrative policy in the management of a state enterprise and the ascertainment of facts peculiarly within their field of authorized action.

In this conclusion we assume, as did the Supreme Judicial Court, that the State may confer on one of its sub-divisions like a city or town the private proprietary capacity by which it may acquire contract or property rights protected by the federal constitution against subsequent impairment by its creator, the State. We do not wish to be understood as accepting such assumption as an established rule. All we do not decide is that even if the city of Boston may invoke the contract clause of the federal constitution to protect its rights under the lease as against infringing legislation by the commonwealth, the act of 1918 does not infringe.

As indicated in the Supreme Court decision the city of Boston, under legislative acts of 1902 and 1911, was given power to construct subways and tunnels at a cost of $31,000,000, and leased these and others already built to the Boston Elevated Railway for a fixed rental until July 1, 1936. The railway got into financial difficulties during the war period, and the Massachusetts General Assembly passed a special act in 1918 to relieve the situation by placing the railway properties under control of a board of five trustees, the State to pay any operation deficit, and assess it against the communities served by the railway lines.

The trustees declared a deficit of $4,000,000 for 1919, after charging up $2,000,000 for depreciation and $2,300,000 for maintenance and repair. The State paid the deficit, and was preparing to assess it against Boston and other cities served, when the city brought suit to enjoin its collection. The city contended the depreciation charge was "excessive, unreasonable, unnecessary and illegal," pointing out that the railway under private control had charged off only $98,000 a year. To be assessed with this deficit, the city claimed, was a violation of its lease to the railway.

Rejects Municipal Offer

The New Brunswick Power Company, controlling the electric light and power, electric railway and gas services in St. John, N. B., has rejected the municipal offer of $2,577,655 for its plant and equipment, according to an announcement of Mayor Fisher. This figure was set by the Supreme Court as the value of the company's property in 1920.

The power company offered four alternative propositions: To sell the property to the city on a basis to be determined by arbitration; to arbitrate the rates to be charged; to elect two members of the board of directors of the company on appointment by the city; or to sell the electric light and power department to the city, retaining the street railway and gas departments.

The company's bonds are held largely in the United States.

The New Brunswick Government approved recently a contract between the Provincial Electrical Power Commission and the city of St. John for delivery of hydro power to the city from the Musquash plant. The signature of Lieutenant-Governor Pugsley, who is visiting New York, remains to be affixed to that contract.

Charles A. Coffin Foundation Set Up

General Electric Company Creates Fund of $400,000 in Honor of Its Founder to Provide Rewards for Its Employees and for Utility Companies and Aid for Education and Research

By action of its board of directors, the General Electric Company has set aside a fund of $400,000, to be known as the "Charles A. Coffin Foundation," the income from which, amounting to approximately $20,000 per year, will be available for encouraging and rewarding service in the electrical field by the award of prizes to the company's employees and by giving recognition to lighting, power and railway companies for improvement in service to the public, fellowships to graduate students and funds for research work at technical schools and colleges.

The foundation will be controlled and administered by a foundation committee appointed by the board. This committee, within the limits of the purposes for which the foundation is created, will have power to charge the conditions applicable to the distribution of the fund and the amounts for each purpose.

How the Income Will Be Used

The committee proposes to distribute the income of the foundation as follows:

1. Eleven thousand dollars in prizes for the most signal contributions by employees of the General Electric Company toward the increase of its efficiency or progress in the electrical art. Particularly, the prizes are further to encourage suggestions from workmen. With each prize the company will give a certificate of award. Foreman's prizes are to be awarded for the best department, taking into account its appearance, efficiency of operation and conditions which add to the better conduct of the work and the welfare of the employees. All employees of the company, except executive officers, heads of departments, works managers, superintendents, district office managers and similar executives, are eligible for such prizes. In works where employees' representation has been adopted such representatives will co-operate with the prize committee in awarding prizes.

2. A gold medal, to be known as the Charles A. Coffin medal, will be awarded annually to the public utility operating company within the United States which during the year has made the greatest contribution toward increasing the advantages of the use of electric light and power for the convenience and well-being of the public and the benefit of the industry. The company receiving the medal will also receive $1,000 for its employees' benefit or similar fund. A committee to be named by the National Electric Light Association and known as the Charles A. Coffin prize committee of the National Electric Light Association, which shall consist of its president, the chairman of its public policy committee and a third member nominatel by them, will award this medal, acting with the advice and co-operation of a committee appointed by the foundation committee. The expenses of the committee are to be paid out of the income of the foundation.

3. A gold medal, to be known as the Charles A. Coffin medal, will be awarded annually to the electric railway company within the United States which during the year has made the greatest contribution loward increasing the advantages of electric transportation for the convenience and well-being of the public and the benefit of the industry. The company receiving the medal will also receive $1,000 for its employees' benefit or similar fund.

A committee to be named by the American Electric Railway Association and known as the Charles A. Coffin prize committee of the American Electric Railway Association, which shall consist of its president, the chairman of the committee on policy and a third member nominated by them, will award this medal, acting with the advice and co-operation of a committee appointed by the foundation committee. The expenses of the committee are to be paid out of the income of the foundation.

4. Five thousand dollars is to be awarded annually for fellowships to graduates of American colleges and technical schools who, by the character of their work and on the recommendation of the faculty of the institution where they have studied, could with advantage continue their research work either here or abroad; or some portion or all of the fund may be used to further the research work at any of the colleges or technical schools in the United States. The fields in which these fellowships and funds for research work are to be awarded are: electricity, physics and physical chemistry. A committee appointed by the foundation committee will award such fellowships and funds for research work, with the advice and co-operation of a committee of three, one to be appointed by each of the following: National Academy of Sciences, American Institute of Electrical Engineers and Society for the Promotion of Engineering Education. This committee is to be known as the Charles A. Coffin fellowship and research fund committee, and the fellowships are to be known as the Charles A. Coffin fellowships. The expenses of the committee are to be paid out of the income of the foundation.

5. In each annual report of the General Electric Company a statement will be made of the awards under the Charles A. Coffin Foundation, and other publicity will be given to such awards.

The board of directors of the General Electric Company has appointed as the Charles A. Coffin foundation committee the following officers of the company: A. W. Burchard, J. R. Lovejoy, E. W. Rice, Jr., Gerard Swope and O. D. Young.

The advisory committee of the General Electric Company will administer the fund within the organization of the General Electric Company. The following committees to administer the fund and to act with organizations outside the General Electric Company have been appointed:

Committee to co-operate with the National Electric Light Association—A. H. Jackson, vice-president; J. R. Lovejoy, vice-president.

Committee to co-operate with the American Electric Railway Association—J. G. Barry, vice-president; A. H. Jackson, vice-president.

Committee to co-operate with the National Academy of Sciences, American Institute of Electrical Engineers and the Society for the Promotion of Engineering Education—E. W. Rice, Jr., honorary chairman; A. H. Jackson, vice-president; W. R. Whitney, director of research laboratory.

Under date of Dec. 2, the president of the General Electric Company issued a letter in explanation of the Charles A. Coffin Foundation. This letter states that Mr. Coffin was the founder and creator of the General Electric Company, of which he has been the inspiration and leader for thirty years. As an expression of appreciation of Mr. Coffin's great work not only for the General Electric Company but also for the entire electrical industry, and with the desire to make this appreciation enduring and constructive, as Mr. Coffin's life and work have been, the board of directors of the General Electric Company created on his retirement and now desire to announce "the Charles A. Coffin Foundation."

Home Rule Measures in Contemplation

Tentative Legislative Program for New York State Expected to Be Agreed Upon at Conference for Which Call Has Been Issued—Program Expected to Be Put Through

As the time approaches for the New York State Legislature to convene speculation is shaping itself over the question of what may be expected to happen. The newly elected administration in New York State is Democratic in its entirety with the exception of the lower house of the Legislature. That body stands sixty-nine Democrats to eighty-one Republicans, with five of the Republican members from Greater New York who may reasonably be expected to vote with the Democrats on many matters of party policy. Besides this several up-state Republicans are pledged to radical measures.

Had the election been a close one instead of a landslide, the lower house might reasonably be expected to exercise a check on the activities of the Senate and block many of the administration measures, but political leaders of both parties are inclined to believe that in the face of 400,000 majority the lower house will hardly assume to place itself in the position of blocking legislation for which in the final analysis the Democratic administration must assume responsibility.

In the matter of public service commission legislation, measures are expected to be introduced giving to municipalities the regulation of public utilities located within their boundaries. This will probably mean that the present Public Service Commission will be permitted to continue to function as a state body, but that the part of the law will be eliminated which permits the commission to raise or lower a rate or charge regardless of the existence of any general or special law franchise or ordinance. The centralized power of the commission may also be lessened.

In the electric railway field, to cite two instances, this would mean the restoration of 5-cent fare in the city of Troy, where a local franchise exists, and a similar fare in the city of Rensselaer, where there is a special statute to that effect which has never been repealed, except by inference.

Should the change in the public service commissions law limit the regulation by municipalities to those public service corporations wholly within their bounds, little jurisdiction would be exercised by such municipalities and a corporation so serving would be able to evade local and secure state regulation by simply building a spur into outlying territory. It is reasonable therefore to suppose, if the policy of local regulation is finally agreed to, that local authorities will be given the

power of regulation over public service corporations located principally within the boundaries of their localities.

Such a program means the creation of cumbersome local administrative machinery with the ultimate cost to many localities greater than the benefits which may be expected to accrue. Still it seems to be the policy of the administration to go ahead with the plan "because the people voted for it." Certain it is that during the transitory period of a change from state to local regulation a perfect hodge-podge will exist with the chance remaining that the courts will declare the entire scheme incompatible with public interests.

In the matter of labor legislation one of the first things which will be attempted is an amendment to the compensation law making insurance in the state fund exclusive except in the case of municipalities which may elect to become self-insurers. While such legislation will have the backing of the State Federation of Labor, the Lockwood committee and the administration a most bitter fight is anticipated before it is passed. The casualty and mutual companies now writing workmen's compensation insurance will insist—and not without a show of reason—that they receive an opportunity to effect a gradual withdrawal from business in order to protect their investments and it is not altogether certain that the most radical propositions in this respect will eventually become part of the law.

New Franchise Provisions in Vancouver

Existing Franchise Amended in Many Particulars—New Arrangement Provides Bus for Operation

After prolonged negotiations, a new agreement has been made between the British Columbia Electric Railway and the city of Vancouver, amounting virtually to a new franchise. It amends the existing franchise, dated 1901, in several important respects, especially in providing for the continuance of the 6-cent fare and for new motor bus routes. It further provides for a reduction in lighting rates within the city limits from 6 cents to 5 cents a kilowatt-hour.

The 6-cent fare charged in Vancouver has been the subject of negotiation and temporary measure for three and a half years. The last permit was due to expire on Dec. 15, by which time the city was to make a new agreement or the provincial government form a board of some nature to adjudicate the matter. This is not the first time recently that a new franchise has been proposed. On two former occasions the City Council failed to come to any agreement and it was believed that no agreement could be found suitable to it. To the last, some members were inclined to put the agreement to the voters, but a declaration by the company that it would withdraw its concessions deterred them.

The provincial government has announced its intention to pass an act providing for a board of arbitration to decide passenger rates of the British Columbia Electric Railway, but the new agreement with the city of Vancouver stipulates that both parties shall not apply to such a board to modify its terms.

The provisions of the new agreement briefly are these:

The 6-cent fare within the city is continued for three years, at the end of which time the fare is to be decided by agreement or, failing that, by arbitration.

The domestic lighting rate in Vancouver is to be reduced on Jan. 1, 1923, from 6 cents to 5 cents a kilowatt-hour.

Where transportation is not adequately provided, the company is to operate buses, provided reasonable roadways are available. The unique feature of this proviso is that the city is to contribute toward any deficit in the operation of such lines.

The company agrees to stand one-half the deficit on these lines up to the amount of $5,000. The remainder is to be deducted from the percentages paid to the city out of the gross annual receipts of the system. Only two lines are at present proposed, and it is likely under this arrangement that the city will scrutinize the possible traffic before ordering the company to provide service.

The company is to replace several portions of temporary track with permanent track within one year, the cost being estimated at about $100,000.

Several other clauses call for further contributions by the company for the maintenance of pavement between the car tracks. The company is required to provide granite blocks for each side of the rails, to pay to the city $5,000 for maintaining pavements and construct and maintain the sub-base between the tracks in future permanent construction.

Within the next five years the company is to spend $250,000 in placing light and power wires underground.

As the city of Vancouver is only a small portion of Greater Vancouver, with only two-thirds of the population of the greater city, this agreement affects only a part of the city system. But agreeemnts are in existence with the municpalities of South Vancouver, Point Grey and North Vancouver and the city of New Westminster which make fare permissions contemporaneous with those in the city of Vancouver. The commutation fare to the suburbs of Vancouver is 7 cents, and this will therefore remain until amended by the proposed provincial board.

Vote Against Municipally Owned Bus System

The proposition to establish a municipally owned bus system in Pasadena, Calif., a bond issue for which was voted on at an election held on Dec. 5, failed by 800 votes to gain the two-thirds majority necessary to carry. The official count was 5,555 yes and 3,930 no. The week prior to the election the Pacific Electric lines negotiated with the present operating bus lines to purchase their interests. This offer was acceptable to the bus operator.

$101,410,000 Transit Proposal

Philadelphia Mayor Presents Outline of Comprehensive High-Speed Line—Program for P. R. T. Company

A comprehensive high-speed system, involving, in addition to the Broad Street subway, two elevated roads, was outlined on Nov. 5 by Mayor Moore of Philadelphia in a letter to Thomas E. Mitten, president of the Philadelphia Rapid Transit Company. The cost of constructing and equipping the system is placed at $101,410,000.

The Mayor's letter to Mr. Mitten embodied the following links in a high-speed program:

1. The Broad Street subway proposition, subdivided into five sections, comprising a four-track subway from Christian Street to the point where the railroad tracks tunnel beneath Broad Street just south of Hunting Park Avenue, and a two-track subway from Hunting Park Avenue to Olney Avenue and from Christian Street to League Island.
2. Construction of an elevated road extending westward from Broad on Christian Street, thence over Gray's Ferry Avenue to Woodland Avenue and up Woodland Avenue to city line.
3. An elevated road from the intersection of Germantown Avenue with Broad Street, north on Germantown Avenue as far as Chelten Avenue.

The Mayor in replying to Mr. Mitten's request for specific information as to cost and probable date of completion, said he was prepared to begin work on the first section of the Broad Street subway, running from City Hall to Hunting Park Avenue, on March 1, and that if money is made available for the purpose, he would begin work at the same time on the lower four-track section, from City Hall to Christian Street.

Director Twining in a letter to the Mayor said he saw no reason why the four-track portion of the Broad Street tube, the two-track strip up to Wyoming Avenue and the three-track elevated running out Christian Street and down Woodland Avenue as far as Forty-ninth Street couldn't be finished by July 1, 1926.

The Mayor also said he thought those portions of the high-speed program could be equipped and placed in operation in 1926, while the remainder could be finished as soon as possible and tied in with the completed portions as the sections became available. Construction and equipment of the Broad Street subway from Christian Street to Wyoming Avenue, with the feeding elevated line extending as far as Forty-ninth Street and Woodland Avenue, would cost $66,920,000, and that is the estimated sum upon which the Philadelphia Rapid Transit Company would have to pay a return at the time operation was begun of the subway-elevated.

The Mayor announced he was prepared to discuss an operating lease with Mr. Mitten at once, but he evinced a determination to begin construction anyhow of the North Broad Street end of the road on March 1, 1923.

Financial and Corporate

Operating Income Increases

Eleven Months Operation in Bridgeport Shows Net Income of $119,450—No Provision for Stockholders

Results of the Connecticut Company's operation in Bridgeport from Nov. 20, 1921, to Nov. 1, 1922, show that the 5-cent fare with restricted jitney service is increasing the trolley fund and is apparently a better investment than the 10-cent rate with unrestricted jitney competition. The company is now meeting operating expenses and taxes. Figures for the eleven months operation were recently compiled by Edward Field, auditor for the commission, from the books of the Connecticut Company.

Although the company shows a gain in its operating income no provision is made for depreciation nor a return to the stockholders on the investment. When the commission fixed an appraisal of the Bridgeport division an amount of $63,700 was decided upon as a fair monthly return if the division was operated by an independent company with private stockholders. For the entire period represented in the accompanying table this would make a fair return of $724,059. As a matter of fact, it will be noted from the figures that the Bridgeport division suffered a deficit for the eleven months period of $605,618 after allowing for the return on property.

Since Nov. 20, 1921, the Bridgeport division of the Connecticut Company has been operated as a separate undertaking. At that time the commission ordered a test period of ninety days to continue until changed by the commission. The commission has not yet ordered any change.

It is noted in the figures shown that for the first two months the operating income was a deficit, but that thereafter, except in the month of October of this year, the company was able to meet expenses. The net income for the eleven months period amounted to $119,450. This profit in operation, it was brought out by the commission and the Connecticut Company, had been made with continued jitney competition and that Bridgeport was the only city in the state where jitneys were still allowed to operate independently of the Connecticut Company.

An absorption of the jitney lines by the Connecticut Company has been suggested as a solution of the transportation problem in Bridgeport under a purchase arrangement with the present owners and company operation of bus lines to supplement existing railway lines. It is said that some company officials believe that a 5-cent fare in Bridgeport would be successful from the point of view of return provided jitneys would be eliminated on parallel lines and service rearranged to cover territory now covered by both trolleys and jitneys.

Richard T. Higgins, head of the utilities board, stated that no immediate change in the Bridgeport situation was contemplated. He said that the commission had made a study of the Bridgeport case and that numerous details had occupied the attention of that body and resulted in a continuance of the trial of the radial 5-cent fare.

Protests Higher Assessment

A delegation representing the Louisville (Ky.) Railway appeared before the Board of Equalization on city tax matters at the City Hall recently and launched a protest against an increase in figures for assessment of company property. This year City Assessor E. E. Bristow placed the net franchise and property valuation of the company at a tentative figure of $18,000,000, as against $10,000,000 last year. The company holds that new improvements do not justify any such increase in assessment figures.

The company also held that with an increased assessment increased taxation would make it impossible for the company to make the profits allowed in its contract with the city, which would force an increase in fare, under the contract agreement, in course of time, as it would represent increased operating cost and prevent the barometer fund from growing.

General opinion is that final figures will not be much higher than those of last year. The Board of Equalization took the matter under advisement.

Representing the company at the conference were Attorneys Churchill Humphrey and Ed Humphrey, President James P. Barnes of the company and Auditor Frank Belleville.

Directors Ratify Sale

Rochester & Syracuse Purchases Empire Railroad Stock—Application to Go Before Commission

The control of the Empire State Railroad Corporation was recently purchased by the Rochester & Syracuse Railroad Company, Inc., after the board of directors of the latter corporation held a special meeting to ratify a contract entered into on Nov. 20 by representatives of the two railway interests.

The Rochester & Syracuse line acquired control of the Empire State by purchasing approximately 20,000 of its 29,500 shares of stock. Officers of the Rochester & Syracuse road declined to disclose the purchase price.

An application for approval of the purchase will be filed immediately with the Public Service Commission at Albany, and the sanction of that body is expected by the first of the year, due to the benefits both electric roads will derive through reductions of operating costs to be obtained by placing both lines under one management.

Properties acquired by the Rochester & Syracuse line are: Syracuse to Oswego interurban electric road; Oswego city lines; Auburn and Port Byron interurban line and branch lines in Auburn.

Although the Rochester & Syracuse and Empire State lines will retain their present identities, they will be under one management. The Rochester road is being operated by Peck-Shannahan-Cherry, Inc., with active management in the hands of Talmadge C. Cherry, first vice-president and general manager. The same organization will assume management of the Empire State Railroad, which will give up its present offices and the two roads will be combined in the present Rochester & Syracuse offices in the Syracuse Savings Bank building.

Directors expressed confidence that the material reduction in operating costs due to joint operation, to be effective as soon as the Public Service Commission approves the purchase of the Empire State road, will result in the class B preferred stock of that line reaching a dividend paying basis. The B stock of the Empire State road has paid no dividend to date, while the Rochester & Syracuse line has paid 4 per cent on its preferred stock for two years.

The Rochester & Syracuse Railroad was organized several years ago. When

	Passenger Revenue	Other Revenue	Total	Operating Expenses	Net Operating Revenue	Taxes	Operating Income	Return on Property	Gain or Loss
Nov.	$ 51,192	$1,719	$52,911	$ 59,679	*$ 6,768	$2,851	*$ 9,619	$23,358	$32,978
Dec.	161,619	4,855	166,475	177,216	* 10,741	8,273	* 19,015	63,700	* 82,715
Jan.	159,945	4,960	164,905	146,665	18,240	4,947	13,293	63,700	*50,4066
Feb.	142,306	4,089	146,396	130,849	15,546	4,391	11,154	63,700	* 52,545
March	159,075	5,158	164,233	143,326	20,906	4,927	15,979	63,700	* 47,720
Aoril	153,437	5,376	158,813	136,342	22,471	4,764	17,706	63,700	* 45,993
May	159,786	5,014	164,800	143,173	21,627	4,944	16,683	63,700	* 47,016
June	153,046	5,486	158,532	137,082	21,450	4,755	16,694	63,700	* 47,005
July	175,134	5,388	180,523	143,384	37,138	5,415	31,722	63,700	* 31,977
Aug.	171,002	5,455	176,458	148,385	28,072	5,293	22,779	63,700	* 40,920
Sept.	159,903	5,249	165,153	146,843	18,309	4,954	13,355	63,700	* 50,344
Oct.	153,955	5,710	159,666	167,169	*7,503	4,789	*12,293	63,700	* 75,993
Totals	$1,800,406	$59,463	$1,859,870	$1,680,120	$178,750	$60,309	$119,450	$724,058	*$605,618

*Indicates deficit.

the Empire United went into the hands of receivers on Nov. 1, 1915, holders of bonds issued on the mortgage covering the unit from Syracuse to Rochester organized a bondholders' protective committee. Mr. Loasby was chairman and Mr. Settle and Mr. Harvey were the other members. Mr. Cowie served in the capacity as counsel for the committee.

When the mortgage was foreclosed, the protective committee bid in the Rochester line for approximately $1,000,000. The Rochester & Syracuse Railroad Company, Inc., was then organized, and in the recapitalization the corporation issued $2,500,000 in bonds; $2,500,000 in preferred and $1,500,000 in common stock.

Arthur W. Loasby was the first president of the reorganized corporation. When Mr. Loasby accepted the position as a vice-president of the Equitable Trust Company of New York, of which he is now senior vice-president, Mr. Cowie was elected president of the Rochester & Syracuse road. Mr. Cherry has held the office of first vice-president and general manager since the reorganization in 1915. Mr. Chase, president of the First Trust & Deposit Company, is second vice-president.

Another bondholders' committee made up of persons interested in the Beebe enterprises bid in the units now included in the Empire State Railroad Corporation, which is now managed by Ford, Bacon & Davis of New York, with J. C. Nelson as president. The road has $2,750,000 worth of bonds outstanding. It also has 2,500 shares of A preferred stock, par value $250,000; 12,500 shares B preferred, par value $1,250,000, and 14,500 shares of common stock with a $1,450,000 par value.

First Report Since 1914 Submitted

The eighth annual report of the board of directors of the Mexico Tramways, Mexico City, Mexico, has been submitted to the shareholders with an appendix report by G. R. G. Conway, managing director, on the company's operations and undertakings for the year 1921. This is the first report since 1914. At that time conditions in Mexico were disturbed. Upon their growing worse the tramways was seized by the government, which continued to operate them until May, 1919, when the property was returned to the company in a very run-down condition.

The gross earnings for 1921 amounted to $13,075,291 (pesos), an increase over the year 1920 of $2,069,160 (pesos). The net earnings after allowing for taxes and depreciation were $2,335,436 (pesos), an increase of $681,844 (pesos) over the previous year. The report makes mention of the "unorganized competition" which had to be encountered owing to the introduction of small "camiones" (jitneys), which number about 1,550, operating daily and carrying approximately 132,000 passengers per day.

The report says that in considering the operating results for the year 1921 the special condition under which the company had been operating must be taken into account, and particularly those which obtained when the properties were returned to the company in May, 1919, after having been administered by the Mexican Government since Oct. 12, 1914. The run-down condition of the property will continue to affect the net earnings of the company even for the next few years. Since the return of the property wages have been increased nearly 100 per cent, with an increase in the number of employees, chiefly in the traffic department.

However, in the opinion of the managing director, the company's property is now in good condition, since the most urgent and necessary reconstructions have been carried out. He added that maintenance expense would probably continue high, as much had to be accomplished during the next few years.

I. R. T. Doing Well on Basis of Readjustment

If the Interborough-Manhattan readjustment plan had been effective during the year ended June 30 last the Interborough Rapid Transit Company, New York, N. Y., would have shown a balance of $4,011,523 instead of a deficit of more than $2,000,000, according to information presented on Dec. 5 by Frank Hedley, its president and general manager, in a letter to the bondholders' and noteholders' committee.

Mr. Hedley stated that the company under the terms of the agreement was about to issue $34,330,000 ten-year secured convertible 7 per cent notes to retire and refund 90 per cent of the outstanding three-year issue. His comment was that under the new plan the company's fixed charges had been materially reduced. He showed the effect of the plan graphically by deducting from the known results of operation for the last fiscal year the interest (but not sinking fund) on the I. R. T. bonds, the interest on the new I. R. T. notes and on the Manhattan Railway bonds. Such a statement follows:

YEAR ENDED JUNE 30, 1922	
Operating revenues	$53,540,859
Operating expenses, etc.	37,557,965
Operating income	$15,982,894
Non-operating income	652,875
Gross income	$16,635,769
Interest on I. R. T. bonds, new notes and Manhattan Railway bonds	12,624,246
Balance	$4,011,523

Mr. Hedley said that 1923 results should be at least as favorable as those indicated for 1922 in the table he presented.

The letter continues:

In view of the substantial increase in the number of passengers carried on the system during the first five months of the fiscal year and also because of the greater economies of operation which are being obtained, there is every reason to believe that the actual results for the fiscal year ending June 30, 1923, will be at least as favorable as those indicated in the table above.

Planning to Operate Recently Sold Line

Following a mass meeting at Weaverville, N. C., efforts are being made to form a stock company to take over and operate the Asheville & East Tennessee Railway Company, an electric line extending from Asheville to Weaverville. The road was sold on Nov. 28 by receivers to S. Sternberg of Asheville and service was suspended the next day. Mr. Sternberg paid $19,000 for the property and is offering it to the proposed new company for $20,000. He has given an option on the property until Dec. 11.

If the new company fails to raise the desired amount and the plan fails the road will be junked. The road made money above operating expenses during the receivership, according to J. S. Coleman, receiver. If the new plans are completed the offices of the road will be moved from Asheville to Weaverville and the cars will not be run into the center of Asheville, but only to Grass, a suburb of Asheville, which has the city car service.

Securities at Auction

Electric railway securities sold by Adrian H. Muller & Company on Dec. 6 at the Public Auction Room, 14 Vesey Street, New York, were as follows:

$7,000 Second Avenue Railroad first consolidated mortgage 5 per cent bonds, due 1948, Guaranty Trust Company certificates of deposit, 1§ per cent.

$59,000 Dry Dock, East Broadway & Battery Railroad registered refunding mortgage income gold bonds, series C, due 1950, with $10 scrip, $300 lot.

$24,000 Denver Tramway Terminal Company thirty-year 5 per cent bonds, due December, 1933, 85 per cent.

Financial News Notes

Property Valued.—In the report of Engineer A. E. K. Bunnell of the Toronto Transportation Commission the valuation of the London (Ont.) Street Railway is fixed at $1,000,000. The report says that this figure refers to its physical value.

Hearing Postponed.—The hearing on the application of the Continental Securities Company for the appointment of a receiver for the Interborough Rapid Transit Company, New York, N. Y., because of a threatened default in interest on securities was recently deferred by Judge Mayer until Jan. 26.

Stockholders to Decide Two Issues.—Stockholders of the Public Service Corporation of New Jersey, Newark, N. J., will vote at a special meeting Dec. 18 on the recent recommendation of the directors that the preferred stock be divided into two classes and that the corporation relinquish its option to redeem the stock at 110.

Traffic and Transportation

Reasons for Removing Toledo's One-Man Cars

Council, Exercising Rights Invested in It by Service-at-Cost Franchise, Swayed by Packed Union Meeting Into Ruling Cars Off Streets

NOW that one-man cars are definitely removed from the streets of Toledo, Ohio, the next problem is to meet the constantly increasing demand for improved service, for which the necessary finances are not available. There have been many angles to the one-man car issue in this city and they have been dealt with previously in these columns. Chronologically, the story of the one-man car dates back to July 1, 1922, when the Community Traction Company, acting upon a suggestion of the City Street Railway Commissioner, equipped its Bancroft belt line with rear-entrance, pay-leave, one-man turnstile cars, using for this purpose ten double-truck pay-enter cars. These cars were equipped with all safety features and Syracuse turnstiles on the rear platforms. After three months of continuous service a check of the results obtained indicated that service had been improved about 6 per cent in frequency, that regularity of schedules was quite as good as had prevailed with two-men cars, that riding had increased on the Bancroft line in greater proportion than on the balance of the city system and that a net saving of approximately 22 per cent was being made in platform expense.

These results seemed to justify a more extensive use of this type of equipment. On Oct. 16 two other and more important lines, Cherry and East Broadway, were equipped with Peter Witt cars operated by one man. Unfortunately, the attempt to load and unload passengers at the front door developed serious congestion that could have been relieved by loading through a turnstile at the center door. However, as a protest against the use of one-man cars had developed in the City Council, it was deemed inadvisable to confuse the issue by installing turnstiles.

Right at this point it ought to be explained that under Section 14 of the Toledo service-at-cost grant, in effect since Feb. 1, 1921, the city has reserved to itself, to be exercised through the City Council, the entire control of service, including the right to fix schedules and routes, the character of cars and the right to increase or diminish service.

On Aug. 21 there was introduced into the Council a resolution providing: "That Council go on record as against the installation of any more one-man cars until such body is convinced that that is the proper way of handling street car traffic in the city of Toledo."

This resolution was referred to the Council committee on railroads and telegraphs and by that committee referred to a special sub-committee of three, who were instructed to investigate and report back to the committee on railroads and telegraphs. This sub-committee, on Sept. 11, after carefully considering the matter, recommended that the cars be continued for a further trial. On the strength of this recommendation the two lines above noted were equipped with one-man cars. The next step was the entrance of the local carmen's union. Section 43 of the wage agreement with the platform men, effective May 21, 1922, to May 21, 1923, after providing for the immediate continuance of the 1921 wage scale, recites:

> It is further provided that should the stabilizing fund as prescribed in the Community Traction Company franchise ordinance be less than the sum of one hundred twenty-seven thousand three hundred dollars ($127,300) on Nov. 30, 1922, the present wage scale will then be automatically reduced to the scale in effect under the 1919 agreement between the association and the Toledo Railways & Light Company, which wage scale will then be operative until May 21, 1923.
>
> One-man car operators to receive 5 cents per hour additional.

While in the early stage of their use some criticism of these cars on the part of the public arose but gradually died down, no protest against the use of one-man cars developed from the union, according to Commissioner Cann, until it was evident that the fare stabilizing fund would on Nov. 30 materially exceed the specified amount of $127,300.

As a result of this well organized and vigorous protest, on Oct. 11 the question of continuing the use of one-man cars was reopened and the members of the local street car union were invited to meet with the committee on railroads and telegraphs one week hence and at that time present their objections to this type of equipment. The subsequent meeting resulted in the Council chamber being packed to capacity with a lobby, 90 per cent of whom were car men and their sympathizers. At this meeting several operators of one-man cars voluntarily appeared before the committee, were questioned as to their length of service and asked for their opinion as to the practical utility of the one-man car. In each case these men, of long experience as electric railway employees, positively stated that, in their opinion, one-man cars could be operated in Toledo with safety and convenience to the public.

After hearing the remarks of the business agent of the local union the committee indorsed a resolution condemning this type of equipment. On Oct. 23, at the regular meeting of the Council, fifteen of the twenty members of that body voted to prohibit the further use of these cars.

One week later Mr. Cann, the City Street Railway Commissioner, appeared before the Council and recommended that cars be continued in operation for the full thirty days permitted by the city charter before the resolution would become effective, and that in the interim a special committee of five be appointed to accompany him on a trip through the East to observe and investigate the operation of similar equipment in Eastern cities. This suggestion was adopted and the special committee appointed. A local election delayed the departure of this committee and at the next regular meeting of the Council the action authorizing the Eastern investigation was rescinded, thirteen of the nineteen Councilmen present voting against any further consideration of the matter. This action met with the heartiest approval of the packed lobby that attended the meeting.

The following week the Street Railway Commissioner exhibited to members of the Council a Peter Witt car equipped with a turnstile in the center door, carefully explained all of the features of the car and suggested that the previous action of Council be rescinded so as to permit a trial of that particular type of car on the Bancroft belt, the line upon which the initial installation of one-man cars had been made and from which no public protest had been heard. Fourteen members pledged their support of this recommendation, but at a meeting of the Council that same evening a packed lobby again stampeded their good intentions and all but three of them voted against any further use or experiment with one-man equipment.

Reduced Fares for Wheeling

Fare reductions ranging from 6 to 25 per cent will be put into effect by the Wheeling (W. Va.) Traction Company on Dec. 17, according to G. S. Wills, general manager of the company, who stated that the cut would bring the "nickel ride" to Wheeling again after an absence of two years. Mr. Wills declared the fare cut was an experiment to stimulate traffic and that in the event of it failing the company would have no alternative but to swing back to the basis it is now abandoning.

Mr. Wills' statement follows:

> The new tariffs will eliminate the present major and minor or short zoning plan, as now in effect, and return to longer unit zones, somewhat the same as were in effect between May 29, 1919, and Dec. 26, 1920. Under the new zoning, universal tickets at 5 cents each, good for a one zone ride on any part of the system, will be placed on sale at our ticket offices and by conductors on cars in strips of ten for 50 cents.
>
> All single zone rides paid for in cash will be 8 cents, while rides in excess of one zone will have a cash fare rate, not a multiple of 8 cents, but either practically the same as the universal ticket rate or 5 cents in excess thereof, depending entirely on density of travel between the points ridden.
>
> In further recognition of the fact that the cost of street car service per passenger is less in dense riding and as an inducement to street car riders to increase their patronage, special strip tickets, purchasable in 50-cent strips, good at all hours and without restrictions, will be placed on sale at our offices and by our conductors at rates per ride lower than those obtained under the universal ticket rate.

One-Way Traffic Recommended

A report has been submitted to the City Council of Portland, Ore., by members of the special traffic committee appointed by Mayor Baker in which one-way traffic for both vehicles and street cars is recommended as a partial solution of the traffic congestion in the city streets.

The committee in its report states that it has come to the unanimous conclusion that any solution of the congestion problem must affect not only automobile and vehicular traffic, but the electric railway system as well. Traffic conditions in the city are largely affected by the trans-Willamette River bridges and their approaches, the report points out, and urges a comprehensive change for the betterment of waterfront conditions by widening bridge street approaches and effecting permanent grades near the waterfront.

In recommending one-way traffic, certain of the wider streets have been excepted, especially for street car traffic.

The report points out that one of the largest contributing causes for the congestion during rush hours is the interurban traffic of the Portland Railway, Light & Power Company, the Oregon Electric and the Southern Pacific Company. "It is important and essential in our judgment," the report says, "that in any permanent solution of the traffic problem a feasible plan should be worked out for the routing of these trains."

The committee recommends adjustment of street railway traffic to conform to the general plan by the construction of loops and several new lines. The report points out that the cost of changes in new track construction contemplated under the plan had been estimated by the city engineer's office at $182,000 and by officials of the Portland Railway, Light & Power Company at $192,000. Additional crossovers and track changes that officials of the company declare are necessary for convenience and for emergencies would bring this cost to the railway company to a total of $231,000. Detailed suggestions for street car track changes, adoption of an automatic signal traffic control and regulations covering foot traffic are also embodied in the report, which the Council will take under consideration.

Joint Freight Service Extended

Joint arrangements have been completed, effective Dec. 6, for freight service by the Northern Ohio Traction & Light Company with the Detroit United Railway reaching the cities of Detroit, Jackson, Saline, Flint, Pontiac, Port Huron, Imlay, Algonoc, Northville and other points and by the Northern Ohio Traction & Light Company with the Nickel Plate for service to Buffalo and intermediate points. The tariff filed in the latter case is effective after thirty days. A joint arrangement has also been made with the Cleveland, Southwestern & Columbus Railroad, Columbus, Marion & Bucyrus Railway and the Columbus, Delaware & Marion Electric Company, all of which operate electric roads, for service to Columbus and intermediate points via Mansfield and Galion. The tariff filed for this service is effective in ten days. This gives freight service for the lines of the Northern Ohio Traction & Light Company east to New Castle, Pa., northeast to Buffalo, northwest into Michigan and southwest into Columbus.

These in brief are the new arrangements just made. They are in effect an extension of similar activities of the Northern Ohio Traction & Light Company dating back a considerable time. As recently as last April, however, the Northern Ohio Traction & Light Company, in conjunction with the Cleveland, Southwestern & Columbus Railway, Cleveland, Alliance & Mahoning Valley Railway, Stark Electric Company and Pennsylvania-Ohio Electric Company, entered the freight field in a joint service covering northern Ohio. The company also made an arrangement with the Detroit & Cleveland and Cleveland & Buffalo boat lines, and only recently the Lake Shore Electric Railway has come into the organization. Radiating from Cleveland, this freight service reaches the industrial cities of Akron, Cuyahoga Falls, Barberton, Wadsworth, Canton, North Canton, Massillon, Dover, Uhrichsville, Kent, Ravenna, Alliance and Youngstown, as well as Elyria, Berlin Heights, Birmingham, Wellington, Strasburg, Newton Falls, Atwater, Salem, Warren, Niles and numerous other smaller towns within a distance of 100 miles.

Declines to Cut Fare

The Public Utilities Commission on Dec. 1 denied the application of the Federation of Citizens' Associations for a reduction in fare on the lines of the Capital Traction Company, Washington, D. C. As a result of the decision the present rate of six tokens for 40 cents or 8 cents cash fare will remain in effect on both the lines of the Capital Traction Company and the Washington Railway & Electric Company.

The counsel for the association was William McK. Clayton, who argued that it was discrimination on the part of the commission to continue the same rate of fare on both systems when that rate netted the Capital Traction Company a bigger return than the Washington Railway & Electric Company.

The commission in its verdict included the opinion of Corporation Counsel Stephens, who maintained that the commissioners were entirely within the law in maintaining a uniform rate of fare. The argument of Counsel Stephens was referred to in the *Electric Railway Journal* issue of Dec. 2.

In concluding the decision the commission said that no sufficient reason had been shown to justify a change in policy which was based "upon the interest of the entire public in the preservation of efficient and dependable street railway transportation in all parts of the District."

Improvement in Glendale Railway Service in Prospect

The Riverside Portland Cement Corporation, which controls the Glendale-Montrose and La Crescenta Railroads, operating car lines in a portion of the city of Glendale, Calif., and also operating a line between Glendale, Montrose and La Crescenta, has fully completed its plans for the complete rehabilitation of the property with a view of giving better service in this locality.

The owners of the lines have acquired the right of way of the Union Pacific System on Glendale Avenue in the city of Glendale and plan the establishment of a high class transportation service at a very reasonable rate between La Crescenta, Sparr Heights, Montrose, Glendale and Los Angeles.

The citizens of La Crescenta, Montrose and Glendale have subscribed a bonus of $25,000, and the railroad has agreed to spend $150,000 in the reconstruction of the line. It is the plan to reconstruct and improve the roadbed and electrify the line from La Crescenta to the junction of Glendale Boulevard with San Fernando Boulevard. At this junction the new service will connect with and transfer, without extra charge, to the Los Angeles Railway Corporation's line, giving passengers access to all parts of Los Angeles on a single fare.

The company proposes to furnish new, modern cars and will establish a fifteen-minute service during the rush hours.

Work on Loop Temporarily Halted

Request of George P. Carrel, Mayor of Cincinnati, Ohio, that work on the rapid transit loop be stopped until a time when the city was in better finances has been complied with by the Rapid Transit Commission. At a meeting of the commission on Dec. 1 the members decided not to ask for further bond issues, because of the present financial condition of the city, but to proceed with the work until the present supply of money was consumed. The members explained that there is enough money left in the commission's coffers to continue the loop to Spring Grove Cemetery, at which point the Ohio Traction Company, Dayton division, will be invited to operate its cars into the city.

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.

Mayor Carrel's request that work be stopped on the rapid transit loop was made at a called meeting of the Rapid Transit Commission Nov. 17. There were present the heads of all the city departments and members of the Rapid Transit Commission. There was no decision reached at the meetng, but the commission took the Mayor's request under consideration.

The Rapid Transit Commission has

reorganized—E. W. Edwards, metal products manufacturer, is chairman; Attorney E. M. Dornette, vice-chairman, and former Judge William Geohegan, secretary.

Discuss Weekly Pass Plan

Members of the City Council utilities committee, Seattle, Wash., recently listened to an extended discussion of the weekly street car pass system by Councilman John B. Carroll, its only advocate in the Council, and B. H. Petley, a civil engineer, who has been interested in the plan for more than a year. Major Carroll suggested that the committee recommend to the Council the adoption of the pass system, contending that the urban street car lines are suffering more and more from the competition of privately owned automobiles. Under the pass system, he maintained, extensions could be hoped for, but not under a 5-cent schedule. Other members of the Council expressed the opinion that the weekly pass has merits, but agreed that its adoption would lead away from the city's ultimate goal of 5-cent fare for all riders.

Transportation News Notes

Five-Cent Fare Provided.—Everett, Wash., will again have a 5-cent fare provided in the filing of a tariff by the Puget Sound International Railway & Power Company for a period of ninety days. The tariff also provides for the extension of the weekly pass system for another ninety days from Nov. 25, both tariffs being permitted to become effective on less than statutory notice.

New Service Plan Given Trial.—The City Railway, Dayton, Ohio, recently put into effect a new plan for speeding up service during rush hours. In the downtown section at each of the principal street intersections employees of the company are stationed who are to go among the people about to board the cars and make change for those who have not the exact fare ready. This plan was started owing to the difficulty experienced by the motormen of the one-man cars in making change for patrons.

Petitions to Operate Buses.—The International Railway, Buffalo, N. Y., has petitioned the City Council for permission to operate double- and single-deck motor buses on Delaware Avenue from The Terrace to the Kenmore-Buffalo city line and on Bailey Avenue. Two buses of the Fifth Avenue type with the enclosed upper deck were brought to Buffalo from Philadelphia by Herbert G. Tulley, president of the International and inspected by members of the City Council. Two other similar petitions are before the Council for the operation of buses of this type in Buffalo.

New Publications

The Constitution of the United States

Its Sources and Its Application. By Thomas James Norton. Little, Brown & Company, Boston, Mass. 1922. 298 pages.

There are many great works on the Constitution, but most of them were written for the legal profession and are so formidable in appearance as to deter anybody but the law student from venturing upon a reading of them. Mr. Norton's work is, perhaps, the first of its kind to overcome all the objections which have been made in behalf of the lay reader to previous volumes dealing with the same subject. This fact alone ought to be enough to secure for it a wide vogue among business men and engineers everywhere who in the past have turned away from books bearing the legal stamp. It is not in any sense a railway book, but it is a work that the railway man can hardly afford not to list among the volumes intended to be used by him in his collateral reading.

As the author explains the purpose of this book, it has been his effort to make accessible to the citizen and his son, to his newly enfranchised wife and daughter, and especially to his children in school, such a knowledge of the Constitution of the United States as will serve in emergency as a "first line of defense." This purpose has been achieved and a great deal more. The treatment of the subject is unusual in that the book explains, clause by clause, the origin of the leading provisions of the Constitution and the Amendments and then gives their application in the great cases which have arisen from the beginning down to the apartment-house rent case in 1921.

In carrying out his purpose the author has provided a note to every line or clause that has a historical story or drama back of it, or that has contributed to the national or the international welfare of mankind during the 133 years of life under this instrument. This method leaves the text of the Constitution and the Amendments in unbroken connection, so that the whole great design is visible, and the explanation appears immediately under the part to be explained. As to the typographical arrangement of the book, the text of the Constitution and Amendments is printed in large type, while the explanations of the clauses are not mere footnotes, but are given the typographical prominence they deserve by being made part of the text.

In addition to a showing of the historic sources or causes of particular provisions of the Constitution, there are also exhibited examples of the application of the clauses in great cases which have arisen during our constitutional life. It is illustrated very clearly that the man in power has undergone no change and that without the prohibitions of the Constitution and the means of giving them immediate effect he would become as dangerous as he ever was to the safety of the government and to the rights and liberties of the people.

A New Edition of "Pender"

Handbook for Electrical Engineers. Compiled by a staff of specialists, with Harold Pender as editor in chief and William A. Del Mar as associate editor in chief. Second edition, revised and enlarged. John Wiley & Sons, Inc., New York, N. Y. 2,263 pages.

Eight years ago the first edition of what was then called the "American Handbook for Electrical Engineers" was issued, under the editorship of Professor Pender. Since that time a number of changes have occurred in the field of electrical engineering, and two years ago the publishers undertook the complete revision of the handbook.

Of the approximately 2,200 pages (excluding the index) 158 pages or about 7 per cent are devoted to electric traction. This excludes steam locomotives and electric automobiles, which while listed under Traction are not electric railway subjects. Electric traction may, therefore, be said to have been given a fair amount of space in the book. Under the subject of traction the topics given most extended treatment are energy requirements and motor equipment for electric railways, overhead trolley systems, third rail, and signaling. These take nearly two-thirds of the space. The material here seems to be accurate and as nearly up to date as is possible in a field in which practice is so rapidly changing as it is in the electric railway field at present. However, for the electric railway engineer the handbook has its principal value outside of the electric railway section. What the engineer expects a handbook to contain is primarily the fundamental principles and data of the field which it covers and the standardized items in those fields. This the "American Handbook" does in a thorough manner. Like the "Standard Handbook," the publication of the fifth edition of which was mentioned briefly in the issue of this paper for Oct. 14, 1922, page 652, "Pender" includes the complete "Standards of the A.I.E.E."

Fusibility of Ash from Coals of the United States

Fusibility of Ash from Coals of the United States. By W. A. Selvig and A. C. Fieldner, United States Bureau of Mines, Department of the Interior, Washington, D. C.

As the fusibility of the ash in coals determines the clinkering quality, information regarding fusing temperatures, etc., is of value to coal users who desire to operate their boiler or other furnaces with the maximum of intelligence. This report emanating from the chemical laboratory of the Bureau of Mines contains a wealth of data as to coals from all parts of the country.

Personal Mention

Fifty Years in Railroading in Chicago

Sixty Friends of John M. Roach Fete Him on Half Century of Work There for Local Roads—Rehabilitation of 1908 Carried Out During His Administration

JOHN M. ROACH, member of the board of operation of the Chicago Surface Lines, was the guest of honor at a dinner recently to celebrate the fiftieth anniversary of his connection with transportation companies in Chicago. Directors of the several companies, heads of departments and old time friends made up the party of sixty who took part in this testimonial event.

Only a few days before Mr. Roach was honored as the senior past-president of the American Electric Railway Association at a gathering of past-presidents during the convention in Chicago. On that occasion, the presiding officer, Gen. George H. Harries, said of him:

"Mr. Roach is a transportation man through and through, but he is by no means through."

It is a far cry from work as a cowboy and miner to that as the president of a great transportation system. That was the range covered by the subject of this sketch. It is characteristic of Mr. Roach that he learned from each experience in life the lesson it contained, and as the years have passed he has developed executive force, keen discrimination and managerial ability which today mark him as a prominent figure in Chicago's business circles.

Mr. Roach's advancement has been due to his own efforts rather than to fortuitous circumstances. He has an unusual capacity for work and for organization. His knowledge of men is perhaps his strongest characteristic, and while he has been out of active management of the street railways for the last ten years, he still is loved by thousands of the men who served under him and who are still with the properties.

Mr. Roach was born in Lowell, Ohio, in 1852. At the age of eighteen he was attracted by the story of gold discoveries in Montana and went with a party of young men from his home in Belvidere, Ill., on the long Western trip on horseback. The visions of wealth vanished after an attempt at mining, and the young man then tried his hand at ranching and newspaper work. In October, 1872, he went to Chicago and was at once attracted by the possibilities of advancement in street railway work. He had a letter of introduction which would have secured him a position in the office of the general manager of the company, but he expressed preference for employment as a conductor "so he could learn the business from the car up."

A few years later he became cashier of the North Chicago Street Railway, and then purchasing agent. In 1890 he was made general superintendent of all the North Side lines and three years later became also vice-president. In 1897 he assumed similar titles with the West Chicago Street Railway, and, when the Union Traction Company took over both properties, he continued in direct charge of the management. He was the first president of the Chicago Railways, which took over all the North and West Side lines under the 1907 ordinances. He retired from active management in 1912. With the merger of all the Chicago street railways under the name of the Chicago Surface Lines in 1914, Mr. Roach became a member of the board of operation. He also continues as vice-president and director of the Chicago Railways.

J. M. ROACH

When Mr. Roach went to Chicago, it was a city of 300,000 population, with an area of 36 square miles and with only 40 miles of car tracks. It is now a city of 2,701,000 persons, with an area of 200 square miles and has more than 1,000 miles of surface tracks.

Another instance of the growth of Chicago during Mr. Roach's service with the companies is that a single fare in 1872 would purchase a ride of only 2 miles, whereas now it is possible to ride 35 miles on one fare with unlimited use of transfers.

Mr. Roach saw the introduction of the cable system in 1882 and the trolley system beginning in 1890. It was during his administration that the properties were rehabilitated with new tracks, cars and substations, beginning in 1908. This record for reconstruction work in three years is said to have been unequaled in traction history.

Outside of business, Mr. Roach has two hobbies—golf and baseball. He enjoys watching the big league players and gets much pleasure out of the comradeship of the links. He plays a good game, too. He has an office with the executive staff in the Borland Building, but is also to be found daily at his old headquarters on the North side, where he served so many years in active management. Many an old employee calls on him there, finding the latchstring always out and securing helpful advice when the occasion warrants. An Eastern financial journal recently said:

"Roach is a great operator; nobody knows the traction game better."

It might have said with equal truth:

"Roach is a true friend; no one knows better how to make and retain friends."

Senator Couzens Wants to Help Detroit Municipal Railway

James Couzens, appointed to the United States Senate by the Governor of the State of Michigan to fill the vacancy caused by the resignation of Senator Newberry, has resigned as Mayor of the city of Detroit. While the belief has been expressed by members of the Street Railway Commission that Mr. Couzens will remain as head of the street railway department, the Senator-elect stated that he would have nothing to say on street railway matters until he had talked with Corporation Counsel Wilcox, with acting Mayor Lodge and with members of the Street Railway Commission.

Protest was made to Governor Groesbeck by citizens of the city of Detroit who saw in Couzens' appointment to the Senate the loss of his services to the city. Since the time when the Street Railway Commission granted Joseph S. Goodwin, general manager of the municipal system, a leave of absence for six months because of his illness, Mr. Couzens had been devoting half of his time to active management of the Municipal Street Railway system.

It was pointed out by supporters of the municipal system that many years devoted to the study of Detroit's transportation problem and years spent in overcoming obstacles placed in the way of municipal ownership had given Mr. Couzens an unusual insight into Detroit's needs and the solution of the city's problems.

In accepting the appointment to the Senatorship, Mr. Couzens states that if he might continue to serve the people of Detroit legally and with the consent of the new Mayor and the members of the Street Railway Commission, he was willing and anxious to do so. Citing that with the consent of the Council men have been selected to consider the further development of Detroit's transportation needs, such as subways, elevated and bus lines, he stated that if he in any way felt that Detroit would be inconvenienced by his accepting the appointment, he would decline to do so.

Celebrates Fifty Years of Business

Some sixty of the personal and business friends of Daniel M. Brady were guests of the directors of the Brady Brass Company at a luncheon at the India House on Dec. 6. The occasion was the completion by Mr. Brady of a service of fifty years in the railroad industry and of forty years in the metal trade. Gathered around the tables were many men prominent in business and steam railroad circles in New York, as well as from the electric railway companies of the city. Letters read by H. H. Vreeland, Interborough Rapid Transit Company, indicated that many other steam railroad officials would have been present if the luncheon had not occurred at the same time as the meeting of the American Railway Association in Chicago this week. As the affair was in the daytime the speeches were limited to few, but J. F. Fowler, vice-president W. R. Grace & Company; C. S. Tench, editor *American Metal Market Report*, and Henry A. Bishop, director of the company, spoke, and Judge Morgan J. O'Brien acted as toastmaster. At the conclusion of Mr. Bishop's speech he presented a gold watch to Mr. Brady, in behalf of the directors of his company. In his reply Mr. Brady said that the greatest asset which a person could have was friends, and friends could be gained best by gratitude and loyalty.

Mr. Brady was born in New York City sixty-nine years ago and in 1871 entered the employ of the New York Central Railroad in the office of General Manager John M. Toucey. He was afterward chief clerk of the car department under Leander Garey, general superintendent of the car department of the company. Mr. Brady resigned from the New York Central Railroad in 1883 to join the then newly organized Paige Car Wheel Company, Cleveland, with which he was connected for a number of years. In 1888 he established the Brady Brass Company and has been president of it since its organization. For many years he was also director of the Rochester Car Wheel Works. At the time of the reorganization of the American Street Railway Association in 1905, he had a great deal to do with the organization of the American Street Railway Manufacturers' Association, and was the first president of that organization.

Mr. Kirk Sioux City President

E. L. Kirk is now the president of the Sioux City Service Company following a consolidation with the Sioux City Gas & Electric Company on Nov. 1. Mr. Kirk was office manager for the Riverside Park Railway from 1891 to 1894 and receiver for this company until 1899, when this road and four other lines were consolidated under the name Sioux City Traction Company. He remained as general manager for this firm from 1900 until 1905, when this company was absorbed by the Sioux City Service Company, thereby bringing electric light and power service under this organization. Mr. Kirk continued as general manager of this concern until his recent promotion to the presidency.

Messrs. McIlraith, Allen, Hamilton and Aycock All Resign from P. R. T.

The resignation of G. A. Richardson as vice-president in charge of operation of the Philadelphia (Pa.) Rapid Transit Company, noted in the *Electric Railway Journal* for Dec. 2, was followed by the resignation on Dec. 3 of:

E. J. McIlraith as superintendent of rolling stock and buildings,

Elbert G. Allen as chief engineer,

F. M. Hamilton as assistant to the president, and

N. M. Aycock as superintendent of car maintenance.

Quite naturally the Philadelphia papers have expressed great surprise at the announcement of these changes. The stories some of them print of internal dissension are so extravagant as to be fanciful. Whatever the reasons may be for the retirement of officials en bloc, as it were, Mr. Mitten's searches in the past for the best available talent make the statement seem absurd that appears in the *Ledger* and credited to a reliable informant to the effect that "Mr. Mitten's policy of 'taking glorified office boys and endeavoring to create street railway officials of them by his mere say-so' proved very distasteful to the experienced street railway men."

However, some of the resignations must have been unexpected, for official departmental order No. 4 indicates as much. That order, dated Nov. 13, was signed by G. A. Richardson as vice-president and approved by Mr. Mitten. It says that F. M. Hamilton will become assistant to the president. Mr. Hamilton is one of the four who, according to the announcement of Dec. 3, has quit the service.

Recent official announcements of the company in effect on Dec. 3 follow:

"Effective Dec. 1, 1922, R. T. Senter, now assistant to the president, will become vice-president in charge of engineering, this to include such part as P. R. T. may take in city transit development.

"Until the appointment of a successor to G. A. Richardson, whose resignation takes effect this date, R. F. Tyson, assistant to the vice-president in charge of operation, will, with the aid of the undersigned, assume the duties of the position thus made vacant.

"Leon Jewell will move to 1520 Spruce Street and assume the duties of the newly created position of traffic manager of the system, in charge of timetables, traffic checks and traffic income estimates.

"W. R. Scanlin will assume the duties of the newly created position of assistant to the chief engineer.

"Effective Dec. 1, G. H. Stier is appointed superintendent of rolling stock and buildings."

Funeral Services for A. E. Duty

Funeral services for Albert E. Duty, assistant general manager of the Cleveland (Ohio) Railway, were held in Cleveland on Dec. 2. Mr. Duty died at the age of 69 following a brief illness, although he had not been in good health for almost a year.

He had spent fifty-three years in the street railway business in Cleveland, being the only executive outside of John J. Stanley, president of the company, whose services spanned the period from horse-car to electric line.

Mr. Duty began his street railway business as a driver for the Woodland and South Side Railway Company line. In 1883 he became assistant superintendent for the Cleveland City Railway. In 1912 he was made general superintendent, continuing in that post until last February, when he was promoted to be assistant general manager.

Mr. Duty was a Clevelander all his life. He is survived by his wife, a brother, who is superintendent of construction with the Cleveland Railway, and five sisters.

Peter M. Kling Dead

Peter M. Kling, for a number of years general manager of the St. Louis Car Company and later with the John Stephenson Company, Elizabeth, N. J., in a similar capacity, died at his home in Detroit on Nov. 25. He had not been in good health for the last two years.

Mr. Kling was born in Denmark on July 24, 1855, and served his apprenticeship in that country as joiner, carriage and wagon builder. At the age of fifteen he came to the United States and located at St. Charles, Mo., where he worked for a few years in a country wagon and blacksmith shop. Later he went to St. Louis, where first he engaged in the manufacture of wagons, carriages and omnibuses, but later became associated with the Brownell & White Car Company, where he worked up to be foreman and superintendent. Still later he was largely responsible for the organization of the St. Louis Car Company and had a great deal to do with the design of that company's present shops.

He resigned from the St. Louis Car Company in 1900 to become general manager of the John Stephenson Company, which had recently moved its car works from New York to Elizabeth. When this company was purchased by another corporation in 1905, he resigned to assist in the organization of the pressed steel passenger car department of the Pressed Steel Car Company, Pittsburgh, and became general manager of that department. Since leaving the Pressed Steel Car Company, in 1909, he had been associated with the Brooklyn Rapid Transit Company, the Laconia Car Company and the Indianapolis Body Company. He leaves a widow, four sons and two grandchildren.

Mr. Kling was widely recognized as a man of sterling worth, with extended knowledge of car building.

Manufactures and the Markets

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

ROLLING STOCK PURCHASES BUSINESS ANNOUNCEMENTS

An Example of Merchandising Electric Locomotives

The sale and shipment of a 50-ton 600-volt electric locomotive within a period of five hours was the novel record established recently by the Pittsburgh office force and shop employees of the Westinghouse Electric & Manufacturing Company. In fact, the circumstances attending the sale of the locomotive, which was taken from stock, indicate that it is one of the very few cases on record of an electric locomotive being sold in a manner similar to the merchandising of staple goods, for the locomotive was actually sold "off the shelf."

Comes to Purchase Much-Needed Locomotive

A. A. Crawford, an official of the Youngstown & Ohio Railroad, which operates in the soft coal regions between East Liverpool and Salem, Ohio, recently went to the East Pittsburgh works of the Westinghouse company to purchase a much-needed locomotive, the two Westinghouse Baldwin locomotives used on the railroad being in service continuously twenty-four hours every day except four hours on Sunday, when they were taken into the shops for oiling and inspection.

Mr. Crawford arrived at the Westinghouse plant at 10:30 o'clock in the morning and immediately entered into negotiations for the purchase of a locomotive. Upon being informed that the Westinghouse company had a locomotive whose general design and operating characteristics, though not duplicates of the locomotives then in service on the railroad, were capable of giving the same service, the railroad official, pressed by a dire need due to the fact that a breakdown of one of the locomotives in use would result in congestion of traffic, signed the contract for the purchase at 3 o'clock.

The shop force was notified and, with complete service data on the railroad where the locomotive was to be used, a corps of workers immediately examined the locomotive, testing the motors for insulation, ringing out the main and control circuits and clearing up the other necessary items of inspection. At 4:30 o'clock, after the messenger had made his bunk in the cab, the locomotive was in the Pitcairn yards of the Pennsylvania Railroad.

Placed in Service Almost Immediately

The day after the sale the locomotive was at Leetonia, Ohio, and the following day was placed in service in hauling coal on the Youngstown & Ohio Railroad between Leetonia and East Liverpool, Ohio. It is believed also that the sale, shipment and placing in service of the locomotive within a period of less than three days established a record in this phase of railroad work.

$200,000 in Improvements

The Pittsburgh (Pa.) Railways, through Receivers Fagan, Tone and George, have filed a petition in the United States District Court asking permission to spend $211,300 for improvements to the system. The betterments and estimated costs are as follows:

Passing siding on West Liberty Avenue, $22,500; transformer at Library, $3,000; additional feeders on Brighton Road, $1,200; track reconstruction on Western Avenue, $57,500; track reconstruction on Eighth Avenue, Homestead and West Homestead, $40,000; crossing on East McKeesport division, $2,500; crossing over Braddock Avenue, Pittsburgh, $2,500; additional feeders on Eighth Street, Braddock, $750; heating boiler Ardmore carhouse, $1,500; additional poles on Electric Avenue, East Pittsburgh, $850; track reconstruction on Hamilton and Brushton Avenues and Tioga Street, $62,500; additional feeders and lights at the Tunnel yards and shops, $7,000, and additional vacuum boilers, $9,500.

Metal, Coal and Material Prices

Metals—New York	Dec. 5, 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.	36.25
Bituminous Coal, f.o.b. Mines	
Smokeless mine run, f.o.b. vessel, Hampton Roads, gross tons	$7.50
Somerset mine run, Boston, net tons	3.875
Pittsburgh mine run, Pittsburgh, net tons	2 625
Franklin, Ill., screenings, Chicago, net tons	2.50
Central, Ill., screenings, Chicago, net tons	1.675
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 51

Rolling Stock

Cleveland (Ohio) Railway has purchased Eclipse trolley catchers and Eclipse fenders for fifty new cars now under construction in the plant of the Kuhlman Car Company.

Kansas City (Mo.) Railways will purchase, it is reported, three new Differential dump cars with three compartments each. The total cost will not exceed $29,000.

Pittsburgh (Pa.) Railways has started the operation of eight new modern cars of steel construction to replace a similar number of the older and smaller type of cars on the Homestead and McKeesport routes.

City Railway, Dayton, Ohio, equipped its new cars with Eclipse trolley catchers. The cars were described in the *Electric Railway Journal* for Oct. 28 and the statement made that these catchers were of another type was in error.

Washington Railway & Electric Company, Washington, D. C., has ordered ten new one-man cars costing $75,000 and is remodeling seven more of its existing cars for one-man operation. The company already has fifty-five single-man cars so that the additional seventeen will give a total of seventy-two.

Track and Roadway

Fresno (Calif.) Traction Company will start within the next three months extending its lines to the city limits on both McKenzie Avenue and on Fresno Avenue. The McKenzie Avenue extension calls for 6,900 ft. of track for 1½ miles of new trackage.

Ephrata & Lebanon Traction Company, Lebanon, Pa., has been authorized through Henry A. Albin and Walter C. Graeff, receivers, to spend a sum not exceeding $3,100 for track and car improvements to enable the company to operate one man cars.

Chautauqua Traction Company, Jamestown, N. Y., and the Buffalo & Lake Erie Traction Company jointly will construct a short piece of track connecting the two lines in Westfield, N. Y. The commission holds that it is desirable in the public interest that the connection be made so as to facilitate the interchange of freight.

Power Houses, Shops and Buildings

Boston (Mass.) Elevated Railway will award the contract for building the new Harvard Square station of the Cambridge Subway to the Coleman Brothers. Owing to a controversial interpretation of bids the company was compelled to appeal to the Massachusetts Public Utilities Department to decide. The department awarded it to the Coleman Brothers.

Trade Notes

Republic Railway & Light Company, New York, N. Y., Pennsylvania-Ohio Electric Company and the Pennsylvania-Ohio Power & Light Company announce the removal of their New York offices to suite 2626, Equitable Building, 120 Broadway, New York City.

J. E. Slimp, for many years identified in the South and West with the railway and transmission field, has opened an office at 50 Church Street, New York. This will be the Eastern agency of the Pacific Electric Manufacturing Company of San Francisco, makers of high-tension oil circuit-breakers, air-break switches, choke coils, lightning arresters, fuse equipment, etc., for high-voltage transmission lines. Mr. Slimp later may take other lines of apparatus in the transmission field. For eighteen years he was connected with the Ohio Brass Company.

Like the Safety Valve on a Boiler

which acts automatically to prevent the steam pressure from going too far and exceeding the predetermined safe working pressure.

—the automatic stop on PEACOCK Improved Brakes

The Automatic Stop

also acts automatically to prevent the brake chain from unwinding too far on release. Handle or hand-wheel may spin around a dozen revolutions, but the brake chain is stopped the instant full release is reached, thus preventing excessive slack in the brake chain. Saves at least one full turn of the handle the next time brakes are applied.

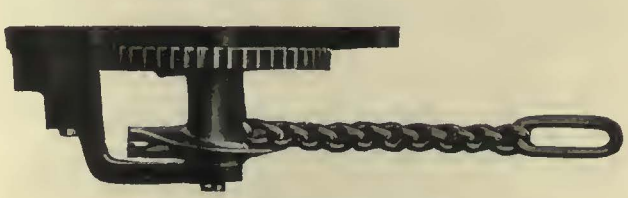
This is only one of several notable features of Peacock Improved Brakes. They are always specified where choice is based on safety and reliability first.

National Brake Co., Inc.

890 Ellicott Sq., Buffalo, N. Y.

Canadian Representative:

Lyman Tube & Supply Company, Limited, Montreal, Canada



Peacock Improved Brake

Bankers and Engineers

COLUMBIA GEAR CASES

—reduce winter maintenance worries

Built with especially-designed reinforcement to stand the shocks of dragging over ice-covered pavements, Columbia Gear Cases greatly reduce the number of winter pull-ins for breakage.

This reinforcement consists of three thicknesses of metal where the channel-shaped suspension brackets are attached, firmly riveted to resist the destructive tendencies of winter conditions. We have been making electric railway gear cases for years. Our experts have had ample opportunity to study the causes of gear case breakage, and have learned the way to successfully combat them. This knowledge is what has been applied to the design and construction of Columbia Gear Cases You can count on saving money, if you equip with Columbia Gear Cases.

Try them out this winter.

Some other Columbia Specialties

Bearings
Motor Coils
Trolley Ears
Trolley Wheels
Line Materials

Send for criculars

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.

SEARCHLIGHT SECTION

EMPLOYMENT-BUSINESS OPPORTUNITIES-EQUIPMENT

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Positions Wanted, 4 cents a word, minimum 75 cents an insertion, payable in advance.

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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.

SUPERINTENDENT of transportation wanted for electric line operating interurban, city and suburban property in Middle West. State age, experience, qualification, references and salary expected. Replies treated strictly confidential. P-487, Electric Railway Journal, 10th Ave. at 36th St., New York City.

POSITIONS WANTED

AUDITOR, broad experience as chief accounting officer with representative utility interests, now engaged on important work for federal government, desires connection with progressive utility as auditor, secretary or treasurer. PW-488, Electric Railway Journal, Real Estate Trust Bldg., Philadelphia, Pa.

DIVISION road master, general foreman; practical experience, for twenty-two years maintenance, construction, special work, steam or electric; three years division road master on New England city and interurban line; prefers Middle West or Coast. PW-484, Elec. Ry. Journal, 10th Ave. at 36th St., New York City.

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.

IS MONEY ever "spent" for advertising? If your railway don't pay you don't advertise. Let me do your worrying as manager, assistant manager, superintendent or manager of public relations. PW-486, Electric Railway Journal, 10th Ave. at 36th St., New York City.

POSITIONS WANTED

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.

MR. MANAGER, are you in need of a capable, practical superintendent of transportation who is fully competent to take over all details and handle same in a manner that would be a credit to your property? Successful in public relations, safety campaigns and capable of getting results from employes; recognized as an economical operator. At present with large property; present relations are pleasant; personal reasons for desiring a change to another property. A proven record of eighteen years with large city, suburban and interurban properties with high grade references is back of this ad. PW-485, Elec. Railway Journal, Leader-News Bldg., Cleveland, Ohio.

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

FOR SALE

2—*Brand New* G. E. Reversible motor equipments, 550 volt, D.C., each consisting of:
1—50 Hp., 250/1000 r.p.m., and one 6 hp., 1100 r.p.m., intermittent rating motors, complete with control panels, controllers, rheostats, etc. Price each equipment, $1000, f.o.b., New York, boxed.

GR. WEINBERG & AL. POSNER ENGINEERING COMPANY, Inc.
120 Broadway, New York, N. Y.

FOR SALE

20—Peter Witt Cars

Weight Complete, 33,000 lbs.

Sest 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.

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Write or wire when in the market to BUY or SELL

Please Mention this Publication

New Motor Repair Parts

IMMEDIATE SHIPMENT

We have in stock virtually every part necessary to complete all of the types of non-interpole motors. They are new and were manufactured by either the Westinghouse Company or the General Electric Company. They may be purchased at 25 per cent less than the manufacturers present prices.

Send your orders to us and deduct 25 per cent from the current quotations.

What have you for sale?

TRANSIT EQUIPMENT CO.

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!

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., Barron 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
Bemis Car Truck Co.
Standard Steel Works Co.

Axles, Car Wheel
Bemis Car Truck Co.
Brill Co., The J. G.
Carnegie Steel Co.
Westinghouse E. & M. Co.

Axle Straighteners
Columbia M. W. & M. I. Co.

Babbitt Metal
Ajax Metal Co.
More-Jones Br. & Metal Co.

Babbitting Devices
Columbia M. W. & M. I. Co.

Badges and Buttons
Electric Service Sup. Co.
Internat'l Register Co., The

Batteries, Dry
National Carbon Co.

Bearings and Bearing Metals
Ajax Metal Co.
Bemis 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.
Westinghouse E. & M. Co.

Bearings, Center and Roller Side
Stucki Co., A.

Bearings, Roller
Stafford Roller Bearing Car Truck Corp'n

Bells and Gongs
Brill Co., The J. G.
Columbia M. W. & M. I. Co.
Consolidated Car-Heating Co.
Electric Service Sup. Co.

Benders, Rail
Railway Track-work Co.

Boilers
Babcock & Wilcox Co.
Edge Moor Iron Co.

Boiler Tubes
Edge Moor Iron Co.

Bonding Apparatus
American Steel & Wire Co.
Electric Railway Improvement 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 Railway Improvement 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 Cross Arms (See also Poles, Ties, Posts, etc.)
Bates Exp. Steel & Tr. Co.
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. Br. Shoe & Fdry. Co.
Barbour-Stockwell Co.
Bemis Car Truck Co.
Brill Co., The J. G.
Columbia M. W. & M. I. Co.

Brakes, Brake Systems and Brake Parts
Allis-Chalmers Mfg. Co.
Bemis Car Truck Co.
Brill Co., The J. G.
Columbia M. W. & M. I. Co.
General Electric Co.
National Brake Co.
Safety Car Devices Co.
Westinghouse Tr. Br. Co.

Brooms, Track, Steel or Rattan
Amer. Rattan & Reed Mfg. Co.

Brushes, Carbon
General Electric Co.
Jeandron, W. J.
Le Carbone Co.
National Carbon Co.
Westinghouse E. & M. Co.

Brushes, Graphite
National Carbon Co.

Brushes, 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.
Republic Truck Sales Corp.

Bus Seats
Hale & Kilburn Corp.

Bushings
Nat'l Fibre & Insulation Co.

Bushings, Case Hardened and Manganese
Bemis Car Truck Co.
Brill Co., The J. G.

Cables (See Wires and Cables)

Cambric, 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.

Cars, Dump
Differential Steel Car Co.

Cars, Passenger, Freight

Express, Etc.
Amer. Car Co.
Brill Co., The J. G.
Kuhlman Car Co., G. C.
National Ry. Appliance 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 Steel
Bemis Car Truck Co.
Columbia M. W. & M. I. Co.
Standard Steel Works Co.

Castings, Malleable and Brass
Amer. Brake Shoe & Fdry. Co.
Bemis Car Truck Co.
Columbia M. W. & M. I. Co.
Le Grand, Inc., Nic

Catchers and Retrievers, Trolley
Electric Service Sup. Co.
Ohio Brass Co.
Wood Co., Chas. N.

Catenary Construction
Archbold-Brady Co.

Ceilings, Plywood, Panels
Haskelite Mfg. 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.

Coils, Armature and Field
Columbia M. W. & M. I. Co.
Economy Elec. Devices Co.
General Electric Co.

Coils, 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.

Concrete Products
Massey Concrete Products Corp.

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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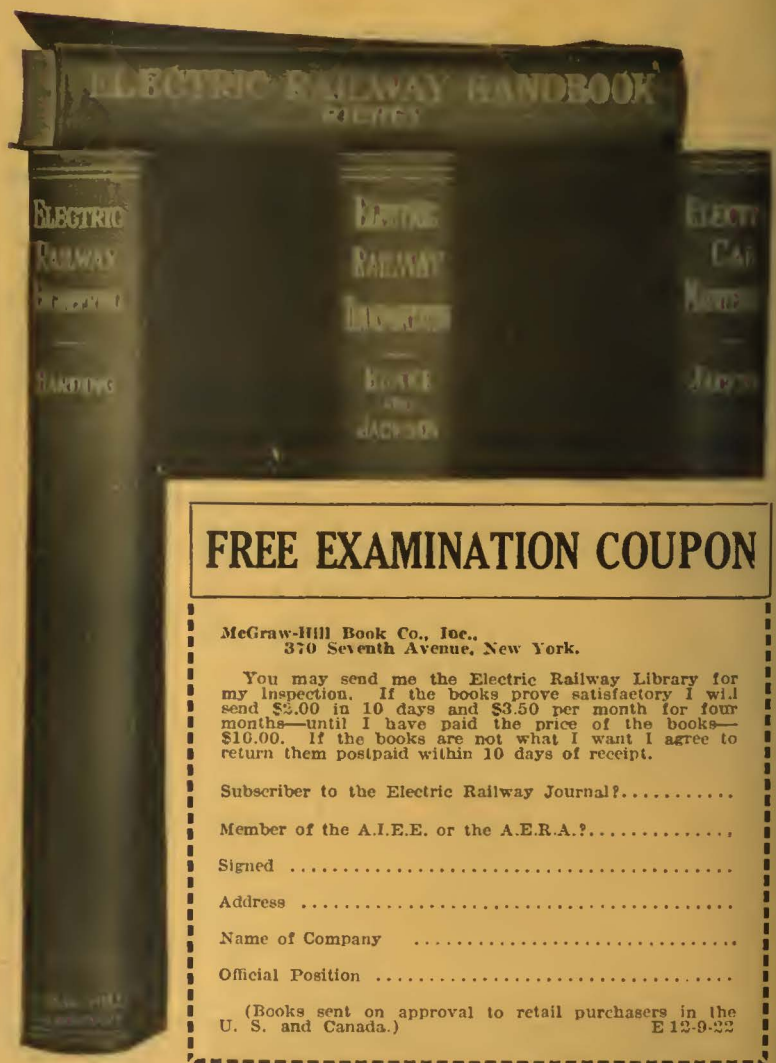

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