ANNUAL MAINTENANCE AND CONSTRUCTION NUMBER

ELECTRIC RAILWAY JOURNAL

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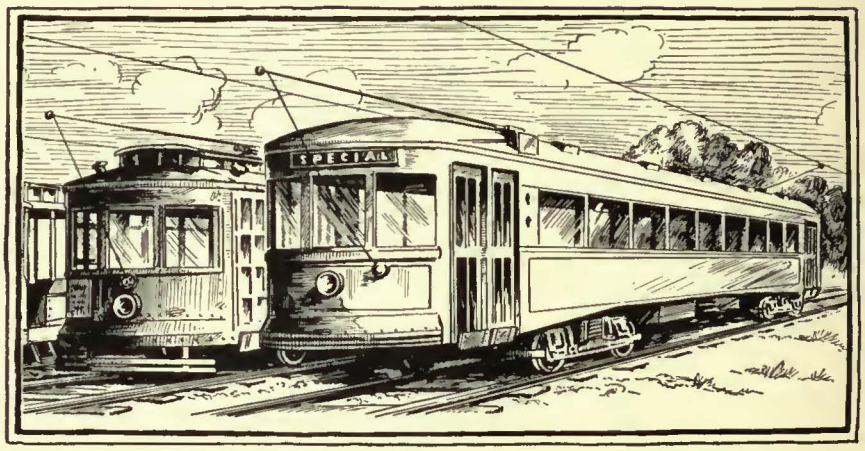
INCREASED *speed* *for* OLD *cars*



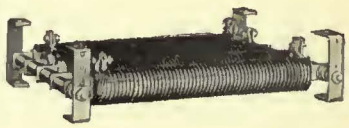
Shunting equipment installed on your old cars will increase their schedule speeds.

THE most important requirement of the modern street car is that its speed be great enough to beat the traffic on the green light and to hold that position.

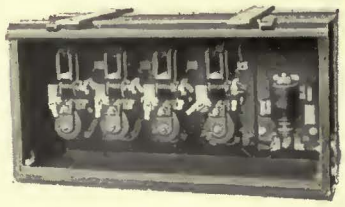
Although many new cars will be bought embodying the latest ideas of rapid transportation, where old cars are operated with the new ones, full advantage of the new cars cannot be obtained without increasing the speed of the old ones.

A relatively inexpensive shunting equipment will help you solve this important problem.

Any Westinghouse transportation representative will be glad to discuss this with you.



Motor shunts.



Shunting switches and relay.

Service, prompt and efficient, by a coast-to-coast chain of well-equipped shops

Westinghouse

T 31077

Electric Railway Journal

Consolidation of
Street Railway Journal and Electric Railway Review

MORRIS BUCK
Engineering Editor
GEORGE J. MACMURRAY
CLIFFORD A. FAUST
J. W. MCCLOY

JOHN A. MILLER, JR., *Managing Editor*

Vol. 74, No. 4 *Pages 179-244*

PAUL WOOTON
Washington
ALEX MCCALLUM
London, England

LOUIS F. STOLL
Publishing Director

Next Month

Underground Overhead

A timely article telling how the invisible overhead expense of keeping in stock an enormous number of different items and repair parts can be reduced by standardization.

McGraw-Hill Publishing Company, Inc.

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1930

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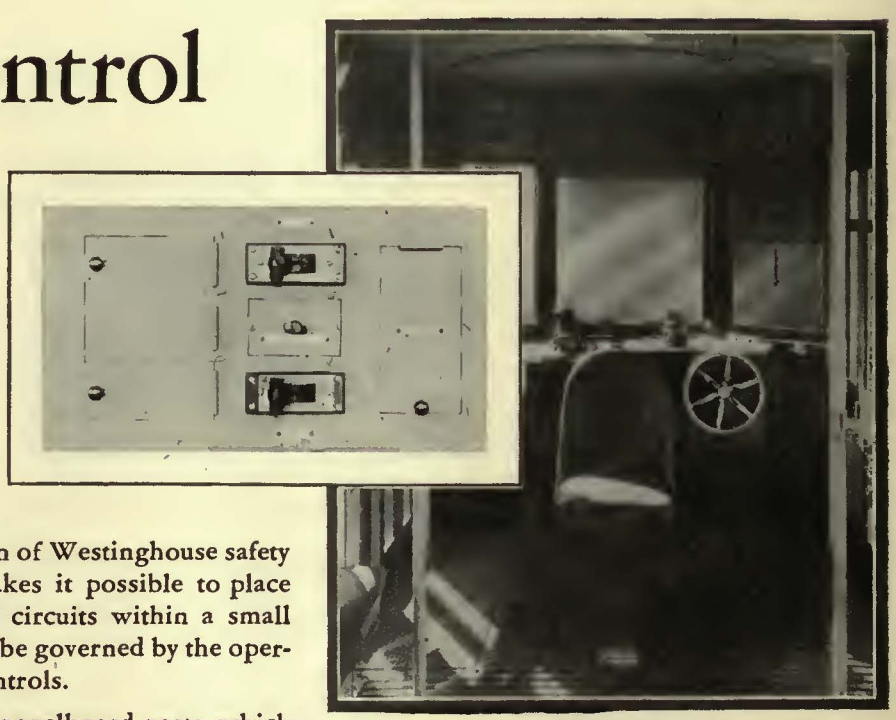
CAR PANELS

...that Centralize Circuit Control



A typical panelboard layout in the modern street car.

THE compact design of Westinghouse safety type car panels makes it possible to place the controls for a large number of circuits within a small space. Buzzer, lights and heater can be governed by the operator without leaving his place at the controls.

These panels are built-up of standard panelboard parts, which can be assembled in various ways to meet the space and circuit requirements of each application. The neat appearance and compact design are in keeping with the trend toward better car layouts.

Full safety to the operator is provided because the doors covering the switch and fuse compartments cannot be opened when the switch is "on".

When you buy new cars or recondition your old ones use Westinghouse car panels. Their reliability has been proved in service.

Service, prompt and efficient, by a coast-to-coast chain of well-equipped shops

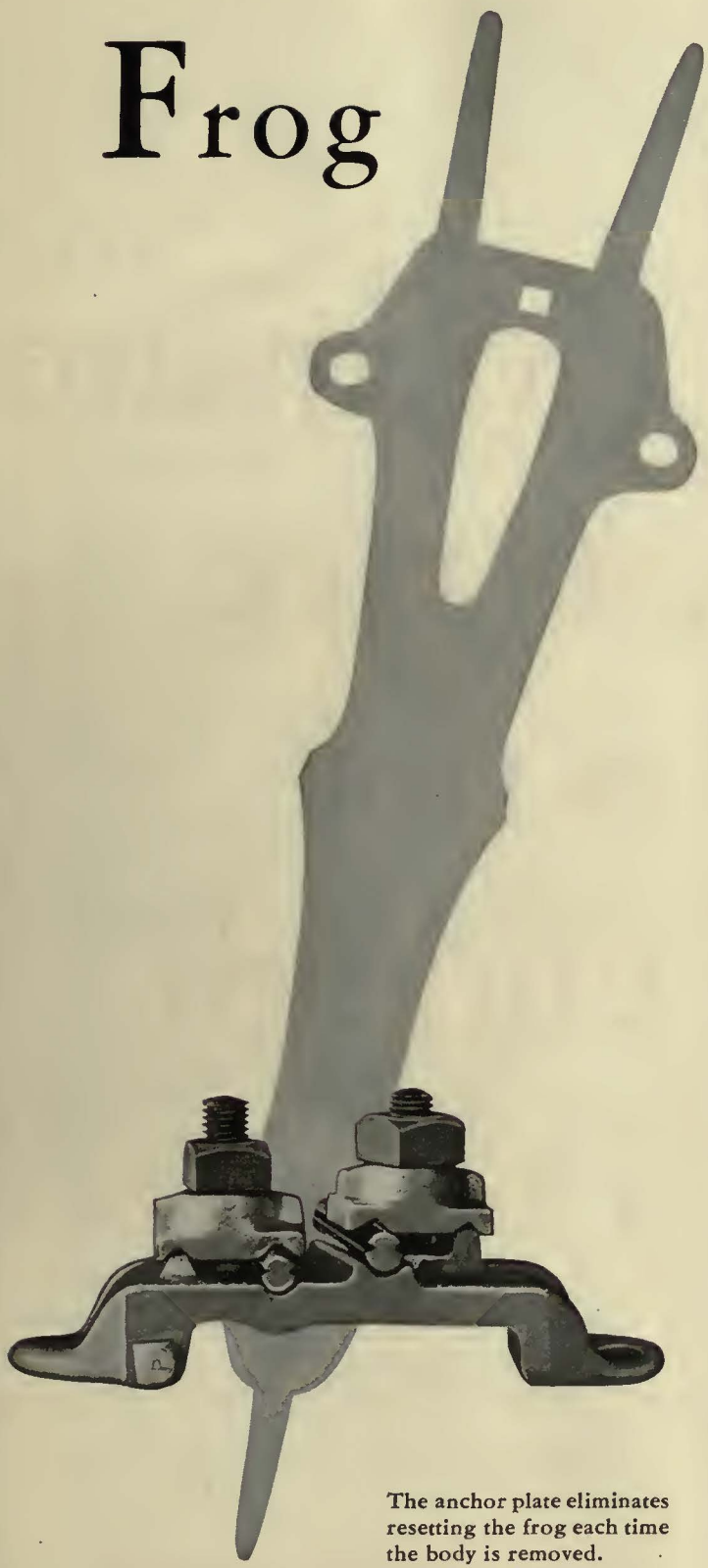
MEMBER ELECTRIC RAILWAY ASSOCIATION AERA 1939

Westinghouse

WESTINGHOUSE ELECTRIC

T 31164

Frog Replacement ...now a ONE MAN job



The anchor plate eliminates resetting the frog each time the body is removed.

The type RP renewable pan trolley frog consists of a malleable iron galvanized body and a malleable iron galvanized anchor plate. The wires are clamped to the anchor plate, and the frog is hinged to it. Once the anchor plate is set correctly, it becomes a permanent fixture, and the frog body can be removed or replaced without interfering with the setting of the complete frog.

This frog is one of the recent additions to the extensive line of railway overhead equipment which Westinghouse is constantly improving in order that electric railway companies may obtain better operating economies.

Service, prompt and efficient, by a coast-to-coast chain of well-equipped shops

MEMBER AERA 1930

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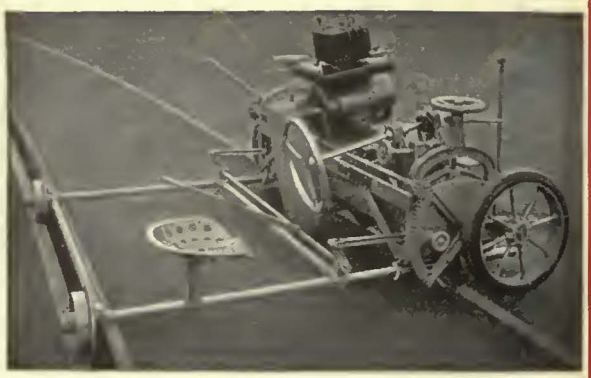
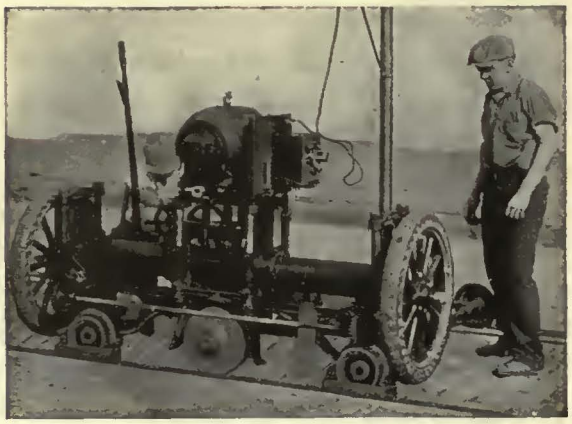
WESTINGHOUSE ELECTRIC

T 31160

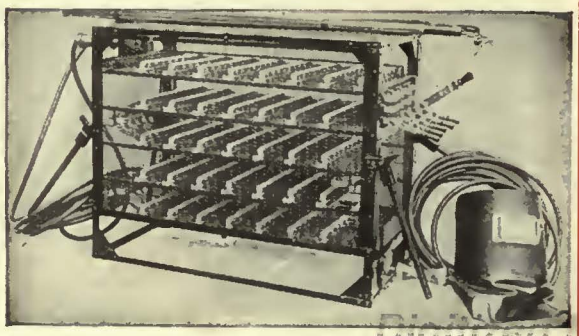


Improved Atlas Rail Grinder

Eureka Radial Rail Grinder



Imperial Track Grinder



Ajax Electric Arc Welder

Adequate service is not enough

Said Mr. Paul Wilson at the C.E.R.A. meeting in January:

"Many of us are trying to render adequate service rather than attractive service."

It's a nice distinction worthy of more than passing note. Even adequate service is not enough to sell the service. It must be more—it must be attractive.

Specifically, service, to attract, must sell a swift, silent, comfortable ride. Only on good track can you meet those specifications—and it's your public that writes them.

Fortunately good track is so easy to have and so inexpensive to maintain with the equipment we sell.

Railway Track-work Co.

3132-48 East Thompson Street, Philadelphia

AGENTS

Chester F. Gailor, 50 Church St., New York
Chas. N. Wood Co., Boston
H. F. McDermott, 208 S. LaSalle St., Chicago
F. F. Bodler, San Francisco, Cal.
H. E. Burns Co., Pittsburgh, Pa.
Equipment & Engineering Co., London

3384

Reciprocating Track Grinder

Vulcan Rail Grinder

Midget Rail Grinder

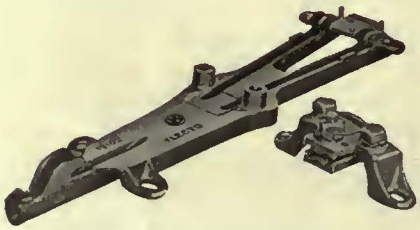
RTW Curve Oiler

These Little Grow Into

For years O-B has seriously studied the factors which contribute to operating costs. As a result of this study, O-B has continuously offered the industry a great many devices designed to lengthen life and reduce maintenance —in brief to lower operating costs.

A typical installation of the O-B Duplex Frog in a large midwestern city. Service results are highly satisfactory. Observe the use of the O-B Span Grip Clamp in this installation.

Longer Service and Lower Maintenance Win New Friends Daily



Top view of O-B Duplex Frog, showing removable yoke, and manner of assembling pan and yoke.

View of pan of O-B Duplex Frog to show overlapping runner construction which increases life of frog and wheel.

THE O-B Duplex Frog is outstanding in its operating cost savings character. It is designed to provide longer life. This is effected by overlapping the runners so that the wheel does not come in contact with the pan of the frog. Current collection is better, with a marked reduction in arcing and pitting, resulting in long wheel wear as well as from 300,000 to 500,000 car passes per frog.

In addition, the O-B Duplex Frog is designed with a removable yoke, which permits complete replacement of a worn-out pan and the cam tips without disturbing the position of the trolley or span wires. This simple change is easily and *quickly* effected, as it is not necessary to use block and tackle, or respot the frog. When the yoke has been correctly "spotted" when first installed, the yoke becomes a permanent part of the overhead.

As a result of these time and money saving advantages, the O-B Duplex Frog has been chosen by alert overhead superintendents in such large cities as Boston, Baltimore, Buffalo, Cleveland, Louisville, Knoxville, St. Louis, Denver, St. Paul, Minneapolis and Montreal, as well as for scores of other properties.

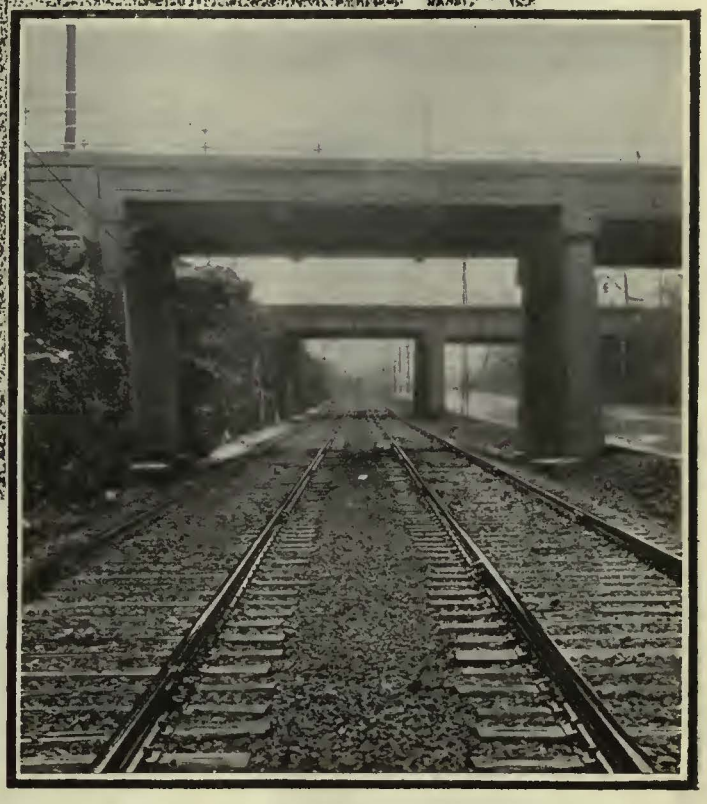
Your selection of the O-B Duplex Frog; described on pages 38 and 39 of New Products Supplement No. 3 to O-B Catalog No. 20; is a step toward greater economy and efficiency in operation.

Ohio Brass Company, Mansfield, Ohio

Canadian Ohio Brass Co. Limited
Niagara Falls, Canada

Acorns Will Big Oaks

True, each saving may be small in itself, but the aggregate makes a very substantial sum—a marked reduction in operation expense, which directly increases net profits. Thus, like the little acorn, the small savings make a total which grows like the great oak.



Reliability, Durability and Efficiency are Proved by this Bond Installation

ABOUT four years ago, shortly after its introduction, the O-B Titon Bond was selected for the rebonding of the Niagara, St. Catherines and Toronto Railway. Engineers of this property made this choice after exhaustive service tests, and because O-B Titon Bonds were performing so satisfactorily elsewhere.

Results have been as anticipated. This important property has had no trouble since installing. In fact, the photographic illustration at the right indicates probably greater service life than was originally expected.

This service is representative of the service of O-B Titon Bonds everywhere, and is undoubtedly the reason why more than 125 properties in the United States, Canada and foreign countries have chosen O-B Titon Bonds.

Installation is by copper electrode arc welding, using O-B Duron Welding Rod, to the head of the rail. An internal copper sleeve, between the copper strand and steel terminal, damps out vibration. Terminal design provides for a beveling of deposited metal from the rail, which tends to deflect wheel traffic. These two advantages, plus the superior design and construction materially strengthen service life.

If you are interested in securing a rail bond of permanent low electrical resistance and high mechanical reliability, investigate O-B Titon Bonds. Refer to page 667 of O-B Catalog No. 20.

View of right of way of the Niagara, St. Catherines and Toronto Railway. The return circuit is efficiently maintained with O-B Titon Bonds.

Close-up of O-B Titon Bond installed on track of above property.

The O-B Titon Bond, showing terminal construction. View shows the side of bond which adjoins the rail.

CHICAGO

SURFACE LINES

CHICAGO SURFACE LINES officials spent more than a year carefully investigating equipment for their feeder expansion program and then recommended the modern trolley bus as the best solution of their requirements.

THE MARCH OF PROGRESS

TWIN COACH body design, unit strength, balanced weight, patron appeal, entry and exit arrangement, low platform and general adaptability won for it better than **70%** of the orders placed by Chicago Surface Lines.

THE TROLLEY BUS *IS* HERE

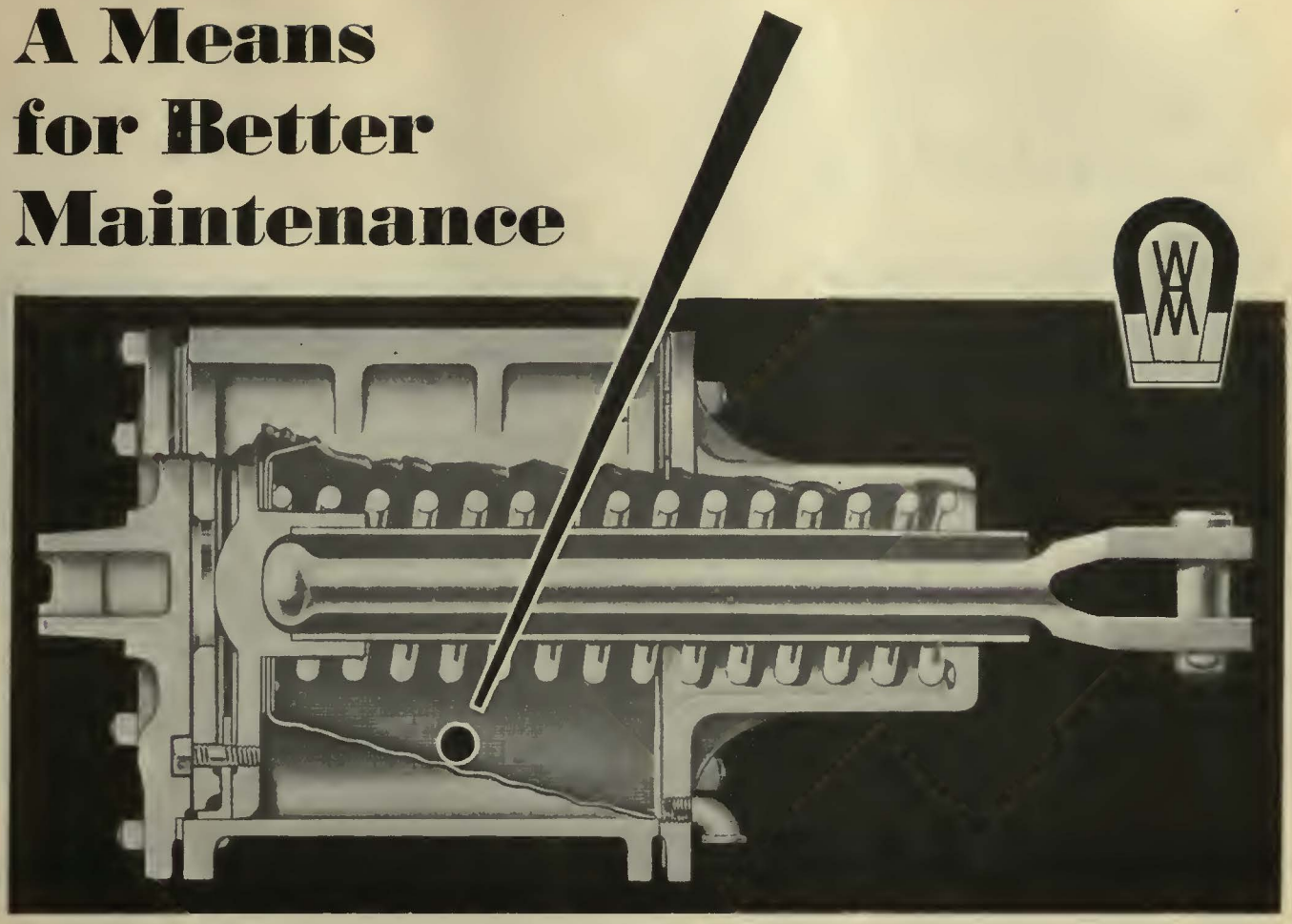
New Orleans
Twin Coach Design
Trolley Bus

Salt Lake City
Twin Coach Design
Trolley Bus

If you require a rail-less vehicle with modern body development and rider appeal the answer is—

Twin Coach
BY F.R.FAGEOL KENT, OHIO

A Means for Better Maintenance



A collapsible water-proof hood inserted in the brake cylinder as shown, is an effective means of preventing dirt and moisture that may sift in through the non-pressure head from reaching the cylinder walls . . . Keeping cylinders clean in this manner will reduce leakage, lengthen life of packing cups, and decrease maintenance expense. Many railroads are now realizing the benefits of this protector.

WESTINGHOUSE
Traction Brake Co.
General Office and Works
Wilmerding, Pa.

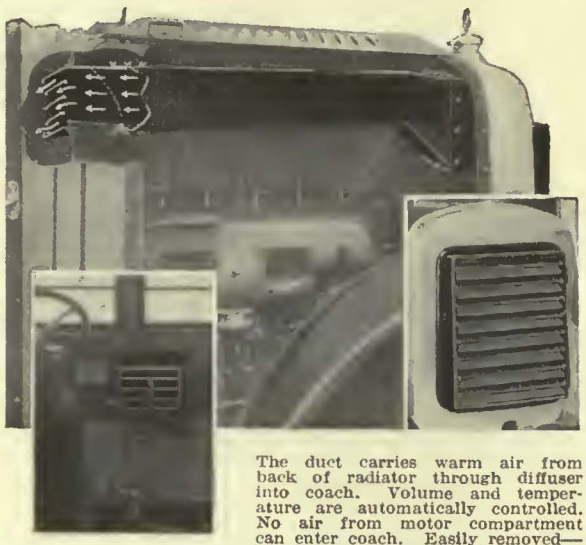
easiest way out

Announcing

A NEW AND IMPORTANT ADDITION TO THE LINE OF

Keystone Bus Equipment

MUELLER-EVANS
HEATING AND VENTILATING SYSTEM



The duct carries warm air from back of radiator through diffuser into coach. Volume and temperature are automatically controlled. No air from motor compartment can enter coach. Easily removed—requires no pipes—occupies no space in bus.

ELECTRIC Service Supplies Co. will at once take over the exclusive sale of the Mueller-Evans system of Motor Coach Heating and Ventilating System because of the many superior advantages it offers over other systems and because there is a definite need for such a system to provide fresh, warm air for bus riders. Certainly in a short time, its use must become universal.

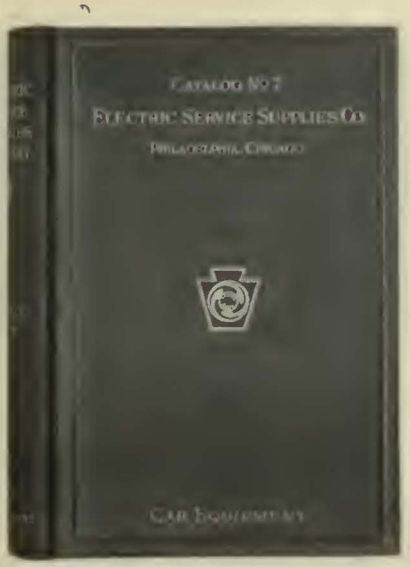
In the Mueller-Evans system—air warmed in passage through the radiator is forced through a duct into the front end of the bus and directed toward the floor. This clean, warm air provides 1200 cubic feet each hour for each passenger.

There is no odor of gasoline or oil—not the slightest trace of Carbon Monoxide. Let us send you details.

ELECTRIC SERVI

Home office and manufacturing plant located at 17th and Cambria Streets, Philadelphia, Pa.; District offices are located at 111 North Canal Street, Chicago, Ill. and 50 Church Street, New York City.

—And the Latest Catalogs on Keystone Car and Bus Equipment



Keystone Car and Bus Equipment includes the items shown below—and hundreds of other car and bus accessories.

Car Equipment is listed in Catalog No. 7 and Bus equipment in Catalog No. 9.

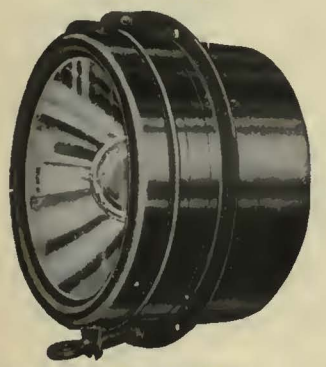
If you do not have these catalogs—and you are purchasers of car or bus equipment—please write for the one you require.

Faraday Push Buttons

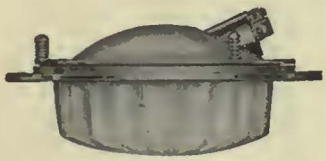
Dome Type A Keystone-Ivanhoe Fixture

Faraday Buzzers

Hunter Illuminated Signs



Golden Glow Headlights



Dome Type S Keystone-Ivanhoe Fixture

Faraday Car Signal Systems

Keystone Trolley Catchers

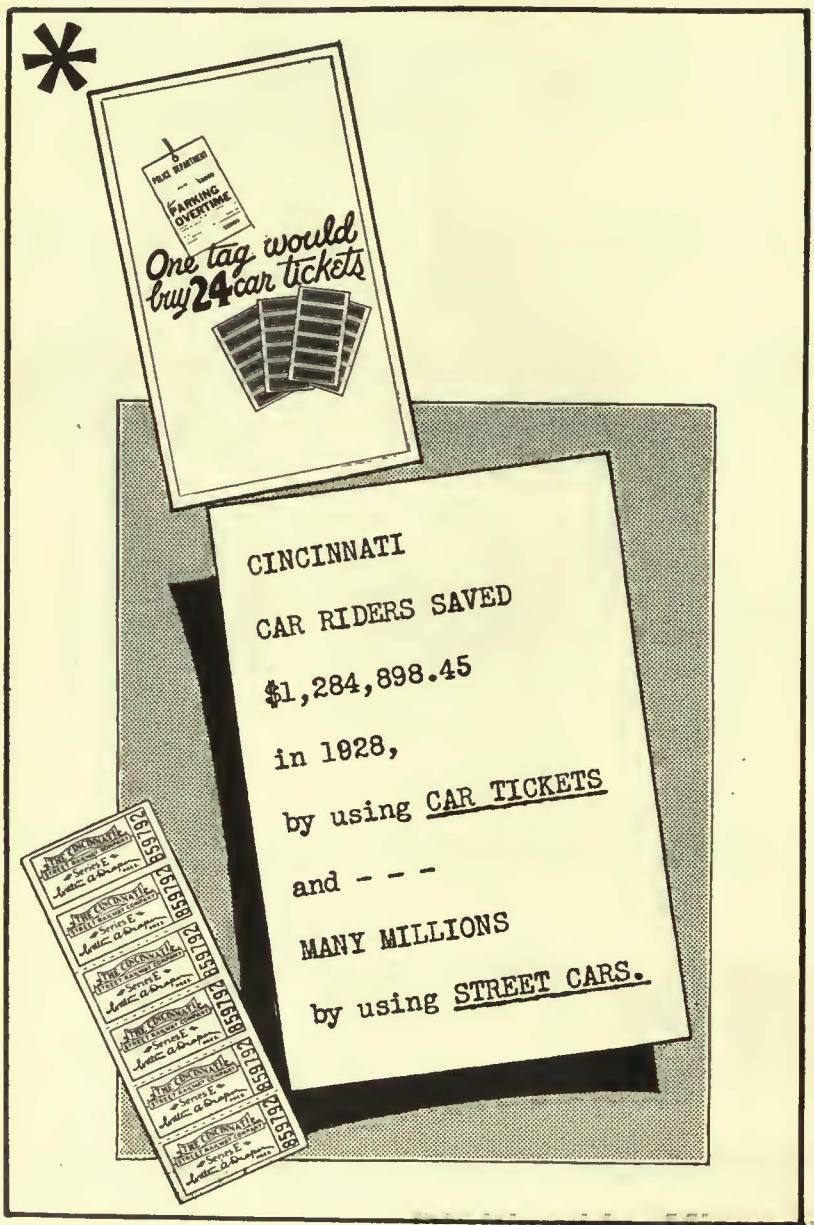
CE SUPPLIES CO.

Branches—Bessemer Bldg., Pittsburgh; 88 Broad Street, Boston; General Motors Bldg., Detroit; 316 N. Washington Ave., Scranton; Canadian Agents—Lyman Tube & Supply Company, Ltd., Montreal, Toronto, Vancouver.

CINCINNATI

*sells 'em this way-**

and Cincinnati sells millions of Globe tickets



Cincinnati car fare is 10 cents cash, three tickets for a quarter. The street railway carried 7½ million more passengers in 1927 than in 1926. In 1928 it held the gain of the previous year and added another 1½ million passengers to it. In 1929, in spite of a general decline in business, the gains of the two previous years were practically maintained. This property is firmly convinced of the value of selling bulk transportation in advance to its patrons. This is borne out by the fact that the percentage of passengers using tickets has increased until it is now 86.31 per cent.

Globe
Ticket Company
PHILADELPHIA, PA.

Offices:
Syracuse
Baltimore
Cincinnati
Cleveland
Pittsburgh

Factories:
Philadelphia
Los Angeles
Boston
New York
Jacksonville

G-E 1850 PAPER

You can be *sure* of G-E 1850 Insulating Paper. It doesn't carbonize, under motor operating heats. It resists moisture, and it's mechanically strong . . . doesn't split in tight slots, leaving hidden cause for later trouble.

There are no pinholes in it . . . no thin spots . . . no brittle potches.

Careful selection of pulps from all over the world, special processes, hot rolling under tremendous pressures, long manufacturing experience—in a plant devoted to this product—all these factors make G-E 1850 *super* insulating paper.

You will understand why it can add life to hard-driven motors if you will accept a sample from us. Write today to Section M-814, Merchandise Department, General Electric Company, Bridgeport, Conn.

G-E INSULATING MATERIALS

For every purpose

Varnishes, Oils, Shellacs, Paints.
Filling and Sealing Compounds.
Varnished Cloths and Tapes.
Insulating Papers.
Core Solder and Fluxes.
Cords and Twines.
Glyptal Lacquers.

GENERAL ELECTRIC

INSULATING MATERIALS

MERCHANDISE DEPARTMENT · GENERAL ELECTRIC COMPANY · BRIDGEPORT, CONN.

The essential equipment

THE modern light-weight car is the answer to a general demand for rolling stock of low initial cost and decreased maintenance. General Electric stands ready to supply the essential equipment for this service—equipment that has in every way kept abreast of the requirements of the railway industry.

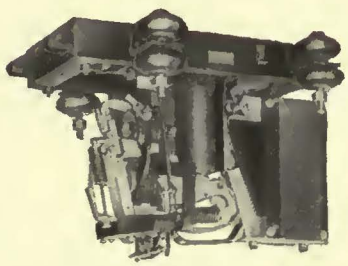
GE-264 motor

This 25-horsepower motor, GE-264, has excellent characteristics for service in light-weight cars. Several features, such as constant-oil-level bearings and ventilated cover above commutator, add to its desirability for this class of service.

Type K-75 control with LB handle

Type K-75 control with LB control handle is designed for light-weight cars. Although smaller and lighter than standard controllers, it embodies the latest improvements including hinged-type control fingers. The LB handle, which provides for opening and closing of the control contacts before the drum is moved, confines practically all arcing to the line breaker; all heavy currents are opened under the car.

JOIN US IN THE GENERAL ELECTRIC HOUR, BROADCAST EVERY SATURDAY EVENING ON A NATION-WIDE N.B.C. NETWORK



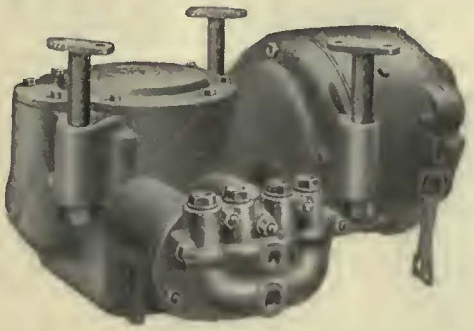
Type DB-986-A line breaker (cover removed)

G-E line-breaker equipment not only prevents a large percentage of the arcing that would otherwise occur in the controller, but it also protects the equipment from short circuits and overloads above a predetermined value. A substantial reduction in maintenance costs is thus made possible.

GENERAL

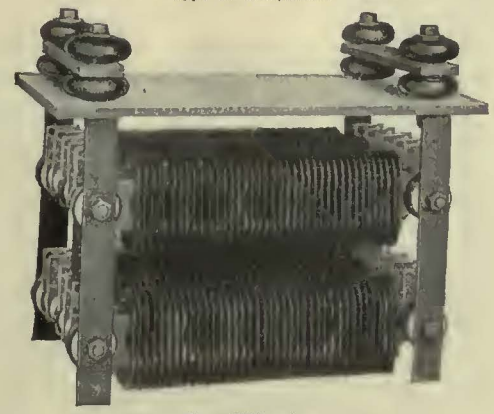
GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y.

for light-weight cars



Type CP compressor

Type CP motor-driven compressors for air-brake service are the result of long experience in the design and manufacture of reciprocating air compressors. The many features that contribute to the reliability and long life of these units are of interest to every operator.



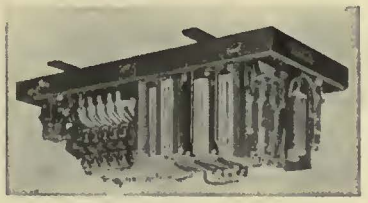
Type EW resistor

Exposure to the elements does not affect the Type EW resistor, because the units are made of special non-corrodible alloy; nor will vibration break it, because the alloy is flexible and has a high tensile strength. It weighs but half as much as a grid-type resistor of the same capacity.

-and if you want fast acceleration

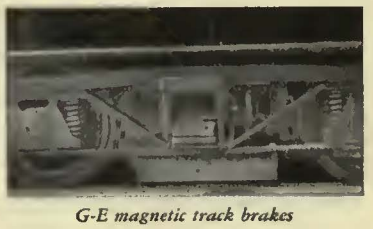
GE-301 motor

The GE-301 motor (50 horsepower) was developed to meet the demand for fast acceleration in large cities where cars of greater seating capacity are required. This motor is provided with four commutating poles (unusual in a motor of this size) and constant-oil-level bearings.



PCM control (cover removed)

PCM control provides automatically smooth, fast acceleration without discomfort to passengers. It has the largest number of steps available in any control and yet the construction and operation are simple. Ask for complete information concerning this modern device.



G-E magnetic track brakes

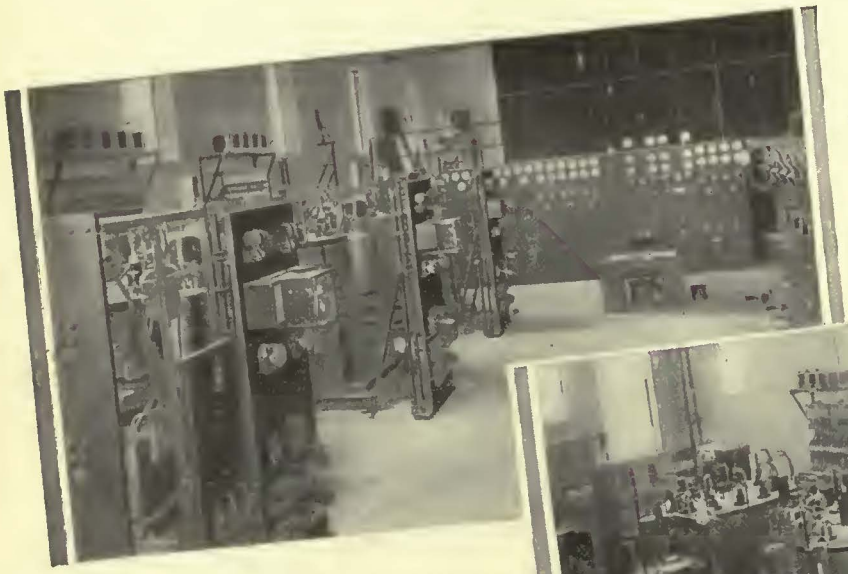
Magnetic track brakes are designed to increase safety in traffic. They provide the ability to stop quickly regardless of rail conditions and are a valuable aid to the maintenance of fast schedule speeds through heavy traffic areas.

330-148

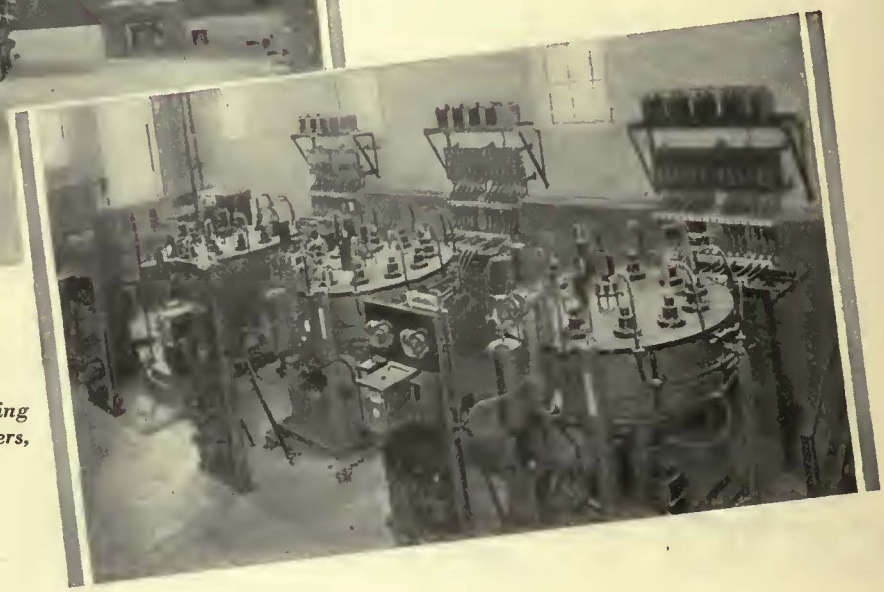
ELECTRIC

SALES OFFICES IN PRINCIPAL CITIES

G-E mercury-arc rectifiers demonstrate their flexibility



Interior view of Fall River station showing control panels



Interior view of Fall River station showing three General Electric mercury-arc rectifiers, each of 1,000-kw. capacity

—this station converts either 25- or 60-cycle power

OF UNUSUAL interest is the installation of G-E mercury-arc rectifiers at the Fall River substation of the Eastern Massachusetts Street Railway Company. Normally, these rectifiers utilize 25-cycle power at 13,200 volts. However, the equipment is so designed that in case the 25-cycle power is interrupted, 60-cycle power at 22,900 volts can be substituted instantly. Other G-E equipment at this station includes transformers and complete manual switchgear.

The reliability of G-E mercury-arc rectifiers has been proved again and again through years of railway service. Your interest is invited. Address the nearest G-E office or General Electric Company, Schenectady, N. Y.

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130-22

GENERAL ELECTRIC

SALES AND ENGINEERING SERVICE IN PRINCIPAL CITIES

Electric Railway Journal

Consolidation of
Street Railway Journal and Electric Railway Review
A McGraw-Hill Publication—Established 1884

JOHN A. MILLER, JR., *Managing Editor*

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Improvement Plans Go Forward

DETERMINATION on the part of electric railway executives to carry out their full program of expenditures for improvements during 1930 remains unshaken. They believe that there is nothing in the present general business situation to necessitate any curtailment of their new equipment, construction and maintenance budgets. Expenditures planned by the industry for these purposes total more than $371,000,000. This was indicated by the survey appearing in the Annual Statistical Issue of ELECTRIC RAILWAY JOURNAL, published early in January.

But that was three months ago. They have been three months of economic uncertainty. Business trends have been hesitant. Electric railway traffic has declined sharply. To determine what effect, if any, these conditions might have on the improvement plans of the industry, this paper made a telegraphic survey covering railways in most of the principal cities in 27 states and Canada, as well as a considerable number of interurbans. Practically without exception these companies replied that they intend to carry out their program of extensions, betterments and maintenance as originally planned. "No reduction in expenditures contemplated," "See no reason to change our plans," "Our company is carrying out full program of expenditures," are typical of the answers received. Detailed results of the survey are given in an article appearing elsewhere in this issue.

Preliminary steps have already been taken to carry out these improvement plans. Orders for more than 250 new cars have been placed since the first of January and announcement has been made of the prospective purchase of 200 additional cars in the near future. Approximately 500 new buses have been ordered by the electric railways during the past three months, with the purchase of 150 more pending. Activity has been evident also with respect to trackless trolleys. Orders have been placed for 41 of these vehicles, with the purchase of 100 more under consideration. Track construction, of course, is a seasonal activity. The work for this year is only just beginning. Orders placed for track material indicate that the electric railways are practically ready to begin the execution of extensive construction programs. Materials for the maintenance and construction of overhead line and power equipment also have been purchased in volume, indicating that activity in this department will not lag.

Expenditures made during the first three months of this year for new equipment, construction and maintenance represent only a relatively small part of the annual budget. During the next six months improvement plans will be pushed more rapidly. Electric railway men feel entire confidence in the fundamental soundness of the economic situation and in the continuing need for public transportation service. They are going forward with this program of extensions and betterments. This the JOURNAL's survey definitely substantiates.

Transportation Salesmen Who Wear Overalls

WHILE the first contact made by a transportation company's patron is with the operator of the vehicle in which he is riding, an effective merchandising program must go far deeper than that. Important as it is to have neatly dressed, competent and courteous operators, it is equally important to have shop foremen and carhouse employees who measure up to their responsibilities. Train crews may be letter perfect in the performance of their duties and well versed in all the requisites of ride salesmanship, but the effect will be nullified if the cars themselves are dingy, dirty and noisy. Merchandising, in fact, begins in the shops and garage.

Poorly maintained rolling stock prevents successful merchandising in two ways. Cars and buses are the show windows of the local transportation industry. By their appearance, they attract or repel potential customers. Even strangers in a city, though they may not patronize its local transportation system, often gain a lasting impression of that city from the appearance of its street cars. Equally important is the fact that the vehicle operators themselves have little enthusiasm and interest in salesmanship unless they have worth-while service to sell. Just as surely as the craftsman must have proper tools if he is to perform good work, so too must the operator have a clean, well-maintained vehicle if he is to render good service. The shopman in his overalls is a salesman of transportation just as much as is the operator in his brass-buttoned uniform.

Putting Maintenance on a Production Basis

UNIT replacement has been generally accepted in many industries as the most efficient system of equipment maintenance. This system is akin to the mass production methods which have been instrumental in lowering manufacturing costs. Although the electric railway industry as a whole has been slow to adopt this practice the properties where it is followed are convinced of its effectiveness.

By centralizing the overhaul and repair of equipment parts, the unit replacement system results in better work being done at lower cost. On many railways it is customary to do minor overhaul work at the various carhouses whenever inspection discloses the need for it. Costs are higher when work is done in the individual

overhaul shop, and the time required for inspection and repair is considerably increased over that required under the unit replacement system. Centralization permits overhauling to be done at a steady rate by trained specialists working at maximum efficiency all the time. Moreover, the installation of modern machinery can be justified when it is kept in steady operation. This in turn results in further economies.

Another advantage of unit replacement is the reduction in the length of time required to overhaul a car. With the old system of bringing the car into the shop, stripping it of its equipment, overhauling each of the individual parts and then reassembling them, a period varying from three to twenty days is required. This represents a long term of inactivity during which the car is earning nothing. With the unit replacement system it is possible to bring in a car for overhauling, replace old parts with repaired parts, and get the vehicle back into service again much more quickly.

Of paramount importance, also, is the encouragement which the unit replacement system gives to preventive maintenance. With this system it is possible to overhaul spare parts at a central point and distribute them among the various operating stations so that worn parts can be replaced at the regular inspection periods. The presence of extra equipment which can be easily subsituted for a suspected part encourages such substitution rather than the policy of "taking a chance" that such a part will last until the next inspection. Other advantages of the unit replacement system worthy of serious consideration are the closer supervision of overhauling work and the keeping of more accurate equipment records.

Perhaps the hesitancy on the part of electric railways to adopt this procedure has been due to the additional investment required to keep on hand the necessary extra equipment. While it is true that the unit replacement system requires at the beginning an additional investment in extra equipment, it permits a substantial reduction in the amount of repairs material which must be kept on hand at the operating stations. Regardless of the matter of investment, however, experience shows that this system is effective in preventing rolling stock failures in service. Undoubtedly the cost of such breakdowns, measured in public good will as well as in actual dollars and cents expenditures, is far greater than the cost of keeping on hand the extra equipment.

Junk Piles—Monuments to Progress

"JUNK is a horrid word," to paraphrase a current advertisement, and a junk pile is seldom good to look at. But, according to no less an authority than Dr. Julius Klein, Assistant Secretary of Commerce, these piles of discarded machinery, of cast-off equipment, are impressive monuments to American progress. They are in sight because progressive managements prefer to have the junk outside the factory instead of inside and in use.

Generally speaking, the progression to the junk pile is accelerated by a desire to have in use only such equipment as will render satisfactory and economical service. Thus obsolescence rather than complete destruction of usefulness is the measure that determines when retirement is desirable—and necessary—if the business is to be conducted economically. Obsolescence indicates progress. It also indicates careful management, for equipment is seldom if ever discarded until an analysis has proved that the move is a wise one.

In the electric railway industry, a survey made by this paper a few years ago showed that 40 per cent of the machine tools in use were 20 or more years old. There is no indication that this proportion has changed materially. Another survey by this paper showed that 34 per cent of the passenger cars were more than 20 years old. Today there is an even greater proportion of old cars. While these pieces of animated junk will function after a fashion, it is self-evident that they cannot do the work of equipment designed today for today's need. Now is the time to build our monuments to progress by consigning the junk to the junk pile, where it belongs.

Interstate Bus Regulation Advanced

WITH the passage of the Parker bill by the House of Representatives on March 24 an important step was taken toward the regulation of interstate bus operations. Legislation on this subject has been under consideration by Congress since 1925, shortly after the United States Supreme Court decided that under the existing law neither the individual states nor any federal agency possessed authority to regulate this form of transportation. The situation created by the absence of regulation has been of direct concern to the electric railways, both from the standpoint of their own operations and those of their competitors. While general agreement has long existed among interstate bus operators that regulation of some sort was desirable, differences of opinion concerning certain details, and opposition from various sources outside the ranks of the operators have resulted in protracted delays.

In its present form the Parker bill empowers the Interstate Commerce Commission to supervise the interstate operation of passenger buses, acting through the state regulatory bodies where not more than three states are involved and with discretionary authority to refer cases to state bodies where more than three states are involved. The authority granted includes regulation of rates and fares and the requirement that the bus lines file liability insurance or indemnity bonds.

Buses are to operate under certificates of convenience and necessity, with regular routes and fixed termini. Operation of interstate buses on March 1, 1930, is to be considered *prima facie* evidence of convenience and necessity. This date is a change from that originally fixed in the bill, which was Jan. 1, 1930.

Some opposition was voiced to the passage of the bill on the ground that it would tend to stifle competition and create a monopoly. Obviously this argument has little merit as practically all states have laws governing intrastate transportation of persons by motor carriers, and the enactment of the proposed legislation is merely an extension of this principle to a type of operation which has heretofore been without adequate regulation. With a view to overcoming this objection, however, an amendment was made to the bill on the floor of the House providing that no consolidation, merger or acquisition of control should be approved if more than one of the groups involved was directly or indirectly engaged in railroad transportation.

The next step will be the consideration of the Parker bill by the commerce committee of the Senate. It is expected that the committee will conduct hearings before making any recommendations. While this will necessarily result in some additional delay it is to be hoped for the stability of the bus industry that favorable action will be taken at this session.

Hidden Assets

FEW, indeed, of the millions of passengers who ride the electric railway cars every day have any realization of the far-reaching organization required to provide the safe and dependable service which they use. They would be amazed to know that on a property of average size, more than 8,000 different items must be kept constantly on hand in the storeroom in order to assure the reliability of the service. The amount of money tied up in these materials and supplies averages nearly half a million dollars, or about 5 per cent of the annual gross receipts. For the industry as a whole, a survey published elsewhere in this issue shows that there is a total investment of approximately $72,500,000 in materials and supplies kept in stock.

In this survey figures were secured from 42 electric railways of varying sizes in the United States and Canada, representing in the aggregate about one-quarter of the entire industry. Considerable variation was shown between the large and small companies, and also between different companies of the same approximate size. In general, however, the reports showed remarkable uniformity, and the averages of the large, medium-size and small groups, furnish a series of convenient yardsticks by which to measure the conditions on an individual property.

The survey also showed that there is a decided trend today toward buying in small lots at frequent intervals rather than in occasional large quantities. Most of the railways are following this practice, but not overlooking the price inducements offered for quantity purchases. The general rule appears to be that smaller amounts are bought unless the savings accruing from quantity purchase exceed the interest on the extra investment.

In the past few years standardization has been responsible for many substantial reductions in the quantity of materials and supplies kept in stock. This has been done by co-operative effort of the industry as a whole, and also by standardization on individual properties. Further progress in this direction is to be expected, but despite everything that can be done, the materials and supplies kept on hand to insure the continuity of service will always remain a "hidden asset" of enormous importance.

Electrification Proceeding on Its Merits

INDICATIVE of the modern viewpoint in transportation circles which looks toward making the maximum use of the plant is the present activity in the field of steam railroad electrification. Thirty years ago, when electrification of main trunk lines was first proposed, the principal claim in its favor was economy of power supply as compared with steam. While the arguments advanced were valid enough, comparatively few installations were made for this reason. A more important factor was the impracticability of using steam in special locations, such as metropolitan terminals or tunnels. A number of years later, when the terminal installations had given ample proof that electric power was not only able to replace steam, but under certain conditions was doing things that steam never could accomplish, more roads began giving serious consideration to electrification.

Today the use of electric power is being extended rapidly. The Pennsylvania, a pioneer in electrification, will within a few years have the most comprehensive heavy installation in the world. The suburban electrifications of the Lackawanna in New Jersey and the Reading in Philadelphia are looked on merely as forerunners of much greater projects. Even the Cleveland terminal electrification, now about to start operation, appears to be only a step in the ultimate conversion of a large section of the New York Central.

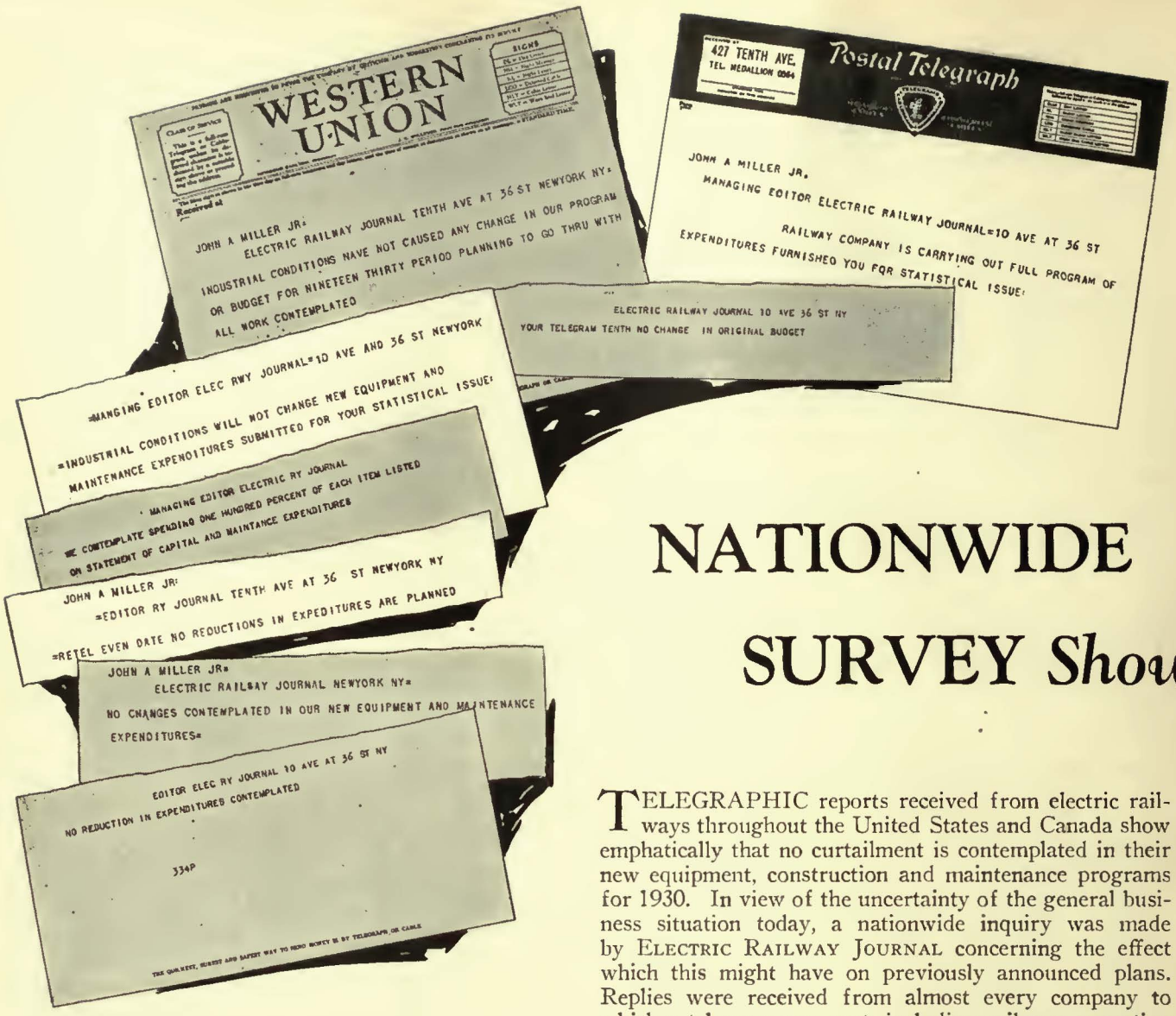
Two of these new installations, the Pennsylvania, which is a heavy trunk line system, and the Reading, which for the present comprises suburban service only, are being made with 11,000-volt single-phase alternating current. The other two are being made with 3,000-volt direct current. The Cleveland Union terminal electrification will handle heavy trains while the Lackawanna for the time being will use multiple-unit suburban trains only. Thus it appears that the sponsors of both systems consider them entirely suitable for practically all classes of electrification. It is quite significant that there are so few limitations to the type of supply that will give satisfactory service. To some extent, however, this wide choice has tended to retard rather than help the progress of electrification both in this country and abroad.

It is needless to recount the advantages of electricity. They are now well known to railroad men who have been following developments. With increasing use new advantages are being discovered which scarcely could have been predicted before any comprehensive installations had been completed. Accordingly the new electric roads are being watched with great interest. Their success is a foregone conclusion.

A Professor Speaks

IDEAS that have long been held by electric railway men received new emphasis from the clear and forceful presentation made by Prof. Winthrop M. Daniels at a recent meeting of the New England Street Railway Club. Problems of transportation have occupied the attention of Professor Daniels for many years. His conclusions deserve consideration. When, speaking of street traffic conditions, he said that "we are now engaged in the almost hopeless task of trying to force a 3-in. stream through a ½-in. nozzle," he created a picture the vividness and accuracy of which must appeal to every thinking person. Changing the metaphor, he pointed out that the arteries of local traffic in central shopping and business districts are suffering from high blood pressure. His listing of schemes which are merely palliatives, or which involve prohibitive expense, was extremely helpful.

Though there is a "no man's land" where competitive rivalry is acute between the private automobile and the public transportation agency, he believes that there is a definite core of traffic which can be handled only by the latter. In congested districts electric railway traffic represents the major movement and should receive dominant consideration. The convenience of the few as represented by parking and similar uneconomic uses of street space must give way to the convenience of the many as represented by the traffic on public transportation vehicles. At present the satisfactory operation of the electric railways is being seriously impaired by congestion. The railways cannot afford to sit back in the hope that this difficulty will be self-corrective. Only when they militantly, but without asperity, insist that their right is paramount, will they be able to operate satisfactorily. This they must do not in their own interest alone, but in the interest of the public as a whole.



NATIONWIDE SURVEY *Shows*

TELEGRAPHIC reports received from electric railways throughout the United States and Canada show emphatically that no curtailment is contemplated in their new equipment, construction and maintenance programs for 1930. In view of the uncertainty of the general business situation today, a nationwide inquiry was made by ELECTRIC RAILWAY JOURNAL concerning the effect which this might have on previously announced plans. Replies were received from almost every company to which a telegram was sent, including railways operating in most of the principal cities in 27 states, as well as from a considerable number of interurban lines. The territory covered extends from Maine to California and from Canada to the Gulf of Mexico, with intervening areas covered approximately in proportion to the extent of electric railway operations. Practically without exception these railways state that they intend to carry out the full program of improvements specified in the confidential budget figures submitted last December for the Annual Statistical Issue of this paper. The wide geographical distribution of the railways replying to the inquiry, as well as the variety of business and industrial conditions existing in the territories they serve, assures the reliability of their reports as an index of what may be expected during the year.

Typical of the spirit of the replies is the statement of J. N. Shannahan, president Omaha & Council Bluffs Street Railway and chairman of the Advisory Council American Electric Railway Association. The telegram from Mr. Shannahan reads, "No change in plans submitted for your Annual Statistical Number. We will adhere to those plans during the year." From A. G. Neal, vice-president and comptroller Washington Railway & Electric Company, comes the statement "We contemplate spending 100 per cent of each item listed on statement of capital and maintenance expenditures." The president of a large railway in the East says "Our company is carrying out a full program of

Typical Statements Concerning Improvement Plans for 1930

No changes in budget figures. Full expenditures expected.

Industrial conditions will not change new equipment and maintenance expenditures.

No reductions in expenditures are planned.

Have made no change in budgeted amounts for new equipment and maintenance expenditures.

No change on our property.

We do not anticipate any change in our budget for 1930 on account of industrial conditions.

See no reason to change our plans.

No change contemplated in our new equipment and maintenance expenditures.

Present industrial conditions will not affect contemplated expenditures for new equipment and maintenance.

There has been no change in our contemplated budget for 1930.

We do not anticipate any change in new equipment and maintenance expenditures.

No reduction in expenditures contemplated.

expenditures furnished you for Statistical Issue." Other typical replies are presented in an accompanying panel. From these answers it is clearly evident that the electric railways are planning to adhere to the previously reported budget of construction and maintenance expenditures totaling approximately $371,000,000.

A general summary of the plans of the industry for 1930, as presented in the Statistical Issue of this paper is repeated herewith.

Only three companies replying to the JOURNAL inquiry are considering any curtailment of expenditures. One of these, located in an industrial territory on the Atlantic seaboard, believes it may be necessary to reduce expenditures 5 to 10 per cent if industrial conditions do not improve. Another is considering a curtailment of construction and maintenance expenditures ranging from 10 to 20 per cent. The third plans no change in its construction program but may adjust its maintenance budget to meet the decrease which has occurred in the number of revenue passengers carried.

Electric Railway New Equipment, Construction and Maintenance Budget for 1930

	New Plant and Equipment	Maintenance Materials	Maintenance Labor	Total
Way and structures	$88,400,000	$35,790,000	$51,360,000	$175,550,000
Cars	31,800,000	36,520,000	50,200,000	118,520,000
Buses	19,900,000	19,650,000	12,470,000	52,020,000
Power equipment	8,950,000	10,520,000	5,660,000	25,130,000
Total	$149,050,000	$102,480,000	$119,690,000	$371,220,000

Electric Railways Proceeding with

Full Budget Program

New equipment, construction and maintenance expenditures to be made during 1930 in accordance with original plans. Total remains at $371,000,000 despite uncertainty of present business situation

By

JOHN A. MILLER, Jr.

Managing Editor

Electric Railway Journal

To offset these possible reductions a number of other railways now plan to make larger expenditures in 1930 than were contemplated when figures were submitted for the Statistical Issue of the JOURNAL. Of particular interest is the statement of Lucius S. Storrs, executive chairman United Railways & Electric Company of Baltimore: "The credit of this company has been so far improved that a complete rehabilitation is in view and we have decided to materially increase our budget for new expenditures in the matter of cars and buses." In Detroit, General Manager Del Smith expects that the additional revenue derived from increased fares will permit the Department of Street Railways to add approximately 200 units of rolling stock to present equipment this year, as well as to make numerous other improvements not contemplated when budget figures were submitted. According to D. W. Harvey, general manager Toronto Transportation Commission, "Estimated new equipment and maintenance expenditures will be adhered to, with the exception that a greater amount will be expended for new buses." The Regina Municipal Railway has increased its way and structures budget 50 per cent. Other companies have indicated the possibility of making increases in improvement expenditures similar to those already mentioned.

Among the reports received, a number are particularly encouraging. Richard Meriweather, general manager Dallas Railway & Terminal Company states, "Our business shows slightly upward trend as compared with 1929." In the opinion of N. E. Drexler, division manager Virginia Public Service Company, the business outlook is good and is "already showing up better than last year." According to M. H. Frank, railway manager Wisconsin Power & Light Company, "We are proceeding as originally reported. Expect good year." From Cincinnati, J. B. Stewart, Jr., wires, "No change has been made in new equipment and maintenance expenditure budget. With opening up of outside construction season it is expected that conditions will more nearly approach normal and no cut in budget will be necessary."

Industrial conditions have not caused any change in the program of the Chicago, North Shore & Milwaukee Railroad, according to J. R. Blackhall, general manager. The company is planning to go through with all work as contemplated. He states that general conditions are beginning to show some improvement.

Increased traffic on the lines of the Montreal Tramways is reported by Col. J. E. Hutcheson, vice-president in charge of operation. He says that while curtailment has taken place in some lines of industry with a consequent increase in unemployment at this season, street railway riding has increased 3.66 per cent since the beginning of the year. D. W. Houston, general superintendent Municipal Railway of Regina, Saskatchewan, estimates that passenger revenue in 1930 will be about 10 per cent higher than in 1929.

A hundred cars of this type, using aluminum extensively, are being delivered to the Brooklyn & Queens Transit Corporation

Aluminum

Gaining in Favor

Experience with many vehicles built largely of aluminum alloys has proved the economic value of this metal, from the standpoint of both operation and maintenance

RADICAL changes in design during the past few years have resulted in the development of electric railway cars which are very different from those of a decade ago. General appearance has been greatly improved. Riding qualities have been bettered. Much attention has been given to interior design and appointments. Means have been found to reduce noise and to increase the smoothness of operation. Higher rates of acceleration and braking have been attained. And last, but not least, improvements in design have produced substantial economies in operation. An important element in this development has been the reduction in weight made possible by the extensive use of aluminum and its alloys.

Although the use of aluminum in car construction dates back to 1904, when the Interborough Rapid Transit Company and the Chicago City Railway used the metal for several parts, and to 1905, when the J. G. Brill Company used aluminum sheets for the headlining of cars for the Manila Electric Railroad & Lighting Corporation, experimentation on a large scale did not begin until 1923. In that year the Illinois Central Railroad built a number of cars for suburban electrified service, using aluminum extensively. From that period forward the use of aluminum alloys in car construction became more and more frequent. Electric railways, recognizing the advantages of reducing car weight, introduced the lighter metal in a number of sample cars and later in larger orders. In an accompanying table are listed a large number of cars that have been built of aluminum, and others that have used this metal to a considerable extent. Several electric railways have designated that certain parts shall in the future be built of aluminum.

In the construction of buses, too, aluminum has been used for a number of years. Several manufacturers have used aluminum panels for a long time, as well as miscellaneous aluminum castings. It is interesting to note, also, that aluminum has gained a strong foothold in Europe in the construction of both street cars and buses. As early as 1911, Zurich, Switzerland, used aluminum for car panels, roof members and fittings.

This extensive development of aluminum alloys has come about as a result of their many advantages. Outstanding among the points in their favor are strength, light weight, ability to absorb impact loads—making for greater safety, non-corrosive qualities and economical maintenance.

Aluminum alloys have been developed which have

about the same physical properties as mild structural steel, except that the modulus of elasticity is about 10,000,000 instead of 30,000,000 for steel and the coefficient of expansion is about twice that of steel. Through the process of heat treating it is possible to obtain aluminum alloy members comparable in strength with steel members of equal size. The Aluminum Company of America has developed alloys to be used for various purposes, five of which are particularly suitable for electric railway car construction. The strongest alloys are known as 17 ST and 25 ST and have physical properties similar to mild steel. Their tensile strength is from 55,000 to 63,000 lb. per sq.in., their yield point from 30,000 to 40,000 lb. per sq.in. and their elongation from 25 to 18 per cent. They are used for all strength members, including structural shapes, side girder sheets, letterboards, anti-climbers, coupler bars, etc. Another alloy used rather extensively is 51 ST, also heat treated, and having a tensile strength of from 45,000 to 50,000 lb. per sq.in., a yield point from 30,000 to 40,000 lb. per sq.in. and an elongation of 18 to 10 per cent. It is used for some interior finish, seat frames and trolley poles.

By

CLIFFORD A. FAUST

Assistant Editor

Electric Railway Journal

for Car Construction

The alloy used for interior sheets, bulkheads, moldings, trim, sign boxes, conduits, cable ducts and other parts which do not require the greater strength of the other alloys is 3 S, with a tensile strength of 20,000 to 25,000 lb. per sq.in., a yield point from 15,000 to 20,000 lb. per sq.in. and an elongation of 20 to 3 per cent. The fifth alloy used is 195 HT, an aluminum casting alloy, heat treated after casting to obtain the desired mechanical properties. These vary upon the heat treatment process administered, the tensile strength varying between 28,000 and 50,000 lb. per sq.in., the yield point between 13,000 and 29,000 lb. per sq.in., and the elongation between 12 and 0 per cent. It is used for trolley bases and harps, fender parts, drawbar anchorages and other similar parts requiring strength and ductility.

From the vintage of 1905—a car for Manila, using aluminum to withstand the ravages of "white ants"

Although as strong as steel, most aluminum structures weigh only about half as much. In parts where aluminum is used—the underframe, the body, the trucks, the motors and control and accessories—it has been found possible to obtain large reductions in weight. As will be seen in an accompanying table, savings in weight of 13,150 lb. have been made on some cars. In another table the structural members and equipment made of aluminum in the Cleveland Railway car are listed.

Among the more important results of light weight are less power consumption, satisfactory performance of smaller motors and other parts, higher acceleration, braking and running speed, less wear on the track structure, reduced wear of brakes and other parts, less strain on the framing, greater safety, better performance, reduction of unsprung weight of trucks and less noise.

Numerous tests have been made of power savings, resulting from lighter weight. All have shown very substantial reductions. One company reported savings varying from 15.7 per cent with a 23.1 per cent reduction in weight, to 46.2 per cent with a 33.3 per cent reduction in weight. By decreasing the weight of a car it is possible to use smaller motors with considerably less total rating, but which have a higher rating per pound of car. Similarly, many other parts, such as the controller and brake equipment, can be made smaller. Starting with higher acceleration, braking and running speed, made possible by lighter weight, a cycle is set up which includes fewer cars to maintain the same schedule, less power, fewer men, lower investment, etc.

The volume and cost of track work depends to a large extent upon the weight of the rolling stock operated. Light-weight cars can materially reduce the cost of track maintenance by subjecting the track to less wear. Because of the high accelerating and braking rates it is easier for an operator to handle a lighter vehicle. Consequently, these cars are usually handled much more efficiently and with greater safety. Less vibration and

The Illinois Central Railroad pioneered the use of strong aluminum alloys. The two-car train above, one of the first designed, appeared in 1923

Equipment in Which Aluminum Has Been Used, with Weight Data

Company and City	Equipment—Number and Type	Manufacturer	Date Equipment was Placed in Service	What Parts of the Vehicle are Aluminum
Interborough Rapid Transit Co. New York, N. Y.	300 subway motor cars and trailers	American Car & Foundry Co.	Oct. 27, 1904	Interior finish, all moldings for finish, hand rail, brackets and wiring molding. Wainscoting surface between seats, end interior panels, window panels and headlinings faced with aluminum
Chicago City Ry., Chicago, Ill.	200 semi-convertible double-truck cars	J. G. Brill Co.	1905	Air pipe, hand rails and fittings
Manila Electric Co., then Manila Electric Railroad & Lighting Corp., Manila, P. I.	15 full-convertible double-truck cars	J. G. Brill Co.	Aug., 1905	Sheet for headlining and ceilings
Illinois Central R. R., Chicago, Ill.	25 trailers 130 motor cars 85 trailers 10 motor cars—10 trailers	Pullman Car & Mfg. Co. Pullman Car & Mfg. Co. Standard Steel Car Co. Pullman Car & Mfg. Co.	1923 March, 1926 March, 1926 1928	Roof sheets, interior finish, doors, conduit, fittings, junction boxes and smaller parts
Pennsylvania R. R., Philadelphia, Pa.	8 suburban multiple-unit cars	Pennsylvania R. R.	1925	All of super structure—posts, carlins, sheets, bulkheads, doors, etc.
Chicago & North Western Ry., Chicago, Ill.	120 cars for suburban service	Standard Steel Car Co. Pullman Car & Mfg. Co. American Car & Foundry Co.	1927	All sheets above underframe
Cleveland Ry., Cleveland, Ohio	1 double-truck city car	Cleveland Ry.	Dec. 2, 1926	Body, underframe and trucks
Pittsburgh Rys., Pittsburgh, Pa.	1 pair trucks	Pittsburgh Rys.	1926	All except wheels, axles, springs and working parts
Springfield Street Ry., Springfield, Mass.	1 double-truck city car	Wason Mfg. Co.	April 14, 1927	Side members, letterboard, belt rail and body bolsters
Montreal Tramways, Montreal, Que., Canada	10 two-man city cars 40 of same type 30 of same type	Canadian Car & Foundry Co.	1927 1927 1928	Framing and exterior sheathing Exterior sheathing Exterior sheathing
Chicago & Joliet Electric Ry., Joliet, Ill.	1 double-truck city car	Cummings Car & Coach Co.	Nov., 1927	Body and underframe
St. Louis Public Service Co., then United Railways of St. Louis, St. Louis, Mo.	1 double-truck city car	United Rys. of St. Louis	Dec., 1927	Body and underframe
Twin City Rapid Transit Co. Minneapolis, Minn.	25 city cars	Twin City Rapid Transit Co.	Dec., 1927	Sheets, posts and carlins. Use now standard except underframes
Cincinnati Street Ry., Cincinnati, Ohio	1 pair archbar trucks	Cincinnati Car Corp.	March, 1928	All except wheels, axles, springs and working parts
Utah Light & Traction Co. Salt Lake City, Utah.	11 Versare electric coaches 7 Versare electric coaches	Versare Corp. Cincinnati Car Corp.	Sept. 9, 1928 Dec. 4, 1929	All except two underframe members
Delaware Electric Power Co. Wilmington, Del.	10 double-truck city cars 10 of same type 12 of same type	J. G. Brill Co.	Dec. 4, 1928 1929 Not delivered	Sheeting, seats and miscellaneous parts
Calgary Municipal Ry. Calgary, Alta., Canada	3 one-man city cars 6 of same type	Canadian Car & Foundry Co.	1928 1929	Exterior sheathing
Pittsburgh Rys., Pittsburgh, Pa.	1 double-truck suburban car	Osgood-Bradley Car Co., Trucks by Timken-Detroit Axle Co.	June, 1929	Body and underframe. Trucks all except wheels, axles and springs
J. G. Brill Co. Philadelphia, Pa.	1 experimental trackless trolley	American Car Co.	June, 1929	Body and underframe
Dept. of Street Rys., Detroit, Mich.	1 double-truck city car	Dept. of Street Rys.	July, 1929	Castings, posts and miscellaneous parts
Northwestern Pacific R.R., San Francisco, Cal.	5 interurban motor cars 5 interurban trailers 5 motor cars of same type 5 trailers of same type	St. Louis Car Co.	Sept., 1929 Not delivered	Roofs, conduit, seats and interior finish
Louisville Ry., Louisville, Ky.	1 double-truck city car	Cincinnati Car Corp.	Sept., 1929	Body, underframe and trucks
United Traction Co., Albany, N. Y.	1 double-truck city car	Cincinnati Car Corp.	Sept., 1929	Body and underframe
Third Avenue Ry., New York, N. Y.	1 four-wheel double-end city car	J. G. Brill Co.	Sept., 1929	Body, underframe and parts of the truck
British Columbia Electric Ry. Vancouver, B. C., Canada	15 one-man, two-man cars	Canadian Car & Foundry Co.	Nov., 1929	Exterior sheathing
St. Louis Public Service Co., St. Louis, Mo	1 double-truck city car	St. Louis Public Service Co.	Dec., 1929	Body and underframe
Monongahela West Penn Public Service Co. Fairmont, W. Va.	3 double-truck cars	G. C. Kuhlman Car Co.	1929	Sheeting, air compressors and miscellaneous parts
Youngstown Municipal Ry. Youngstown, Ohio	13 city cars	G. C. Kuhlman Car Co.	Being delivered	Sheets and miscellaneous parts
Chicago & Joliet Electric Ry., Joliet, Ill.	1 four-wheel car	Cummings Car & Coach Co.	March, 1930	Body and underframe
Delaware, Lackawanna & Western R. R. Hoboken, N. J.	141 motor cars for suburban service	American Car & Foundry Co.	Not delivered	All sheets except outside side sheets
Brooklyn & Queens Transit Corp. Brooklyn, N. Y.	100 double-truck city cars	Osgood-Bradley Car Co., (50) J. G. Brill Co. (50)	Being delivered	Interior panels, headlining and miscellaneous parts
Board of Transportation, New York, N. Y.	300 subway cars	American Car & Foundry Co.	Not delivered	Seats, doors, door control, miscellaneous parts and all sheet except outside sheeting

Aluminum was used for car construction as early as 1904. In that year and the one following, three companies adopted the lighter metal for sizable orders. Experimentation on a large scale, however, began in 1923, when the Illinois Central incorporated strong alloys in the design of several suburban cars.

During the latter part of 1926 the Cleveland Railway completed the first all-aluminum street car. In 1927 cars were built in Springfield, Montreal, Joliet, St. Louis and Minneapolis.

and Other Pertinent Information

Weight of Aluminum Used in Lbs.	Total Weight of Vehicle in Lbs.	Weight Saved in Lbs.	Estimated Net Additional Cost of Aluminum per Pound of Weight Saved, in Cents	Weight per Seated Passenger in Lbs.	For Detailed Description Refer to the Issue of
.....	Live Load 88,000 motor car 66,000 trailer	.....	.....	1,620 motor car 1,180 trailer	Oct. 8, 1904 March 4, 1905
.....	52,000	.....	.....	1,182	April 8, 1905 Sept. 16, 1905
.....	.....	.....	.....	.....	April 29, 1905 Aug. 12, 1905
4,985 average	88,700 trailers 140,000 motor cars	8,958 average	22	.....	Nov. 10, 1923 Feb. 7, 1925 Dec. 31, 1927
8,636	111,300	13,150	36	.....	July 11, 1925
3,600	99,600	7,000	20	1,015	Jan. 8, 1927
6,647	30,300	12,901	20	618	Dec. 4, 1926 April 9, 1927
518 per truck	1,100 per truck	856 per truck	25.3	.....	.....
735	23,450	.....	.....	521	March 26, 1927 May 14, 1927
2,275 650 650	33,400 35,900 34,700	3,700 1,200 1,200	22 22 22	759 817 789	Sept. 3, 1927 Dec. 10, 1927
10,000	23,722	13,500	20	474	Dec. 17, 1927
3,697	32,000	5,332	35.9	542	Dec. 24, 1927
1,372	27,670	2,618	17.3	553	Nov. 26, 1927 March 31, 1928
450	3,668	650	22.3	.....	.....
.....	16,000	.....	.....	372	Sept. 8, 1928 Feb. 9, 1929
.....	36,640	.....	.....	833	Sept. 22, 1928 Dec. 15, 1928
700	37,800	1,330	.....	713	Sept. 15, 1928 Jan. 12, 1929
3,325	25,200	7,863	19.4	600	July, 1929 Nov., 1929
1,595	14,500	2,282	24.1	483	Aug., 1929
.....	32,500	4,000	.....	625	Aug., 1929 Nov., 1929
3,579 motor cars 3,226 trailers	110,000 79,000	6,650 6,049	17.6 average	1,122 motor cars 767 trailers	March 9, 1929
2,300	29,150	2,500	40	550	June, 1929
2,300	32,450	2,500	40	737	Nov., 1929 Feb., 1930
.....	27,000	3,000	.....	530	Oct., 1929 Nov., 1929
650	39,000	1,330	.....	780	Jan., 1930
4,084	36,180	7,350	19.7	584	Feb., 1930
.....	35,000	.....	.....	729	Jan., 1930
.....	28,000	.....	.....	622	Jan., 1930
.....	.....	.....	.....	.....	.....
.....	148,000	.....	.....	1,762	Aug., 1929
.....	34,000	.....	.....	630	Sept. 14, 1929
.....	85,000	.....	.....	1,417	Nov., 1929

The great number built in 1928 and 1929, listed in the above table with several now on order, indicates that aluminum as a metal for car construction is beyond the pioneering stage and well advanced in the period of general acceptance by the industry.

attendant noise result with the use of aluminum because of its physical nature.

Greater safety results from the ability of aluminum to absorb impact loads without distortion. In the event of a severe impact, when the yield point of the metal is exceeded there is a tendency for the structure to hold together. I-beams, webs of channels, built-up girders and gusset plates bend but do not tear, as most grades of structural steel will do under similar strains. The

Equipment and Structural Members of the Cleveland Railway Car, Made of Aluminum

Body

All side and end plates
Steps, front and center
Hand brake levers
Sash rail
Post angles
Door frame
Head lining strips
Conduit
Carlins
Letterboard
Junction box
Bulkhead

Underframe

Cross channels
Coupler bar attachment to underframe
Front platform atem
Body bolster
Gusset plates
Radial bar

Trucks

Side bars
Pedestal gibs and tie bars
Horizontal lever
Truck bolsters
Side bearing housings
Motor supports
Brake shoe holders
Top brake rods

Motors

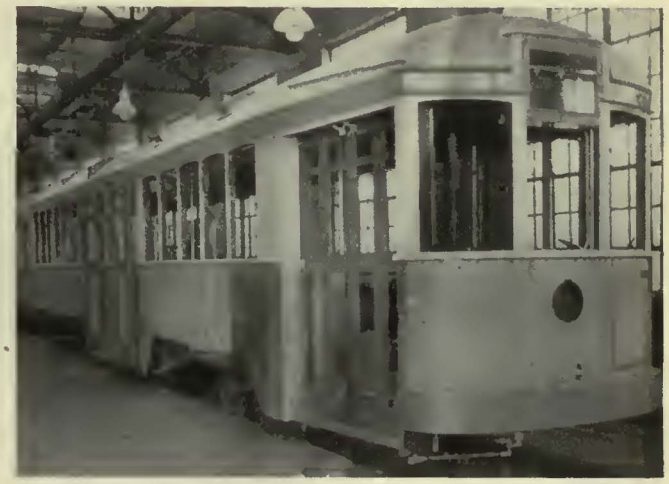
Gear cases
Pinion and commutator end housings
Pinion and commutator end axle caps

Controller

Back frame

Accessory Parts

Bumper
Fare box
Seat pedestals and framework
Draw bar
Heater duct
Door shafts
Window locks
Conductor seat
Ventilators
Window guards
Brake cylinder parts
Front draw head
Fare box stand
Stanchions
Seat grab handles
Sign box
Sand box
Head light
Trolley base
Fender
Trolley catchers
Window screens
Coupler
Gong



During 1926, the Cleveland Railway built the first street car of aluminum, using this metal not only for the body and underframe, but also for the trucks

low modulus of elasticity is probably responsible for this characteristic.

Another distinct advantage of aluminum is its ability to withstand atmospheric corrosion. Because of this resistance there is little tendency for paint to peel off, as it does quite frequently on steel. Tests conducted on cars long in service show no signs of corrosion.

During the development of aluminum for street cars it became apparent that it was desirable to isolate the motor ground circuits to prevent leakage of current through joints of aluminum and steel. One instance was encountered where a divided ground circuit caused electrolytic corrosion of an aluminum joint fastened with steel rivets. This was entirely corrected by proper grounding.

From the standpoint of maintenance, aluminum alloys have numerous advantages. Chief among these is the case with which the metal can be worked. A portable pyrometer for measuring heat intensity is necessary in a shop for the proper handling of aluminum alloys, and it

Early in 1927 the Springfield Street Railway introduced its light-weight experimental car, with side members, letterboard and other parts of aluminum

is desirable to have a pyrometer-controlled electric furnace, but no other equipment need be purchased. Punching, shearing, machining and riveting are all performed with the same tools that are used for steel. Bending cold must be watched and the particular qualities of the various grades and tempers of aluminum alloys known. Temperature control is essential for hot bending or forming, this process requiring a special technique.

The lighter metal was first used in Canada by the Montreal Tramways. A total of 80 cars with aluminum are now in service on this property

Aluminum alloys can be welded with an oxy-acetylene torch and at the present time an electric welding apparatus is being developed. Although aluminum parts for replacement are more expensive than steel ones, this cost can be largely offset by the high salvage value.

Perhaps the greatest deterrent to the more general adoption of aluminum alloys for car construction has been the higher cost of this material. The alloys used for car construction cost from 28 to 45 cents per pound or 9 to 15 cents per square foot, as compared with 3 to 6 cents for steel. However, the smaller weight of material required, the power savings possible, the lower first cost of motors and other parts and the lower maintenance cost of cars and track, largely offset the extra original cost. In terms of extra cost per pound of weight saved, 20 cents can be taken for an average. In the accompanying table listing cars using aluminum, the estimated additional costs of aluminum per pound of weight saved are shown. As will be noted, the figures vary from 17.3 cents to 40 cents. Since the net savings for those cars which were ordered in quantity vary from 15.3 cents to 22 cents, it is reasonable to assume the figure of 20 cents as representative. It has been further estimated that the cost of hauling dead weight is from 5 to 10 cents per pound per year for electric railway cars in city service and 3.5 cents on cars in heavy suburban service. Assuming the figure of 5 cents as the average cost, it appears that aluminum will pay for itself in a period of four years.

Another important factor bearing on the cost is the lower initial investment for motors and other parts which can be made smaller. It has also been pointed out that if lighter equipment were adopted generally it would permit the use of a lighter track structure, which would materially lower the capital investment in this part of the system. This would be true also for the generating and transmission system.

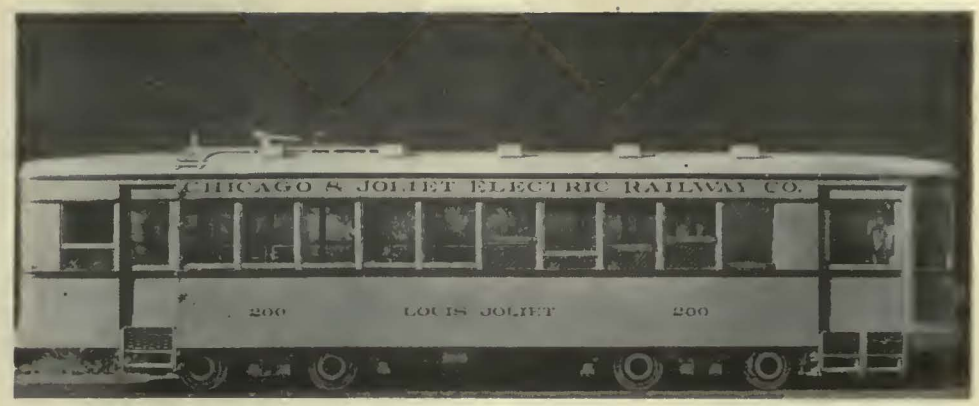
At the time the first cars were made of aluminum practically all of the parts were made individually, involving a heavy extra unit cost. In addition, the pioneer designers of aluminum cars expended large amounts in preparing their designs and in carrying out other experimental work. Naturally, the costs of the first vehicles were much in excess of the old standard cars. As the car manufacturers become more and more accustomed to the fabrication of this metal and get the proper machinery and training for using it, the costs will continue to go down. Moreover, when aluminum cars are built in quantity, it is likely that the total cost of a car will be no higher than for a standard steel car.

As has been pointed out, aluminum was used in the construction of cars as early as 1904. In that year and the year following three companies received cars using aluminum to some extent. They were the Chicago City Railway, the Interborough Rapid Transit Company and the Manila Electric Railroad & Lighting Corporation. The Chicago car used aluminum for the air pipe, hand rail, fittings and other miscellaneous parts, while the Interborough used

Another Canadian user of aluminum is the British Columbia Electric Railway. Only recently the company received 25 cars of the type shown

aluminum for the interior finish and miscellaneous castings in its cars. In the fifteen cars built by the J. G. Brill Company for the Manila company, aluminum sheet was used for the headlining. This metal was selected so that the cars would have a material which would withstand the ravages of the tropical insects without adding to the weight of the car.

In the early days of the local transportation industry wood was a satisfactory material for use in street car bodies. Later, however, came the need for a stronger material and metal began to replace wood. But aluminum was not ready. While it was effective in resisting the attack of insects in tropical countries, for the highly stressed portions of the structure it could not cope with steel. There were no strong alloys, and heat treating processes were unknown. In the next ten years, however, strong aluminum alloys were developed which have mechanical properties comparable with those of steel and which, at the same time, have the light weight of the parent metal.



Five tons of aluminum were used in the Blackhall car of the Chicago & Joliet Electric Railway. The car seats 50 passengers but weighs only 23,722 lb.

The first attempt to reduce the weight of car equipment by means of strong alloys of aluminum was made by the Illinois Central Railroad, which constructed a number of cars for suburban service in 1923. These cars proved satisfactory, so 215 additional cars were built in 1925, with aluminum used for roof, seats, interior finish, doors, conduits, junction boxes, headlights and other miscellaneous parts. About this time the Pennsylvania Railroad went even further and constructed eight suburban cars for its service outside of Philadelphia with all aluminum superstructures. Practically everything above the underframe with the exception of a belt rail was constructed of aluminum. Shortly thereafter the Chicago & North Western Railway built 120 suburban cars having all aluminum sheets above the underframe. Both the Illinois Central and the Chicago & North Western have put additional cars in service since and have extended the use of aluminum somewhat over the original applications.

Among the first electric railways to use alloys were the Cleveland Railway, the Pittsburgh Railways, the Springfield Street Railway, the Chicago & Joliet Electric Railway, and the Montreal Tramways. In the car of the Cleveland Railway aluminum was employed not only in the body and underframe, but also in the trucks. Its total weight of 30,300 lb. represented a saving of 12,901 lb. over the standard car of the company. Because of the extensive application of the lighter metal and the great reduction in weight obtained, much interest was centered on this car.

The car designed by the Springfield Street Railway and built by the Wason Manufacturing Company used aluminum for the side members, letterboards, belt rails and body bolsters. Montreal introduced the first aluminum cars in Canada. In one order placed with the Canadian Car & Foundry Company in 1927 both the framing and exterior sheathing were of aluminum; in a second order all the sheathing was of this material. All metal in the car body and underframe of the Chicago & Joliet Electric Railway car was made of aluminum with the exception of the bolts, rivets and similar parts.

During 1927 a car for the United Railways of St. Louis and 25 for the Twin City Rapid Transit Company, all using aluminum extensively, appeared.

Timken-Detroit aluminum truck, weighing 5,621 lb., used under the Pittsburgh Railways all-aluminum car. The weight saving per truck was 929 lb.; for the entire car it was 7,863 lb.

During the next year a few more vehicles were produced, among them being ten city cars for the Delaware Electric Power Company, by Brill, three cars for the Calgary Municipal Railway, built by the Canadian

In this four-wheel car of the Third Avenue Railway, placed in service last September, aluminum was used for the body, underframe and parts of the new truck

Car & Foundry Company, a pair of Cincinnati Car Corporation trucks for the Cincinnati Street Railway, and eleven Versare electric coaches for the Utah Light & Traction Company. The latter order marked the first use of aluminum in the construction of trackless trolleys.

Spurred on by the developments in the previous years, the industry brought forth an even greater number of cars using aluminum in the year 1929. Among these were an experimental car for the Pittsburgh Railways, by Osgood-Bradley; a double-truck car for the Department of Street Railways, Detroit; ten interurban cars for the Northwestern Pacific Railroad, by the St. Louis Car Company; a sample car for the Louisville Railway, manufactured by the Cincinnati Car Corporation; the United Traction Company car, built by the Cincinnati Car Corporation; the four-wheel city car of the Third Avenue Railway, manufactured by the J. G. Brill Company; fifteen cars for the British Columbia Electric Railway, built by the Canadian Car & Foundry Company, and a sample car of the St. Louis Public Service Company.

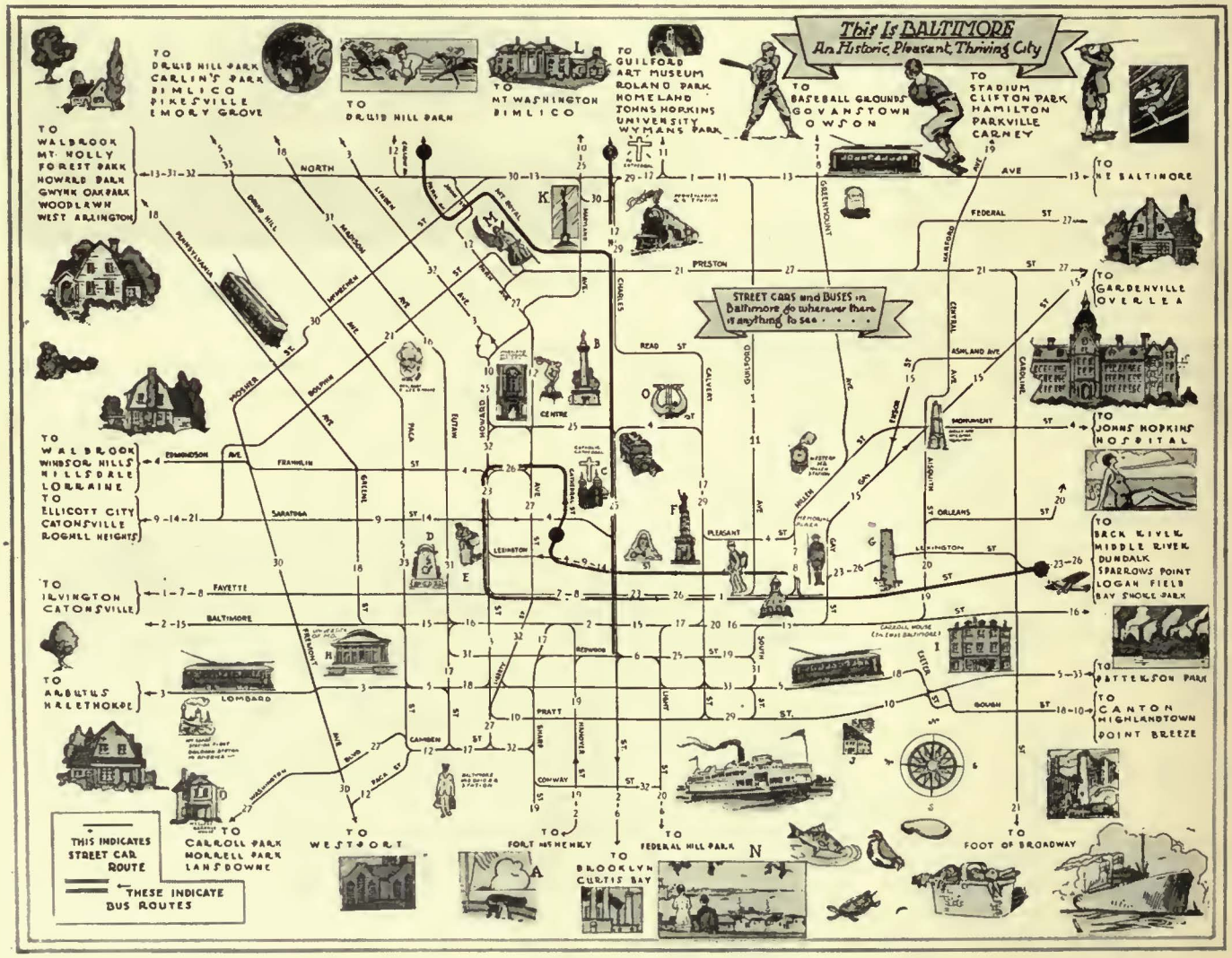
Among the more recent orders for equipment using aluminum are the four-wheel car of the Chicago & Joliet Electric Railway, designed by J. R. Blackhall; three double-truck cars of the Monongahela West Penn Public Service Company, by the G. C. Kuhlman Car Company; thirteen cars for the Youngstown Municipal Railway, of G. C. Kuhlman manufacture; 100 cars for the Brooklyn & Queens Transit Corporation, being built by Osgood-Bradley and Brill; 141 motor cars for electrified suburban service of the Delaware, Lackawanna & Western Railroad, and 300 subway cars for the city of New York, both these orders being filled by the American Car & Foundry Company.

Practically all of these cars have been described in detail in previous issues of ELECTRIC RAILWAY JOURNAL. In the accompanying table the dates of publication of these descriptive articles are shown, along with weight figures and other pertinent information.

With the rapid progress that has been made in the past seven years in the use of aluminum for car construction, and considering its many advantages, there is little doubt that this metal is destined to play an extremely important part in all future vehicle construction.

Railway Distributes Picture Map

AS PART of the celebration marking the 200th anniversary of the founding of the city of Baltimore, the United Railways & Electric Company printed and distributed a picture history map of the city illustrated in color in the medieval manner. This shows the company's car and bus routes as well as places of historic interest. The map folds up to pocket size. On the back are short sketches telling interesting facts about Baltimore's historic shrines. It has proved very popular with the public and demands were received by the company from individuals, department stores, hotels, etc., for extra copies.



Map tells how to reach historic spots in Baltimore by street car and bus

Prominent way engineers give opinions on basic principles of track construction and explain their practices under numerous specific local conditions

SINGLE LIFE *versus* RENEWABLE TRACK

AMONG the factors which determine the design of track laid in paved streets, the possibility of reconstruction at some future date under changed conditions imposed by new grades, street widening, or similar municipal requirements, is of prime importance. It might be thought that in the majority of large cities, alignments, width of streets and grades would have been permanently settled many years ago, but experience shows this is by no means the case. On account of changing conditions brought about by automotive developments within the past fifteen to thirty years, alterations continue to be made. Streets have been widened and straightened; paving construction has improved to meet the demands of greater motor vehicle loads and increased traffic. With a view to determining the effect which these changes have upon the design of electric railway track, the JOURNAL has obtained the opinions of a number of prominent way engineers.

Advocates of single-life track construction feel that had their predecessors 15 to 30 years ago designed tracks on the basis that some parts could be allowed to remain in the ground and be used again now in a rebuilt track, it would have been a mistake. They ask what way there is of knowing what conditions will exist 15 to 30 years hence. Frank B. Walker, chief engineer, Eastern Massachusetts Street Railway, states that in his sixteen years' experience on that New England property, in a section of the country which should be as settled as any other, there have been very few cases where a track has been reconstructed in the exact location and grade of the previous track. He further points out that the industry may be running buses instead of street cars in some places at the end of the normal life of present-day track. To spend any money on ties or foundations with the hope that when the rail is worn out, such material will be of benefit in reconstructing

a new track upon the old, Mr. Walker considers would be extremely ill-advised.

The relative advantages of single life and renewable designs depend also to a considerable extent on soil conditions. H. M. Steward, superintendent of maintenance, Boston Elevated Railway, stresses this point in his discussion of the subject. He states that under certain conditions of soil it is necessary to support the track structure on a concrete bed, similar to the invert of a subway. On this concrete bed the track structure is built, using a minimum amount of material for surfacing. With this type of construction it is assumed that the concrete bed below the track structure would not have to be disturbed and that a second track could be built thereon. With other conditions of soil steel ties or some form of mechanical tie may be imbedded in concrete of suitable strength and thickness, the top of the concrete slab being at the proper distance from the head of the rail to allow the pavement required to be installed. Some engineers using this form of track construction are of the opinion that when the rails wear out it is possible to remove the old rail and install new ones, or by using a shallower rail, by raising the grade of the track, or by a combination of both, to build a new track structure on top of the old concrete foundation.

Monolithic concrete track recently built by the Boston Elevated Railway

Mr. Steward further points out that where the soil conditions are more favorable, it is often not necessary to provide a concrete bed for the track structure, or to imbed the ties and a portion of the rail in concrete. Instead, wooden ties and a sufficient quantity of crushed stone ballast can be used to provide a satisfactory track. With this type of construction a concrete base to support the paving, approximately 6 in. in thickness, may be provided, upon which any type of pavement may be laid. When it becomes necessary to rebuild this type of track the ballast, at least, will be available for further use if it is properly cleaned, and it is also probable that the ties, if they have been properly treated, will be in sufficiently good condition to warrant their use for a second track.

Despite these views on the possibility of a renewable type track construction, Mr. Steward believes that a street railway has no permanent right in a public street, but instead, locates and builds its track only "at its peril." Street changes, necessitating complete relocation of a track area, or underground structures which are constantly being installed under or across the track, mean complete or partial reconstruction of the track and substructure. No matter how carefully a track may be constructed, it will be damaged to a very considerable extent if the paving between the rails or alongside the rails is not carefully installed to prevent water from entering.

With the possibility that all or some of these factors will enter into the problem, Mr. Steward does not believe it advisable to expend too large an amount of money with an expectation of building a permanent structure which will not be disturbed, in order that certain parts may be renewed without disturbing the balance.

In San Francisco, the adoption of single-life track construction has largely been governed by local soil conditions. B. P. Legaré, engineer, maintenance of way and construction, Market Street Railway, has found it impracticable to use a type of renewable track structure with the idea of saving a part of it when reconstruction becomes necessary. In that city there are several

In 1907, track on Market Street in San Francisco had to be raised 4 ft. to bring it back to original grade

different kinds of soil. A great deal of the downtown, heavy traffic district is made up entirely of fill, over an area which was originally either water or mud flats. In these localities it is impossible to keep the grade of the street at any fixed elevation. Obviously, under this condition it would not be practical to construct a track with the expectation of only renewing the rail and utilizing the foundation at some future date. On the Main Street-Market Street line, Mr. Legaré has reconstructed the track twice in the last 24 years. In each case the street had sunk below the official grade and had to be brought back to that grade at the time of laying the new track. The first time it was raised approximately 4 ft. and the second time, at the same place, 3 ft.

In other localities of the city, where the soil does not settle and stays at practically a uniform grade, the Market Street Railway has been forced to renew track areas in conformity with changes in street structure made by the municipality. In order to meet the change in traffic conditions and the demands of modern motor vehicles, the city has tended to replace old pavement with more modern structures, which in many cases change the crown of the road. The city of San Francisco is replacing a large number of granite block pavements with asphalt, the latter requiring a much flatter crown than the block construction. This, of course, necessitates a change in the elevation of the track structure.

If the electric railway track were built on a permanent foundation, it would be awkward to find a rail that would fit the changed conditions, and such construction would be very expensive to tear out. Experience on the Pacific Coast has proved that, in a paved street, the redwood tie will last as long as the rail and should be renewed when the rail is renewed.

Further experiences in San Francisco are given by M. M. O'Shaughnessy, chief engineer, Municipal Railway of San Francisco. Although he has never used a type of construction in which only certain parts are renewable, his observation of such construction has always been that by the time the rails needed replacing, new ideas of construction or unsatisfactory results necessitated entirely removing the parts which were supposed to be permanent. This often resulted in excessive costs and sometimes abnormal delays. He feels that nothing has yet been brought forward to equal the wood tie construction on a resilient base. Standard construction of the Municipal Railway consists of wood ties laid on a substantial hard rolled sub-ballast. Experience has proved that in using California split redwood ties, the life of the wood is equal to that of the rail on all of the major routes. Complete reconstruction of such track is done at minimum expense and with the least disturbance to service.

M. M. Johnston, division engineer, the Connecticut Company, New Haven, Conn., in discussing his preference for single-life construction, states that the most economical method of designing and building a track structure should insure full serviceable life of the particular rail section to be used on each job. In other words, the rail should be the governing factor in track design. He believes that as there is usually very little material of value that can be salvaged or re-used after this period, it is more economical to rebuild the entire structure after the rail is worn out in service. He further states that with the present improved methods of welding the rail, it seems only reasonable to assume that the joint is no longer one of the weakest points in the track structure and that its life, with reasonable maintenance in the way of grinding out any depression that may develop on the rail head, will equal that of the rail.

In discussing the ties to be used, Mr. Johnston believes that either wood or substitute ties will function properly during the life of the rail, provided proper care is taken in their selection. With the wood tie properly spaced to distribute the loads on the ballast, tie plates used to prevent cutting the rail and the ties thoroughly protected by a good concrete foundation, there seems to

Again in 1923, complete reconstruction of track structure had to be made on Market Street, San Francisco, when street was brought back to official grade

be little fear that the ties will fail before the rail life is gone. In his opinion excessive rail movement, which is so destructive to the ties and pavement, usually develops from one or more of the following causes: Improper spacing of ties, poor tamping or spiking, and the failure to use tie plates when necessary to distribute the load and prevent rail cutting. If this movement is prevented by good designing and careful inspection, Mr. Johnston believes there should be very little trouble, if any, from tie failures.

Track structures built for single life as a unit, but with a maximum amount of salvage value when rail renewal becomes necessary, are considered by Howard H. George, superintendent of way department, Cleveland Railway, Cleveland, Ohio, as the ideal construction. Mr. George's experience has taught him that the design of a track structure should be governed by the following factors: The probable number of years the track will be required to be maintained in the location at which it is to be constructed; the volume of traffic it will be required to carry during that time; and the probability that, within its normal useful life, it will have to be disturbed for reasons beyond the control of the railway, as, for instance, changes in grade or alignment of the street.

These factors will all have an important bearing upon the type of track which should be built, but even when they are determined within a reasonable degree of accuracy, sound economics should control the final selection. Mr. George believes this goes much farther than first cost. The following conditions should be met: The design should provide reasonable assurance of the maximum useful life for the structure as a unit; it should be such as to insure the minimum amount of expense for maintenance during its useful life; it should be such as to permit the maximum amount of salvage when rail renewal becomes necessary, and this requirement takes into consideration the possibility of renewing with a different rail section than that used originally; it should be such as to make it entirely practicable to make any necessary repairs with a minimum interference with car operations, and finally, it should be such as to interfere for the shortest possible time, and to the least possible extent, with the public use of the thoroughfare on which it is constructed, either for its original construction, ordinary repairs, or for major renewals.

Pressure-treated creosoted wood ties are used in Cleveland

It has been Mr. George's experience over a period of 25 years that these requirements are best met by a type of construction which will permit the structure, from the ties down, to wear out at least two sets of rails. He prefers pressure-treated, creosoted wood ties, and believes that if proper and well-known rules and precautions are observed in constructing such track it will give excellent service during the normal life of the first rail, and when it becomes necessary to renew this rail, it can be accomplished with minimum expense and with the least interference to the public use of the street as well as car operations. Mr. George adds "What we must aim for is to reduce the cost per year of useful life of every unit in the track to the smallest figure practicable. But in any case, all the factors must be considered and not just a few."

That the question of single life versus renewable track construction hinges on the proper treatment of the paving problem is the opinion of W. R. Dunham, Jr., Department of Street Railways, Detroit, Mich. He believes that to determine the proper track construction the pavement must be considered as a part of that structure and that track should be designed so as best to fit in with it. A break-down in pavement even when laid around track built in the best possible way as a track structure, will inevitably cause high maintenance costs, together with the destruction of the track. The breakdown may be entirely due to the track construction. A pavement must be rigid if it is to withstand traffic; a flexible track cannot be built in a rigid pavement without destroying the pavement. To build a track in these days with the basic idea in mind of renewing a part of it 40, 30, or even 20 years hence in the face of ever-changing conditions in the industry, hardly seems warranted. Mr. Dunham's experience indicates the need for more thought for permanency and less for renewability.

It has been the standard practice of the Birmingham Electric Company, Birmingham, Ala., to construct track on creosoted ties with well-tamped ballast. On top of this is placed a 6-in. slab of concrete to hold the brick paving. According to A. Taurman, superintendent of equipment, way and structures, this type of construction has worked out very satisfactorily for the following reasons: Creosoted ties and blast-furnace slag are easily secured at reasonable prices; this type of track construction can be done under traffic; the territory along many of the streets in Birmingham is not very well developed and the gas, water, and sewer lines in many places have not been installed. This type of track construction readily lends itself to repairs when these lines are installed as the city develops.

The only criticism Mr. Taurman finds with this type of track construction is that when the rail is worn out the concrete slab may have to be removed, but he feels there is no reason why the ties and ballast should not be used. The type of rail he is using is 101-lb. T, with thermit-welded joints, which he estimates under traffic conditions will last from 20 to 25 years. In the downtown section, where traffic is heavy, the Birmingham Electric Company installs 122-lb. girder rail, and Mr. Taurman is of the opinion that track constructed where both vehicular and electric car traffic is heavy should have a permanent base if possible, so that when the rails are worn out they may be renewed with as little interruption to traffic as possible. He has recently found it necessary to renew rails in the downtown section where the track was constructed on this basis, and found that

the interruptions to traffic were very slight, compared with what they would have been if the entire foundation had had to be removed.

J. H. Haylow, chief engineer, Memphis Street Railway, Memphis, Tenn., states that experience in this city proved that a track foundation consisting of stone ballast, well drained, and creosoted pine ties covered with concrete will endure for at least 40 years. Also, that 7-in. standard A.E.R.E.A. rail, judging from his experience in other sections, will endure for 20 years. Why not, therefore, install another rail on the same foundation? By so doing Mr. Haylow believes that money can be saved, that the accident liability of the company can be reduced and that much inconvenience can be saved the company as well as the public. He believes that for a long period of time and the probability of change in grade of the track is slight, Mr. Roundey believes that a carefully constructed track area with a permanent foundation is economical and that rail renewals can be made without disturbance of the sub-structure.

C. A. Smith, superintendent roadway department, Georgia Power Company, Atlanta, Ga., believes that the question of single life or renewable type track construction depends principally on what is likely to be done in the street in the repaving or changing in grade at some future time. He states that it would not pay to go to any additional cost to make provision for the renewal of the rail on the old foundation if there was a likelihood that the grade of the street would be changed or that the type of pavement would be such that the original

Snaking-in a long section of thermit-welded rail in Birmingham, Ala.

these considerations constitute convincing evidence that it is not only good engineering but good business to construct a track foundation that will not be materially interfered with when the time comes to renew the rail. The standard type of track construction in Memphis is shown in an accompanying illustration.

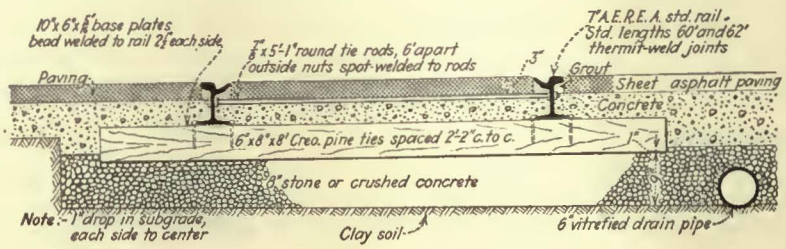
In discussing his preference for renewable type track construction E. P. Roundey, engineer way and structures, New York State Railways, Utica, N. Y., takes into consideration the factors which affect the first cost, maintenance and replacement. He considers the three types of track structure most commonly used, namely, "steel tie and concrete ballast, wood tie and concrete ballast, and wood tie and stone or gravel ballast." The concrete-ballasted type, with either creosoted wood or steel ties, is the type which ordinarily will require renewal of the rail only. The wood tie and stone or gravel ballast type usually requires renewal of the ties as well as the rail, unless the ties are creosoted and protected from mechanical wear by tie plates.

Mr. Roundey's experience has shown that in some cases many of the ties in concrete-ballasted construction become loose by the time the rail is worn out so that much of the ballast has to be excavated and replaced. This costs about as much as it does to replace wood ties on stone ballast. However, when conditions of the subgrade are proper, the width of street definitely settled foundation could not be used. In some instances, however, such foundations can be provided at very little additional expense, and when the time comes for the rail to be renewed this can be done on the old foundation, if properly constructed, at a saving of a great deal of expense over the reconstruction of the whole track.

Many renewals of this sort have been made in Atlanta. For example, last year it was necessary to renew the rails and special work at Peachtree Street, near Currier Street. This special work curve of 9-in. guard section was built in 1915, the foundation being creosoted pine ties on grouted ballast. The estimated cost of tearing up the whole paving area, track and foundation and replacing them was approximately $12,000. It was anticipated, however, that the creosoted ties and grouted ballast would be in good condition and, therefore, the pavement was opened up for approximately 1 ft. on each side of each rail only; tierods were burned off; the old rail was taken out and a new 9-in. rail of exactly the same alignment laid on the old ties. The ties and foundation were found to be in good condition. Beveled tie plates were installed on each tie. In 1915, it was not the practice to use steel tie plates as it is now, and without these plates Mr. Smith has found that the life of a creosoted tie is determined by mechanical wear rather than by decay. The old tierods were burned off about 6 in. from the rail and new tierod

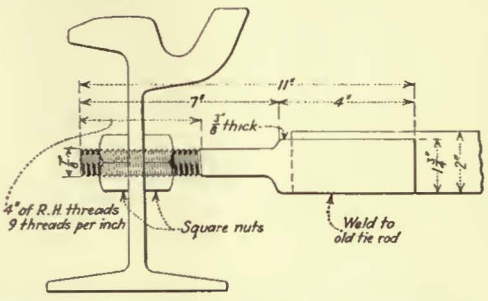
terminals welded to the old rods. This eliminated the necessity of tearing up the pavement to install new tie-rods. The total cost of the job, carried on as outlined above, was $5,920, only about 50 per cent of what it would have cost to reconstruct the whole track, including the foundation and pavement. A sketch showing the tierod terminal is shown with this article.

Likewise, Mr. Smith's department has had many instances where it has been able to renew special work, such as double-track branch-offs, using the same design of work and same depth of rail, laying the new work on the old road bed, this road bed consisting of creosoted pine ties and grouted ballast. Whenever this can be done, it saves approximately 50 per cent of the total cost as compared with what the cost would be if the whole roadbed had to be reconstructed. The present practice in Atlanta on straight track is to use 80-lb. A. S. C. E. rail, beam construction with ties spaced 5 ft. on center, concrete pavement. The reasons for the adoption of this design are its low cost of construction and its permanence. Renewal of the rail without renewing the foundation in the future was not a primary factor. This, however, Mr. Smith thinks can be done.



Standard track construction used by Memphis Street Railway

Treated wood tie and stone balast sub-structure is used to serve through the life of two rails in Memphis



Welding new terminals to old tierods has effectively cut the cost of track renewal in Atlanta

The question as to whether it is more economical to build single-life or renewable track is one that requires careful consideration of the specific conditions to be met. This is the expression of H. F. Merker, formerly chief engineer, Brooklyn City Railways, Brooklyn, N. Y. Assuming that economy is the basis on which the question is to be considered, there should be some assumption as to what can reasonably be considered the life of a piece of track. Many tracks have been declared worn out, yet have carried cars for a considerable number of years thereafter by careful maintenance. The life of track has been variously taken at as low as 10 years and as high as 25, and furthermore there are tracks still in service as old as 30 years or more. Somewhere within this range, however, would lie the life that would have to be considered. In selecting the type of track for any specific condition Mr. Merker further considers the kind of paving to be used, and what assurance there is that when the track is later to be reconstructed the same type and design will be used. Again, what section of rail is to be used, and can it be determined what section will be used in future reconstruction? What will be the grade of the reconstructed track? What is the soil condition and does it require a rigid foundation to carry the track?

This latter question of soil conditions Mr. Merker considers an important one. If a rigid foundation is needed on account of local soil conditions (and this is frequently the case) then the foregoing questions shrink in importance, and it might be just as well to provide a renewable type of construction, as the loss would not be great if the conditions, by chance or otherwise, were unfavorable to renewal. If, however, there is doubt as to the kind of paving that would be used in reconstruction, or if there is a likelihood that another section of rail will be used, or if a change of grade is probable, and particularly if the local soil condition is such as to permit a much cheaper type of construction for base or foundation, then it would not seem good business to invest a large sum of money in a construction that is not really needed.

Mr. Merker states that there have been many localities where a track could safely be built with nothing under the ties but the natural soil, assuming that the ties used were standard wood ties, with the usual spacing. There would be needed, of course, a base for the paving, but when time came for a renewal, the entire structure could economically be scrapped and entirely renewed, allowing at the same time a change of type or section of rail, a different sort of paving, and at the same time any change of grade that might be required. Many soils, however, lack the supporting qualities necessary for this type of cheaper track construction. In such a case it would be far better to add the extra cost in building a track that would distribute the load, keep out the water and permit the renewal of the worn parts, which would be the rail, leaving the sub-structure to do additional service for another life. Mr. Merker concludes that in his opinion there is no one type or design of track that would meet all conditions, that each case or each locality must be carefully considered individually and the track structure designed accordingly.

At each scheduled repair, the mechanic in charge of engine inspection is responsible for the draining, cleaning and refilling of the crank case

Sheer gat grease guns are used to lubricate steering and other chassis mechanisms

Economies Effected

in

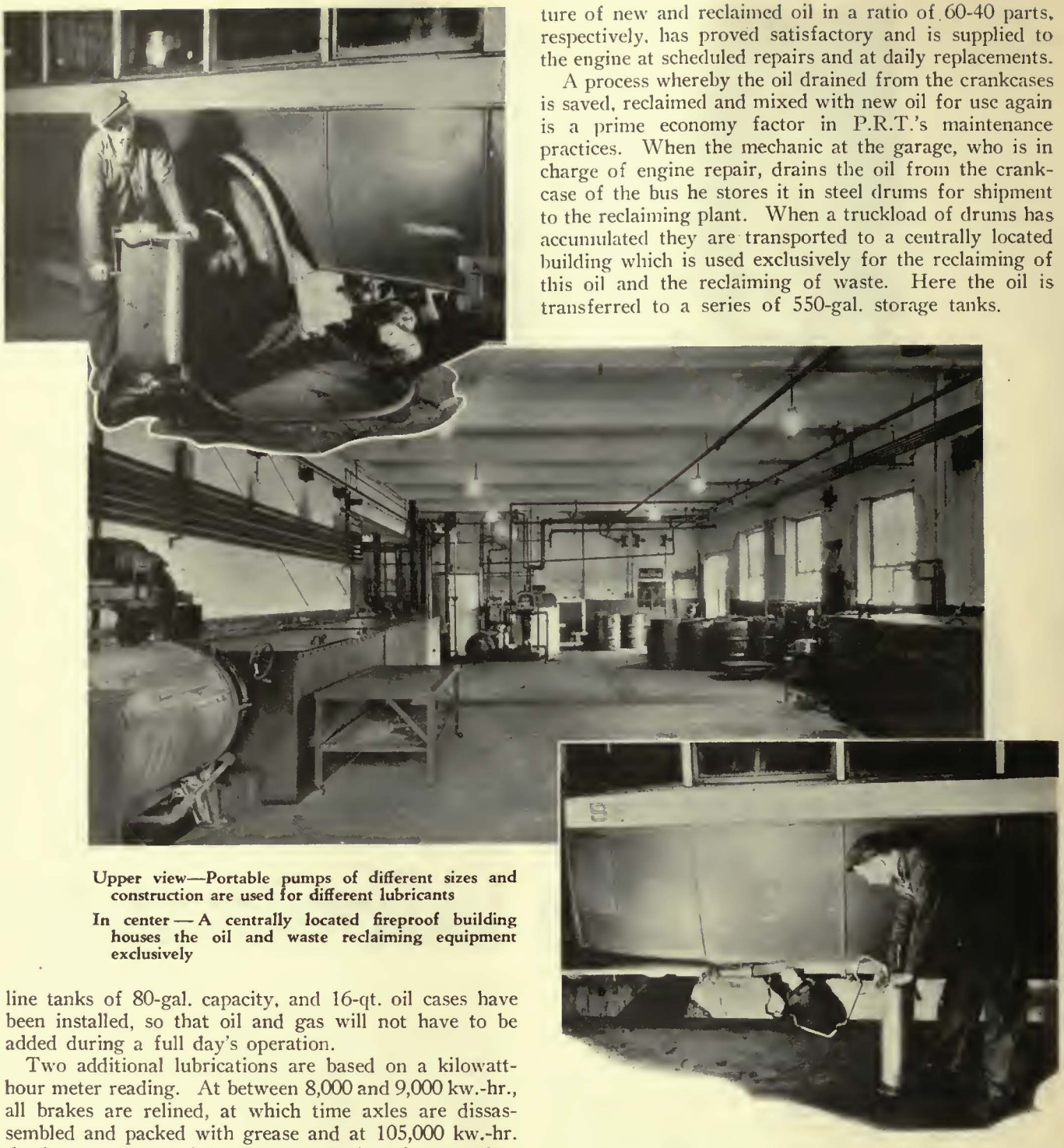
Bus Lubrication

Individual responsibility of the mechanic for the proper lubrication of parts he inspects at scheduled repair periods and reclamation of oil are important features of bus maintenance practice of P.R.T.

BY GIVING special attention to the subject of bus lubrication, the Philadelphia Rural Transit Company, subsidiary of the Philadelphia Rapid Transit Company, has effected substantial savings. Maintenance practices carried on in its shops are regulated by the actual amount of service performed by each vehicle. All buses are gasoline-electric type Yellow Coaches, equipped with kilowatt-hour meters. Inspections, repairs and lubrication are scheduled according to these meter readings.

When the meter shows 3,500 kw.-hr. service, which corresponds to approximately 2,500 miles, the bus is held out for a day and subjected to what is known as a "scheduled repair," including thorough inspection, minor repairs, and complete lubrication. Each mechanic assigned to work on a part of the vehicle is held responsible for the proper functioning of that part. One man tests and greases all steering mechanism, another the rear end, and a third all electrical equipment. The mechanic assigned to brake inspection packs all the wheel bearings and the man in charge of engine repairs drains the oil, cleans the lower half of the crank-case and refills the case with the required amount of clean oil.

Routine oil replenishment is made each time the bus enters the garage, regardless of whether it has operated one trip or a full run. On long runs the oil and gasoline are checked on the street at scheduled periods of about every eight hours, and replenishment for buses in the north end of the city are made at the company's filling station at Broad Street and City Line. On a number of vehicles which operate on outlying routes, special gaso-



Upper view—Portable pumps of different sizes and construction are used for different lubricants

In center — A centrally located fireproof building houses the oil and waste reclaiming equipment exclusively

line tanks of 80-gal. capacity, and 16-qt. oil cases have been installed, so that oil and gas will not have to be added during a full day's operation.

Two additional lubrications are based on a kilowatt-hour meter reading. At between 8,000 and 9,000 kw.-hr., all brakes are relined, at which time axles are dissassembled and packed with grease and at 105,000 kw.-hr. the buses are routed to the general shop for complete overhaul.

Five grades of grease have been adopted as standard for heavier lubrication. Universal grade is used on the steering mechanism, in the universal, front and rear wheel bearings, fans and for all other chassis lubrication. A grade 600-W is used in the rears only, and a special ball-bearing lubricant, grade A, is used on all power generators and motors. A special water-pump grease is used on the water pump only. Medium grade oil is used for the lubrication of starting motors, lighting generators and distributors.

One oil, known as M.M. summer heavy, is standard throughout the property for engine lubrication. It is an all-year-round oil of such quality that the company has found it suitable for repeated reclamation. A mixture of new and reclaimed oil in a ratio of 60-40 parts, respectively, has proved satisfactory and is supplied to the engine at scheduled repairs and at daily replacements.

A process whereby the oil drained from the crankcases is saved, reclaimed and mixed with new oil for use again is a prime economy factor in P.R.T.'s maintenance practices. When the mechanic at the garage, who is in charge of engine repair, drains the oil from the crankcase of the bus he stores it in steel drums for shipment to the reclaiming plant. When a truckload of drums has accumulated they are transported to a centrally located building which is used exclusively for the reclaiming of this oil and the reclaiming of waste. Here the oil is transferred to a series of 550-gal. storage tanks.

Power generators and motors are lubricated with a special ball-bearing grease

The equipment used in the reclaiming process consists of a mixing and treating tank, a centrifugal oil purifier for removing carbon, dirt and other inorganic matter, and a distilling apparatus for removing the water and reagent used and for restoring the viscosity. The same equipment is used for the reclaiming of oil drained from the crankcases of the taxicabs owned by the Philadelphia Rapid Transit Company as well as buses maintained for its other subsidiaries. Approximately 200 gal. of oil is put through the process on each day that the plant is in operation, three days each week being devoted to bus oils and two to those from taxicabs. Thus approximately 1,000 gal. of oil is reclaimed each week.

The process is begun by pumping the oil from the storage tanks into the mixing chamber where water and a reagent are added, the whole mixture then being heated to about 200 deg. F. and well agitated. The mixture is then pumped through a centrifuge at the rate of 80 to 100 gal. per hour, where the greater part of the foreign matter is removed. The clean oil is sent by gravity to the rectifier where the diluent is removed by a distillation process.

The oil is circulated through two electric heater elements to the top of the rectifier where it filters down over tile and again circulates until it has reached a temperature of 130 deg. C. Dry steam at low temperature is forced into the rectifier in an opposite direction to the oil flow. The gasoline and kerosene contents are vaporized and carried off by the steam to the top of the rectifier and into the condenser, to be collected and used around the plant for general cleaning purposes.

With each 10-deg. increase in oil temperature the steam admission valve is opened wider. By the time the oil has reached 195 deg. C. the valve is in full open position. At this temperature practically no more foreign elements are present and the process is completed. About 3½ hours of still operation are necessary to bring the oil back to its original viscosity. It is then passed again through the centrifuge to remove any final traces of dirt and then put into drums for shipment back to the various garages.

90 Per Cent of Oil Reclaimed

A very careful check is kept on the oil thus reclaimed. Each day a sample of the reclaimed oil is sent to the company chemist for inspection and comparison with the new oil as originally purchased. Approximately 90 per cent of the oil put through this process is reclaimed for re-use, the remaining 10 per cent being lost in the form of carbon and dirt.

The time required for the entire reclaiming process covers approximately ten hours and the process is handled by one man. The cost is slightly under 10 cents per gal., which includes labor and material, depreciation and maintenance, power and trucking.

Proper Lubrication Prolongs Life of Control Equipment

By G. L. Moses
Renewal Parts Engineer
Westinghouse Electric & Manufacturing Company

FROM an operating standpoint, it is much worse to "over-lubricate" control equipment than to neglect its lubrication. The important points to lubricate on electric railway control apparatus are the contact fingers and piston leathers, but such lubrication should be done sparingly. Frequent operation of drum controllers and other control apparatus, such as reversers, interlocks and sequence switches, in which contact surfaces move under fingers, may cause considerable wear to both finger and contact surface. This wear can be materially reduced by proper oiling. This should not be done, however, unless the controller can be kept clean and free from abrasive dust. The collection of such dust in the lubricant will increase the cutting, thus defeating the purpose.

Lubrication Schedule for Control Equipment

Part	Lubricant	Period, Miles
Main circuit controller fingers and contac's	Light oil	500
Master controller and interlock fingers and contacts	Light oil	2,000 to 3,000
Controller bearings	Light oil	1,000 to 2,000
Air cylinders (and piston leathers)	Special oil	10,000

The proper lubricant for fingers and contact surfaces is a light machine oil. Vaseline should not be used, particularly in cold climates, as it is stiff, and, if not properly applied, may lift the finger off the contact causing failures in service.

The contacts and fingers should be clean and dry when the lubricant is applied. Kerosene may be used in cleaning them if necessary. The lubricating oil should be applied to fingers and contacts with a cloth or small brush. The apparatus should then be operated so that the fingers pass over the contact surfaces several times. Afterwards the surplus should be removed from finger tips and contact surfaces with a clean cloth.

Contacts where arcing is severe, such as main circuit drum controllers, should be lubricated frequently. This can be done at light inspection or once a week.

Caution Against Excessive Lubrication

A general use of oil in piston leathers, except during overhauls, is not recommended as the treatment of the leather provides sufficient lubrication for ordinary service. The excessive use of oil on piston leathers should be avoided as more damage may be caused from excessive oil than from too little. If severe service necessitates extra lubrication of piston leathers, the oil recommended by the manufacturer of the equipment should be used in small quantities as follows:

1. Inject through the hole in the top of the cylinder casting not more than ⅛ oz. (1 teaspoonful) every 10,000 miles.

2. Oil may be used more frequently should pistons shows signs of becoming gummy, but only in sufficient quantities as a solvent to obtain free operation until piston leathers can be cleaned or replaced.

This oil should be used during heavy overhaul when the pistons are removed from the cylinders. Pistons and cylinders should be coated well with this oil after being thoroughly cleaned. Approximately 1/16 oz. is required for each cylinder and piston.

Bearings of all rotating members, drums, pawls, rollers, etc., of control apparatus should have a light oil applied at every other regular light inspection period.

The accompanying tabulation indicates the parts requiring lubrication, the proper oils and the frequency with which they should be applied.

Shop Efficiency

Overhaul of equipment has been put on mass production basis at New Orleans. Quality of work has been improved by specialization. Availability of extra parts at operating stations encourages preventive maintenance

RECOGNIZING that good maintenance is an important factor in giving the type of transportation service demanded by the public, the management of the New Orleans Public Service, Inc., shortly after the reorganization of this property in 1920 placed the operation of the equipment department on an entirely new basis. The company undertook to improve the rolling stock in every possible way and to stimulate interest among the personnel employed in its maintenance. Change after change was made in the course of the next few years, each one contributing in some measure to lowering the cost and improving the quality of work. In July of 1924 the company instituted the unit replacement system, accompanied by a rigid program of inspection. Further modifications in the plan were made as they appeared warranted, but the general principles have been adhered to consistently.

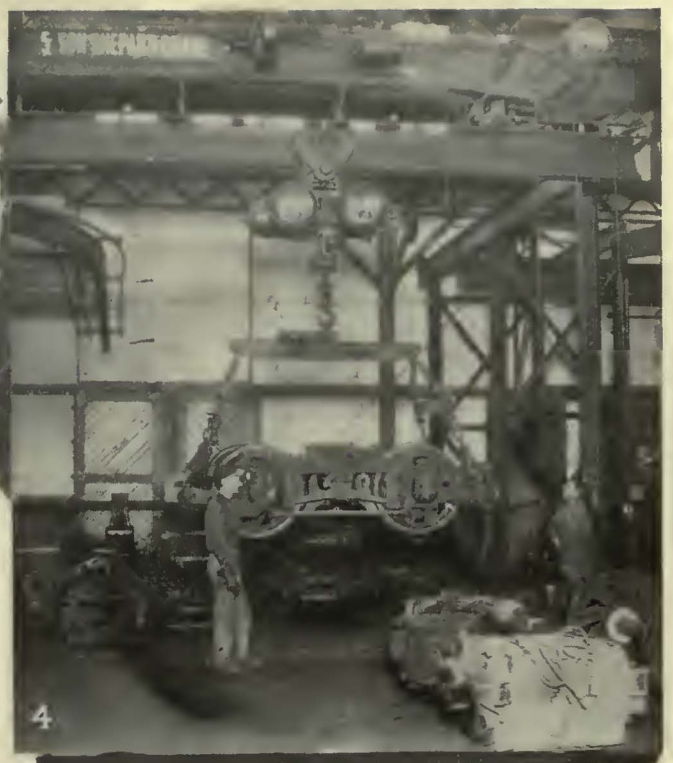
The maintenance achievements of the New Orleans Public Service, Inc., during the past few years are well known to most equipment men. In November, 1920, the maintenance cost per car-mile of the railway was $0.057. For the year 1924 this figure was $0.02114, representing a reduction of $0.03586, or 62.9 per cent. For the year 1925 the figure was $0.01979; for 1927 it was $0.01958, and for 1928 it was $0.01919.

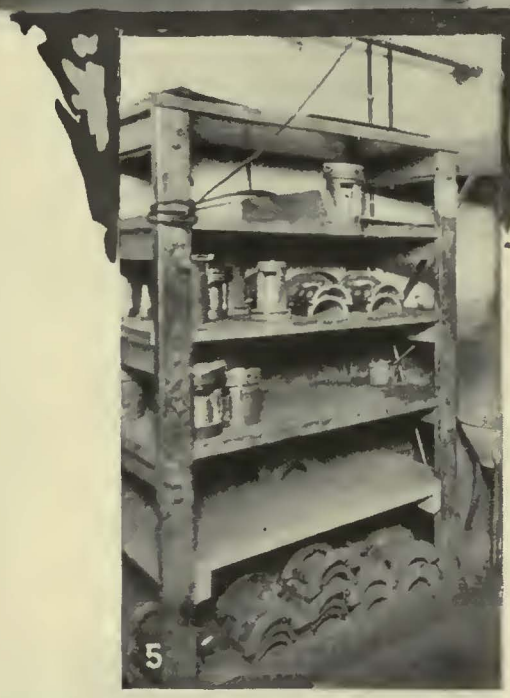
The results of preventive maintenance methods and a high standard of workmanship, however, are even more strikingly reflected in the record of pull-ins. For the year 1929 the company led the 27 members of the Electric Railway Association of Equipment Men, Southern Properties, with the remarkable record of 303,985 miles per pull-in chargeable to equipment, exceeding the second company on the list by 160,946 miles, the third by 161,223 miles and the fourth by 258,981 miles. In total pull-ins New Orleans was second among the 27 companies with the figure of 62,835 miles per pull-in. In this connection, it should be remembered that strike conditions in the city during 1929 were responsible for a number of cars being taken out of service. Over the period of the past nine years the company has made a remarkable record in increasing its average car mileage per pull-in for any cause. From 1921 to 1929, inclusive, the annual figures were 2,803, 10,168, 23,791, 37,080, 64,918, 100,838, 152,632, 121,001 and 62,835. In the matter of pull-ins for mechanical defects, the company has made the following record: 1921, 5,797; 1922, 1,247; 1923, 304; 1924, 118; 1925, 79; 1926, 56; and 1927, 35.

While increasing its standard of maintenance the company made a large decrease in the number of men employed. Figures for the Magazine and Carrollton shops show that 234 men were employed in 1921, 223 in 1922, 219 in 1923, 203 in 1924, 148 in 1925, 132 in 1926, 126 in 1927 and 112 in 1928. It will be noted that the last figure is less than half of that for 1921. By centralizing all overhaul work the company also was able to reduce the number of men employed at the outlying stations. Number of men employed at the stations, with the exception of the repair foremen and clerks, totaled 220 in 1921, 213 in 1922, 208 in 1923, 187 in 1924, 161 in 1925, 148 in 1926, 146 in 1927 and 135 in 1928. Another indication of the improvement in quality of work is shown by the steady reduction in the number of armatures requiring rewinding. Rewinds totaled 201 in 1923, 148 in 1924, 55 in 1925, 36 in 1926 and 30 in 1927.

Undoubtedly, the unit replacement system has contributed to a notable extent in these achievements. Among the important factors which have been instrumental in raising standards and lowering costs are the organization of the department of rolling stock and shops, each man in the set-up having his duties definitely outlined; supervision of all shop work by trained engineers; educational facilities for the foremen and department heads; regular monthly meetings of department heads, at which methods and costs are discussed; creation of competi-

Improved by Unit Replacement System





Methods of Storing Replacement Units in the Shops of the New Orleans Public Service, Inc.

1. Section of the electrical repair room showing a number of extra armatures and field coils.
2. Removing motors and disassembling trucks at the Carrollton shop. Extra motors for substitution are stored in the corner at the extreme right of this view.
3. Wheel and axle units at the Magazine shop, ground and ready for replacement.
4. Extra air compressors with motors and railway motors ready to replace worn units.
5. One of the racks in the babbitting room where bearings are stored.

tion among the stations through comparison of records; careful selection of employees; an excellent morale, reflected all through the organization; elimination of all manufacturing in the shops; active participation in the Electric Railway Association of Equipment Men, Southern Properties, through attending meetings, exchanging ideas and comparing costs and records; installation of all necessary modern machinery and equipment; a rigid inspection system; use of the most modern shop methods; thoroughness in all repairs, and complete overhaul of all equipment. No single one of these factors is responsible for what is being accomplished, but all are important elements in the functioning of the rolling stock and shops department.

Periodic inspection in New Orleans is conducted in the five outlying stations on a 1,000 car-mile basis. Instructions are issued daily in written form to the station foremen, advising them which cars are due for examination. All pneumatic, electrical and mechanical equipment on the cars, from the trolley wheel down to the brake shoes, is thoroughly inspected, as well as the car body itself. If this inspection discloses that some repair work must be done, the work may or may not be done in the station, depending on the nature of the repairs. For example, no motor repairs are performed in the station; the car must be sent to the equipment overhauling department. Line breakers or circuit breakers may have their contact tips renewed in the station, but all other work must be likewise performed at the equipment overhauling department. Hence, each station is supplied with several line breakers, circuit breakers, lightning arresters, resistors, motormen's air brake valves, air compressors, governors, truck brake rigging, and wheel and axle replacement units. Therefore, as a general policy, only very light repairs are made in a station; parts requiring major repairs are replaced with tested units. In the case of the car body, the same policy is maintained. Seats, sash, doors, etc., in need of repairs must be replaced from material furnished by the body overhauling department.

Extra Units Carried by the New Orleans Public Service, Inc., for Replacement

TRUCKS

Complete trucks
- 3 pair 76-E-2.
- 2 pair 39-E.
- 2 pair MCB.

Wheels
- 2 pair drivers for 76-E trucks with GE-263 motors.
- 2 pair drivers for 76-E-2 trucks with Westinghouse 306 motors.
- 4 pair idlers for 76-E-2 trucks.
- 4 pair drivers for 39-E trucks with GE-201 motors.
- 4 pair pony wheels for 39-E trucks.
- 2 pair drivers for MCB trucks with Westinghouse 306 motors.
- 2 pair drivers for MCB trucks with GE-263 motors.
- 4 pair idlers for MCB trucks.
- 1 pair drivers for Lord Baltimore trucks with Westinghouse 514 motors.

Miscellaneous truck parts
- 3 sets journal boxes for 76-E-2 trucks.
- 8 sets pony boxes for 39-E-2 trucks.
- 12 pair axle bearings, babbitt lined, for GE-263 motors.
- 10 journal bearings for 76-E-2 trucks.
- 5 brasses for pony wheels of 39-E-2 trucks.
- 2 MCB truck bolsters.
- 2 body bolsters.
- Several suspension bars for motors.
- Brake equipment under separate head.

MOTORS AND CONTROL

Complete motors
- 12 Westinghouse 306-CB-4.
- 8 GE-263-A.
- 8 GE-57.
- 6 Westinghouse 514.
- 2 GE-247.
- 4 Westinghouse 510.
- 4 GE-265.

Armatures
- 2 Westinghouse 306-CB-4.
- 2 GE-263-A.
- 4 GE-57.

Armature bearings
- 6 pair for Westinghouse 306 motors.
- 6 pair for GE-263 motors.
- 2 pair for GE-57 motors.

Brush holders
- 6 for Westinghouse 306 motors.
- 6 for GE-263 motors.
- 8 for GE-57 motors.
- 3 for Westinghouse 514 motors.
- 3 for GE-247 motors.

Gear cases
- 4 for Westinghouse 306 motors.
- 2 for GE-263 motors.
- 4 for GE-201 motors.
- Extra bottom halves.

Control
- 2 K-35 JJ controllers.
- 14 K-36 controllers.
- 1 set edge-wound resistance for GE-265 motors.
- 2 sets resistors for Westinghouse 306 motors.
- Few sets miscellaneous resistors.

BRAKE EQUIPMENT

Valves
- 1 M-24 air valve.
- 12 PV air valves.
- 6 SL-1 air valves.
- 5 M-1 tripper valves.
- 5 M-1-2A tripper valves.
- 1 reducing valve.
- 1 No. 14 double check valve.

Air compressors and motors
- 4 General Electric CP-27.
- 2 Westinghouse DH-16.
- 2 Westinghouse D-1-H.

Miscellaneous brake equipment
- 3 compressor cylinders, 8x12 in.
- 20 compressor cylinders, 10x12 in.
- 4 jam cylinder piston rods.
- 6 Westinghouse S-6 air governors.
- 1 General Electric ML air governor.
- 1 Westinghouse S-16 air governor.
- 6-31 brake shoes (25 ordered when supply reaches 6).
- 8 slack adjusters.
- Several brake levers, rods, equalizers and other parts of the brake rigging.

ELECTRICAL AND BODY

Overhead line breakers
- 10 General Electric MR-12.
- 10 Westinghouse 6-11-A.
- 5 General Electric MR-22-A.

Line breakers
- 5 General Electric 976.
- 5 Westinghouse 801-E.
- 3 General Electric DB-987.
- 1 Westinghouse UM-2-A.

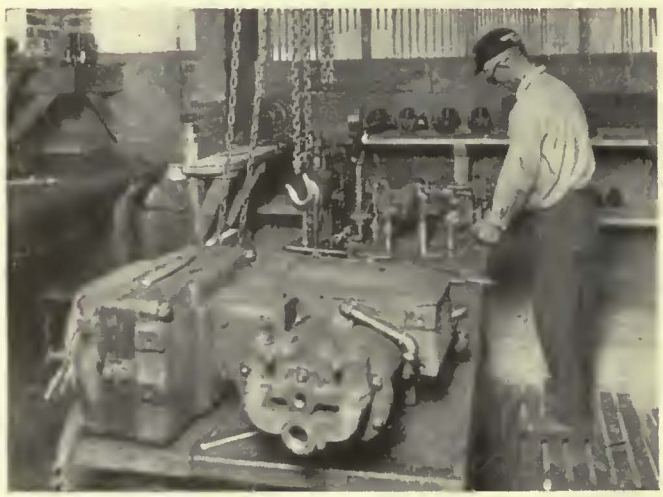
Lightning arrester jars
- 12 sets for General Electric 2-cell aluminum arresters.
- 12 sets for Westinghouse LA aluminum arresters.

Miscellaneous
- 2 complete sets of lightning arresters.
- 12 Ohio Brass trolley catchers.
- 6 National Pneumatic door engines.
- 1 fender.
- 2 H-B life guards.
- Many miscellaneous smaller parts, ordered from storeroom.

One class of work that is still carried on in the stations is the grinding of wheels. Wheels are changed at the station because this work can be done in a fraction of the time required for sending a car to the overhauling shop. Other work carried on by the stations besides the 1,000-mile inspection and the grinding of wheels consists of car oiling, cleaning, washing, emergency wrecker service, sanding and sprinkling.

From the foregoing it should not be thought that a great many equipment units require replacement in the stations. In reality, there is very little of this type of work done. Extra units are carried only to insure that cars are not sent out with equipment that is likely to fail. Why there are few replacements of equipment units due to failure is answered by the thorough method of overhaul.

All equipment changes made at the stations are reported to the superintendent's office on an "equipment change report," one of which is shown in an accompanying illustration. In this way a close check is maintained on all changes in equipment due to failure. This same form is used by the overhauling department. By triplicating the reports a complete record of the equipment on every car is maintained at the superintendent's office, the overhauling department and at the station.



Air compressors, governors, valves and other air equipment are overhauled in this room and held in reserve

All overhauling work is divided into two parts: first, car equipment overhauling, and second, car body overhauling and painting. Car equipment is overhauled on a 40,000 car-mile basis, the work being done at the Carrollton shop; car bodies are overhauled on an eighteen to twenty months' schedule, the work being done at the Magazine shop.

When a car has completed its 40,000 miles of service, it is sent to the car equipment overhauling department by order of the superintendent. This department is handled by a foreman who is responsible for the supervision of the shop employees. A shop engineer works with him and is responsible for the electrical or mechanical testing of every piece of equipment on an overhauled car, and for the general performance of the car itself. Records are kept of the mileage of the cars and they are summoned for overhaul at approximately the 40,000-mile mark, but the exact figure depends on conditions at the shop. By watching the records and properly summoning cars, an even flow is maintained through the shop.

When a car is received the following equipment is removed for overhaul: trucks with motors, air compressors, air governors, air equipment boxes, jam cylinders, door engines, slack adjusters, air intake strainers, line breakers, circuit breakers, lightning arresters, rheostats, trolley bases and trolley catchers. Other equipment, which may require removal for overhaul, depending on its condition, consists of motorman's brake valves, air reservoirs, air gages, miscellaneous air valves, controllers, buzzers, life guards, door and step mechanism, register rods and straps, foot gongs, stanchions or grab handles, handstraps, motorman's steps and headlights. In general,

every piece of equipment must be gone over thoroughly.

Although most of the above parts are removed at each overhaul, because of the use of the unit replacement system, it is not necessary to hold the car until all of this original equipment is ready to be reassembled. As many extra parts as possible that have previously been overhauled are placed on the car and work concentrated on those units which are not replaceable. By this method the overhauling can be done on a steady production basis, permitting the cars to be quickly re-equipped with tested units. In an accompanying table are listed some of the many extra units which are retained as surplus parts at the Carrollton shop. As will be noted a sufficient number are kept to allow a great amount of flexibility in the overhaul work. Since the maintenance methods used by the New Orleans Public Service have been described in detail in previous articles in the JOURNAL they will not be outlined here. It is sufficient to say that all overhaul work is conscientiously and thoroughly done. The activities of this department are extremely detailed and are followed up continuously by the shop foreman and the shop engineer.

Section of the electrical equipment department where line breakers, circuit breakers, lightning arresters and other apparatus are overhauled

In reality the overhauling of a car body every eighteen to twenty months is a light overhaul and is classified as a "touch-up and varnish" job. At this time the doors, vestibule sash, side sash, seat bottoms, side curtains, motorman's curtains, sign box curtains, registers, register straps and bell ropes are removed from the car. Necessary carpenter work is done on the car body, after which it is painted. Removed doors, sash and seat bottoms are repaired if necessary and painted, curtains are given attention, registers overhauled, and register straps and bell ropes replaced if necessary.

When the condition of the car body requires a general overhaul, all equipment is stripped from the car, the necessary sheet metal or carpenter work is done, the old paint is burned off, and the paint surface restored, this job requiring about twelve days.

In the car body overhauling, as in the mechanical and electrical equipment overhauling, as many repaired units are substituted as is possible, in order to reduce the period of inactive service to a minimum.

Buses of the New Orleans Public Service, Inc., are inspected on four bases: daily, every 2,000 miles, every 20,000 miles and every 40,000 miles. No parts are replaced on the bus following the daily inspection, unless some serious defect is found. On the 2,000-mile inspection also all parts are examined and gone over carefully, but none replaced unless necessary. On the 20,000-mile inspection, however, a number of parts are replaced with overhauled and tested units. Among these are the vacuum tank, distributor, cylinder heads, junk heads, lighting generator, starter and horn.

In making the regular 40,000-mile inspection a still greater number of units are replaced. No individual parts of the engine are removed; the entire engine is taken out and replaced. Other units which are replaced with rebuilt ones are the steering gear, gas tank, clutch, transmission, air compressor, lighting generator, starter and horn. On the gas-electric buses the generator and driving motors are replaced with dipped, baked and tested units. Carrying the unit replacement system still further in the overhaul work, the company replaces a number of units with rebuilt ones, even in overhauling its bus engines. Among these units are the cylinder heads, water pump, carburetor and distributor or magneto.

EQUIPMENT CHANGE REPORT

NEW ORLEANS PUBLIC SERVICE INC.

ROLLING STOCK AND SHOPS DEPARTMENT

CAR No.:_____ MILEAGE:_____

STATION:_____ DATE:_____

MOTORS

REMOVED						REPLACED BY			
TYPE	SERIAL No. FRAME	SERIAL No. ARMATURE	CAUSE OF REMOVAL	DATE	END No.	TYPE	SERIAL No. FRAME	SERIAL No. ARMATURE	DATE

RESISTORS

REMOVED					REPLACED BY		
TYPE	SERIAL No.	CAUSE OF REMOVAL	DATE	END No.	TYPE	SERIAL No.	DATE

CONTROLLERS

CIRCUIT BREAKERS

LINE BREAKER

LIGHTNING ARRESTER

AIR COMPRESSOR

GOVERNOR

MOTORMAN'S BRAKE VALVES

TRUCKS

REGISTERS

DOOR ENGINES

MISCELLANEOUS

Returned to_____ Station_____ Date:_____

Part:_____ Repair Foreman. Checked by_____ Engineer.

All equipment changes made in the five stations and the Carrollton shop are reported on the above form

1929 Was a GOOD YEAR

Gross and net revenues are holding steady, and on a large proportion of properties there has been an increase of business over 1928. Analysis of annual reports from 65 companies in this country and abroad presents significant operating statistics

LAST year was a good one from the standpoint of electric railway operation. This is becoming more and more apparent as the annual reports of the properties become available. While there have been few outstanding increases in revenue, there have been few declines. Many companies have had an actual increase in passengers carried, although others have suffered losses varying in amount. The most marked result, however, is a reduction in operating expense that practically offsets losses in gross on the various properties, so that the net operating revenue is as good as or better than it was in the preceding year.

Up to the present time 65 reports for the calendar year 1929 or for various periods terminating within the year have become available. Sixty of these are for electric railway properties in the United States and Canada. Taken together, they present a fair average of the financial results of the year. In size the companies range from small properties, some with considerably less than $1,000,000 operating revenue, to the largest in the country. Of the 60 companies in the United States and Canada, twelve had revenues of less than $1,000,000, 33 had revenues of $1,000,000 to $10,000,000, and fifteen had revenues in excess of the larger figure. Only those companies operating railway or bus lines exclusively, or those larger utilities which present separate reports for their railway departments, are included in Table I. The entire survey, therefore, covers local transportation lines only.

The reports as published differ widely in form, depending on the primary purpose for which they were prepared. Most of them follow the standard accounting form, and this has been adopted for the presentation in the tables, as it was in the analysis of reports presented in this paper last year. Some of the others, which did not follow this form exactly, could be brought in line with little difficulty. In this way they have been made fairly comparable. In some instances comparisons between 1929 and the preceding year were not available in the latest report. However, they were presented in previous reports and have been included for comparison. In a few instances the cumulated monthly reports have been used as the source of the figures. These are subject to minor adjustments, but the totals will be affected but little.

One significant fact that stands out in analyzing the figures is that there was no marked change in revenue for the year, as compared with the preceding period. Despite all difficulties these 60 companies were able to take in revenues that in the aggregate differed but little from those of the previous year. This is the more worthy of note, in that companies of all sizes were con-

Table I—Condensed Financial Reports of Electric Railway Properties, 1929-1928

	Glendale & Montrose Ry., Glendale, Cal.		Petaluma & Santa Rosa R.R., Petaluma, Cal.		Market Street Railway, San Francisco, Cal.		Municipal Railway, San Francisco, Cal.		Denver Tramway Corp., Denver, Col.	
	1929	1928	1929	1928	1929	1928	1929[2]	1928[2]	1929	1928
Railway operating revenue	$80,018	$81,505	$511,088	$595,281	$9,590,194	$9,754,461	$3,499,703	$3,477,665	$4,214,297	$4,310,040
Railway operating expenses	92,976	95,336	418,661[1]	473,453[1]	8,041,926[1]	8,327,688[1]	3,469,118	3,362,293	2,902,564	2,852,496
Net revenue, railway oper.	*$12,957*	*$14,881*	.....	.....	.....	.....	$30,584[3]	$115,372[3]	$1,311,733	$1,457,544
Taxes	4,452	3,801	.....	.....	.....	.....			494,201	506,504
Operating income	*$17,410*	*$18,632*	$92,427	$121,828	$1,548,268	$837,513	$30,584	$115,372	$817,532	$951,040
Non-operating income	1,560	1,302	13,291	11,469	.....	.....	34,277	88,448	46,888	39,077
Gross income	*$15,850*	*$16,330*	$105,718	$133,297	$1,548,268	$837,513	$64,861	$203,820	$864,420	$990,118
Deductions from gross income	.....	.....	36,111	36,890	.....	.....	153,486	163,262	513,283	529,158
Net income	.....	.....	$69,607	$96,407	$837,513[16]	$677,755[16]	*$88,624*	$40,558	$351,137	$460,960
Operating ratio	1.162	1.169	.....	.....	.....	.....	0.991	0.966	0.688	0.662

	Connecticut Company, New Haven, Conn.		Capital Traction Co., Washington, D. C.		Washington Ry. & Electric Co., Washington, D. C.		Jacksonville Traction Co., Jacksonville, Fla.		Honolulu Rapid Transit Co., Honolulu, T. H.	
	1929	1928	1929	1928	1929	1928	1929	1928	1929	1928
Railway operating revenue	$13,399,101	$13,734,222	$4,296,906	$4,344,148	$5,789,979	$5,783,826	$1,141,139	$1,199,516	$1,063,167	$1,087,504
Railway operating expenses	10,546,906	10,759,127	3,067,371	3,054,981	4,787,343[1]	4,731,042[1]	928,589	971,149	737,800	752,531
Net revenue, railway oper.	$2,852,195	$2,975,095	$1,229,534	$1,289,167	.....	.....	$212,550	$228,367	$325,367	$334,972
Taxes	678,174	725,357	327,591	346,965	.....	.....	108,890	106,774	105,832	147,282
Operating income	$2,174,021	$2,249,738	$901,943	$942,202	$2,610,738[17]	$2,484,151[17]	$103,657	$121,591	$219,535	$187,690
Non-operating income	146,046	154,641	26,868	31,924	.....	.....	*6,125*	*6,437*	2,012	2,458
Gross income	$2,320,067	$2,404,379	$928,811	$974,126	$2,610,738	$2,484,151	$97,532	$115,154	$221,547	$190,149
Deductions from gross income	1,289,727	1,373,431	366,837	353,720	699,503	750,196	157,953	164,018	6,600	6,600
Net income	$1,030,340	$1,030,948	$561,974	$620,406	$1,911,234	$1,733,967	*$60,420*	*$48,863*	$214,947	$183,549
Operating ratio	0.787	0.783	0.713	0.704	.....	.....	0.813	0.809	0.694	0.692

(See Page 207 for Footnotes)

or the Electric Railways

sidered. Referring to Table II, it will be seen that in general the largest companies had the greatest number of instances of increases in revenue. Eleven out of fifteen in this class showed gains. This was due to an actual increase in traffic on most of them, since there were relatively few changes in fare during the year. As would be expected, the greatest losses in revenue occurred on the smaller properties, three showing increases and nine showing losses. The medium-sized companies were almost evenly balanced in comparative earnings with the year previous, sixteen taking in more gross and seventeen less.

The most marked effect in the year just past is the reduction in operating expense. Economies were effected in companies in all the classifications. It is rather remarkable, however, that the most marked savings in operation took place in both the largest and the smallest groups. Of the small companies, only two increased their expenses, while ten were able to reduce them.

Table II—Significant Changes in Operation, 1928-1929 Classified According to Size of Properties

	Annual Gross Revenue: Less than $1,000,000	$1,000,000 to $10,000,000	More than $10,000,000	Grand Total
Total number of companies	12	33	15	60
Gross revenue:				
Increased in 1929	3	16	11	30
Decreased in 1929	9	17	4	30
Operating expenses:				
Increased in 1929	2	16	4	24
Decreased in 1929	10	17	11	36
Operating income:				
Increased in 1929	8	15	11	34
Decreased in 1929	4	18	4	26

Table III—Range of Operating Ratios in 1929, Arranged According to Size of Properties

	Annual Gross Revenue: Less than $1,000,000	$1,000,000 to $10,000,000	More than $10,000,000	Grand Total
Total number of companies	12	33	15	60
Range of operating ratios:				
Above 1.00	1	0	0	1
0 90-1 00	1	1	0	2
0 80-0 90	1	6	1	8
0 70-0 80	2	11	9	22
Below 0 70	2	6	3	11
Figures not available	5	9	2	16

Table I—(Continued)—Condensed Financial Reports of Electric Railway Properties, 1929-1928

	Chicago North Shore & Milwaukee R.R., Chicago, Ill.		Chicago Rapid Transit Co., Chicago, Ill.		Chicago Surface Lines, Chicago, Ill.		Chicago & West Towns Ry., Oak Park, Ill.		Gary Railways, Gary, Ind.	
	1929	1928	1929	1928	1930[7]	1929[7]	1929	1928	1929	1928
Railway operating revenue	$8,020,762	$7,967,186	$21,106,491	$19,995,277	$62,717,867	$62,391,622	$1,567,333	$1,515,529	$1,293,442	$1,240,522
Railway operating expenses	5,913,692	5,928,425	14,772,550	14,238,630	46,015,703	45,401,067	1,160,977[1]	1,124,543[1]	1,051,769[11]	970,534
Net revenue, railway oper	$2,107,070	$2,038,762	$6,333,941	$5,756,647	$16,702,164	$16,990,555	.....	.....	$241,673	$269,988
Taxes	380,086	395,596	1,848,611	1,843,112	3,235,000	3,560,000	.....	.....	59,248	63,113
Operating income	$1,787,612[18]	$1,702,768[18]	$4,485,330	$3,913,535	$13,467,164[8]	$13,430,555[8]	$406,356	$390,986	$182,424	$206,875
Non-operating income	380,711	426,467	267,098	268,975	.....	.....	.....	.....	6,886	2,416
Gross income	$2,168,323	$2,129,234	$4,752,428	$4,182,510	.....	.....	$406,356	$390,986	$189,311	$209,291
Deductions from gross income	1,445,257	1,347,513	3,682,948	3,540,195	.....	.....	177,368	153,051	118,295	118,609
Net income	$723,065	$781,721	$1,069,479	$642,314	.....	.....	$228,988	$237,935	$71,015	$90,681
Operating ratio	0.737	0.744	0.700	0.712	0.733	0.728	.....	.....	0.815	0.780

	Indianapolis, Crawfordsv. & Danville E. Ry., Indianapolis, Ind.		Indianapolis & Martinsville R. T. Co., Indianapolis, Ind.		Indianapolis & Northwestern Trac. Co., Indianapolis, Ind.		Indianapolis Street Ry., Indianapolis, Ind.		Terre Haute, Indpls. & E. Trac. Co., Indianapolis, Ind.	
	1929	1928	1929	1928	1929	1928	1929	1928	1929	1928
Railway operating revenue	$230,129	$267,117	$136,035	$139,362	$364,331	$411,387	$5,044,817	$5,213,775	$5,050,541	$5,122,184
Railway operating expenses	239,369[1]	284,942[1]	142,823[1]	163,802[1]	372,958[1]	452,139[1]	3,688,857	3,857,220	3,739,314[1]	4,119,917[1]
Net revenue, railway oper	.....	.....	.....	.....	.....	.....	$1,355,960	$1,356,555	.....	.....
Taxes	.....	.....	.....	.....	.....	.....	308,313	289,303	.....	.....
Operating income	*$9,240*	*$17,825*	*$6,788*	*$24,440*	*$8,627*	*$40,752*	$1,047,647	$1,067,252	$1,311,227	$1,002,267
Non-operating income	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Gross income	*$9,240*	*$17,825*	*$6,788*	*$24,440*	*$8,627*	*$40,752*	$1,047,647	$1,067,252	$1,311,227	$1,002,267
Deductions from gross income	59,500	59,500	38,000	38,000	124,000	124,000	640,037	663,839	1,151,660	1,128,518
Net income	*$68,739*	*$77,325*	*$44,788*	*$62,439*	*$132,627*	*$164,753*	$407,610	$403,413	$159,567	*$126,251*
Operating ratio	.....	.....	.....	.....	.....	.....	0.731	0.739	.....	.....

	Chicago, South Shore & S. Bend R.R., Michigan City, Ind.		Louisville Railway, Louisille, Ky.		Androscoggin & Kennebec Ry., Lewiston, Me.		United Rys. & Elec. Co. of Baltimore, Baltimore, Md.[14]		Washington, Balto.- & Annapolis Elec. Ry., Baltimore, Md.	
	1929	1928	1929	1928	1929	1928	1929	1928	1929	1928
Railway operating revenue	$3,691,578	$3,060,539	$4,820,901	$4,847,000	$784,548	$822,922	$16,717,099	$16,273,806	$2,537,511	$2,488,236
Railway operating expenses	3,043,742	2,536,527	3,465,693	3,494,755	684,343	680,943	11,335,024	10,873,921	2,019,485	1,864,024
Net revenue, railway oper	$647,835	$524,011	$1,355,208	$1,352,244	$100,205	$141,979	$5,382,075	$5,399,884	$518,026	$624,212
Taxes	60,817	51,403	461,000	462,268	20,487	29,356	1,635,733	1,578,782	139,888	131,271
Operating income	$587,017	$472,608	$894,208	$889,976	$79,718	$112,622	$3,746,342	$3,821,102	$378,138	$482,941
Non-operating income	60,246	45,262	89,666	86,107	.....	.....	175,591	150,823	5,911	11,009
Gross income	$647,264	$517,870	$983,874	$976,084	$79,718	$112,622	$3,921,934	$3,971,926	$384,050	$503,950
Deductions from gross income	227,974	517,286	639,720	643,032	68,275	68,560	3,387,077	3,413,532	585,459	561,279
Net income	$419,290	$583	$344,154	$333,051	$11,443	$44,062	$534,856	$558,394	*$201,409*	*$57,329*
Operating ratio	0.823	0.829	0.719	0.721	0.872	0,827	0.678	0.667	0.796	0.748

(See Page 207 for Footnotes)

Among the large companies, eleven out of the fifteen reduced their operating costs. The medium-sized group, where it might be expected large savings could be effected, showed correspondingly less gain in this direction, seventeen having lower costs and sixteen higher. Altogether, 36 out of the 60 properties were able to effect reductions in total operating expense.

That the combination of increased earnings on many properties and operating economies on them and on some of the others where business declined was effective

Table I—(Continued)—Condensed Financial Reports of Electric Railway Properties, 1929-1928

	Boston Elevated Railway Boston, Mass.		Boston, Revere Beach & Lynn R.R., Boston, Mass.		Eastern Massachusetts St. Ry., Boston, Mass.		Fitchburg & Leominster St. Ry., Fitchburg, Mass.		Union Street Railway, New Bedford, Mass.	
	1929	1928	1929	1928	1929	1928	1929	1928	1929	1928
Railway operating revenue	$34,096,623	$34,843,147	$1,271,014	$1,222,093	$8,579,454	$9,005,758	$338,463	$353,771	$1,283,222	$1,286,624
Railway operating expenses	24,024,747	24,900,188	1,002,418	1,068,548	6,358,654	6,714,403	309,778[13]	264,316[1]	1,120,118	1,165,964
Net revenue, railway oper.	$10,071,876	$9,942,959	$268,596	$153,544	$2,220,799	$2,291,354	$28,685	.....	$163,104	$120,660
Taxes	1,619,962	1,721,678	33,769	43,896	351,182	364,759	5,333	.....	61,059	58,713
Operating income	$8,451,914	$8,221,281	$234,827	$109,648	$1,869,616	$1,926,595	$23,351	$89,455	$1,020,045	$61,947
Non-operating income	.....	.....	2,854	2,843	229,744	242,360	.....	.....	1,361	1,251
Gross income	$8,451,914	$8,221,281	$237,681	$112,591	$2,099,361	$2,168,955	$23,351	$89,455	$103,406	$63,198
Deductions from gross income	8,357,842	8,181,230	147,161	50,696	1,098,658	1,176,166	18,748	86,807[13]	16,180	12,465
Net income	$94,072	$40,051	$90,520	$61,894	$1,000,703	$992,789	$4,603	$2,648	$87,223	$50,733
Operating ratio	0.706	0.715	0.788	0.874	0.741	0.746	0.915	.....	0.873	0.906

	Middlesex & Boston St. Ry., Newtonville, Mass.		Department of Street Railways, Detroit, Mich.		Grand Rapids Railroad, Grand Rapids, Mich.		Duluth-Superior Traction Co., Duluth, Minn.		Twin City Rapid Transit Co., Minneapolis, Minn.	
	1929	1928	1929[15]	1928[15]	1929	1928	1929	1928	1929	1928
Railway operating revenue	$1,164,390	$1,176,281	$26,444,874	$24,668,175	$1,555,166	$1,574,170	$1,780,428	$1,873,330	$13,487,976	$13,005,353
Railway operating expenses	1,003,534[1]	999,032[1]	21,057,542	19,283,497	975,116	957,624	1,476,498	1,535,169	9,930,434	9,950,552
Net revenue, railway oper.	.....	.....	$5,387,332	$5,384,677	$580,050	$616,546	$303,929	$338,160	$3,557,542	$3,054,801
Taxes	.....	.....	750,948	783,012	128,422	133,617	147,770	153,561	1,201,924	1,098,849
Operating income	$160,856	$177,249	$4,636,383	$4,601,664	$451,627	$482,929	$156,159	$184,599	$2,355,618	$1,955,952
Non-operating income	.....	.....	118,396	245,586	.....	.....	25,579	33,794	121,978	99,281
Gross income	$160,856	$177,249	$4,754,779	$4,847,251	$451,627	$482,929	$181,739	$218,393	$2,477,596	$2,055,233
Deductions from gross income	156,367	160,693	1,651,590	1,914,896	235,915	240,914	168,983	169,171	1,221,718	1,221,643
Net income	$4,489	$16,556	$3,103,189	$2,932,355	$215,712	$242,014	$12,756	$49,222	$1,255,878	$833,590
Operating ratio	0.862	0.849	0.796	0.782	0.627	0.609	0.830	0.819	0.735	0.765

	Kansas City Public Service Co., Kansas City, Mo.		Illinois Terminal Co., St. Louis, Mo.		St. Louis Public Service Co., St. Louis, Mo.		Public Service Co-ordinated Transport, Newark, N. J.		International Railway, Buffalo, N. Y.	
	1929	1928	1929	1928	1929	1928	1929	1928	1929	1928
Railway operating revenue	$8,951,616	$8,490,282	$7,163,425	$6,717,136	$19,249,779	$19,451,917	$34,732,658	$34,719,509	$10,975,851	$11,116,652
Railway operating expenses	7,327,003[1]	6,242,470	5,025,476	4,902,473	14,326,528	14,616,828	28,588,849[1]	29,268,099[1]	8,291,542	8,336,905
Net revenue, railway oper.	.....	$2,247,812	$2,137,949	$1,814,663	$4,923,251	$4,835,089	.....	.....	$2,684,309	$2,779,748
Taxes	.....	505,530	264,072	305,320	1,922,814	1,885,450	.....	.....	744,601	749,918
Operating income	$1,624,613	$1,621,456[19]	$1,873,744	$1,509,255	$2,954,059[20]	$2,876,247[20]	$6,143,809	$5,451,410	$1,939,707	$2,029,829
Non-operating income	.....	.....	.....	.....	51,304	40,319	144,166	150,842	92,621	56,912
Gross income	$1,624,616	$1,621,456	$1,374,551[12]	$1,066,786[12]	$3,005,363	$2,916,566	$6,287,975	$5,602,253	$2,032,329	$2,086,742
Deductions from gross income	926,393	875,973	.....	.....	1,849,902	1,873,165	6,531,227	5,779,373	1,291,128	1,352,998
Net income	$698,223	$745,432	.....	.....	$1,155,461	$1,043,401	*$248,251*	*$177,120*	$740,200	$733,744
Operating ratio	.....	0.735	0.701	0.729	0.744	0.751	.....	.....	0.754	0.750

	Fonda, Johnstown & Gloversville R.R., Gloversville, N. Y.		Hudson & Manhattan R.R., New York, N. Y.		Long Island Railroad, New York, N. Y.		New York, Westchester & Boston Ry., New York, N. Y.		Staten Island Rapid Transit Co., New York, N. Y.	
	1929	1928	1929	1928	1929	1928	1929	1928	1929	1928
Railway operating revenue	$1,025,933	$1,036,155	$12,517,756	$12,388,927	$41,326,194	$40,532,572	$2,530,488	$2,390,398	$2,637,897	$3,127,661
Railway operating expenses	760,871	749,352	6,248,096[1]	6,425,643[1]	27,734,679	28,434,357	1,570,218	1,622,858	1,892,347	2,103,175
Net revenue, railway oper.	$265,061	$286,803	.....	.....	$13,591,515	$12,098,215	$960,270	$767,540	$745,550	$1,024,486
Taxes	70,775	75,963	.....	.....	2,922,226	2,688,837	275,817	239,672	210,265	225,874
Operating income	$194,285	$210,839	$6,269,659	$5,963,283	$10,649,328	$9,390,508	$684,452	$527,868	$535,285	$798,612
Non-operating income	122,767	101,705	.....	.....	.....	.....	12,460	12,653	.....	.....
Gross income	$317,053	$312,545	$6,269,659	$5,963,283	$8,707,943[12]	$7,542,458[12]	$696,912	$540,522	$460,515[12]	$349,650[12]
Deductions from gross income	381,130	382,786	4,022,449	4,022,226	.....	.....	2,667,847	2,448,950	.....	.....
Net income	*$64,077*	*$70,240*	$2,247,210	$1,941,057	.....	.....	*$1,970,935*	*$1,908,428*	.....	.....
Operating ratio	0.741	0.723	.....	.....	0.671	0.702	0.621	0.679	0.719	0.672

	Cleveland Railway, Cleveland, Ohio		Community Traction Co., Toledo, Ohio		Altoona & Logan Valley Elec Ry., Altoona, Pa.		Fairmount Park Transit Co., Philadelphia, Pa.		Philadelphia Rapid Transit Co., Philadelphia, Pa.	
	1929	1928	1929	1928	1929	1928	1929	1928	1929	1928
Railway operating revenue	$18,403,945	$18,272,040	$3,887,020	$3,691,071	$1,229,007	$1,246,361	$338,032	$487,366	$55,909,553	$55,835,522
Railway operating expenses	15,685,627	15,065,213	2,819,610	2,565,165	813,123[1]	862,930[1]	239,619	391,114	38,666,747	38,935,149
Net revenue, railway oper.	$2,718,317	$3,206,826	$1,067,410	$1,125,906	.....	.....	$98,413	$96,252	$17,242,806	$16,900,372
Taxes	1,210,870	1,261,527	235,331	230,356	.....	.....	26,794	27,698	3,310,797	3,402,066
Operating income	$1,507,447	$1,945,299	$832,079	$895,550	$415,884	$383,431	$71,619	$68,554	$13,932,008	$13,498,306
Non-operating income	171,857	275,707	.....	.....	.....	.....	.....	.....	1,243,331	1,390,208
Gross income	$1,679,304	$2,221,007	$832,079	$895,550	$415,884[6]	$383,431[6]	$71,619	$68,554	$15,175,339	$14,888,514
Deductions from gross income	2,512,754	2,530,953	363,268	321,929	182,150	183,693	24,511	26,313	10,837,831	11,361,425
Net income	*$833,449*	*$309,946*	$468,810[9]	$573,620[9]	$233,734	$199,738	$47,108	$42,241	$4,337,508	$3,527,089
Operating ratio	0.852	0.824	0.725	0.695	.....	.....	0.709	0.802	0.691	0.697

(See Page 207 for Footnotes)

is seen from the change in operating income. Among the 60 companies, 34 were able to show a greater operating income after deducting operating expenses and taxes. In this figure lies the real measure of effectiveness of the operating policy followed for the year. Again it is significant that the groups containing the largest and the smallest railways are the ones which had the greatest gains in net. Eight of the twelve small companies made a better showing in this respect than they did in 1928, and eleven of the fifteen large companies showed similar gains. In the middle group, fifteen companies showed gains and eighteen showed reductions from 1928.

Operating ratios fall within a range not far different from that indicated last year. Only one small company had an operating ratio of more than 1.00. Three small companies for which operating expenses and taxes are not separated were not able to cover both these items of expense out of revenue. They are part of a larger system which as a whole was able to pay expenses by a considerable margin. The remaining 56 companies analyzed were able to pay operating expenses out of receipts. One small and one medium-sized company had operating ratios between 0.90 and 1.00. Thus 41 out of 44 companies for which information was available were able to keep their operating ratios below 0.90. This speaks well for the efficiency of management. At that, only one small, one large, and six middle sized properties had higher than 0.80 for the operating ratio.

Although it sometimes has been questioned whether the small companies are able to operate efficiently, two of those with receipts of less than $1,000,000 were able to operate at less than 0.70. These are both interurban railways, the Galveston-Houston Electric Railway, with a ratio of 0.563, and the Charleston Interurban Railroad, with 0.614. The six companies with ratios below 0.70 in the middle class are the Denver Tramway, 0.688; the Honolulu Rapid Transit Company, 0.694; the Grand Rapids Railroad, 0.627; the New York, Westchester &

Table I—(Continued)—Condensed Financial Reports of Electric Railway Properties, 1929-1928

	United Electric Railways, Providence, R. I.		Dallas Ry. & Terminal Co., Dallas, Tex.		Texas Electric Railway, Dallas, Tex.		Galveston-Houston Electric Ry., Houston, Texas		Houston Electric Co., Houston, Texas	
	1929	1928	1929	1928	1929	1928	1929	1928	1929	1928
Railway operating revenue	$7,421,195	$7,423,475	$3,319,132	$3,260,569	$1,866,307	$1,825,753	$584,490	$643,800	$3,375,857	$3,343,294
Railway operating expenses	6,423,874[1]	6,482,551[1]	2,329,455[1]	2,479,277[1]	1,177,584	1,121,438	329,020	373,360	2,085,804	2,059,957
Net revenue, railway oper.	.....	.....	.....	.....	$688,723	$704,315	$255,470	$270,440	$1,290,053	$1,283,337
Taxes	.....	.....	.....	.....	69,567	65,855	32,356	31,768	273,926	291,672
Operating income	$920,876	$940,924	$989,677	$781,292	$619,156	$638,459	$223,113	$238,671	$1,016,125	$991,664
Non-operating income	86,630	86,559	.....	.....	.....	.....	193	.....	11,730	.....
Gross income	$1,007,506	$1,027,483	$989,677	$781,292	$619,156	$638,459	$223,306	$238,671	$1,027,859	$991,664
Deductions from gross income	610,269	616,886	879,961	.....	417,865	417,877	269,960	269,809	398,669	410,701
Net income	$397,237	$410,597	$109,716	.....	$201,291[4]	$220,582[4]	*$46,654*	*$31,138*	$629,190	$580,963
Operating ratio	.....	.....	.....	.....	0.631	0.615	0.563	0.579	0.618	0.616

	Pacific Northwest Traction Co., Seattle, Wash.		Charleston Interurban R.R., Charleston, W. Va.		Madison Railways, Madison, Wis.		Ottawa Electric Railway, Ottawa, Ont.		Montreal Tramways, Montreal, P. Q.	
	1929	1928	1929	1928	1929	1928	1929	1928	1929	1928
Railway operating revenue	$964,072	$881,076	$839,938	$800,460	$436,165	$439,865	$1,887,123	$1,855,907	$15,669,911	$14,938,678
Railway operating expenses	717,375	736,776	516,077	546,295	343,197[1]	349,250[1]	1,550,342[1]	1,314,349[1]	11,431,166	11,503,314[1]
Net revenue, railway oper.	$246,697	$144,300	$323,861	$254,165	.....	.....	.....	.....	$4,238,745	.....
Taxes	54,176	51,644	79,416	79,416	.....	.....	.....	.....	476,342	.....
Operating income	$192,518	$92,654	$244,445	$174,749	.....	.....	$336,781	$541,558[4]	$3,762,403	$3,435,364
Non-operating income	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Gross income	$192,518	$92,654	$244,445	$174,749	$92,968	$90,615	$336,781	$541,558[4]	$3,762,403	$3,435,364
Deductions from gross income	116,215	155,255	111,399	110,372	61,365	71,655	182,589	.....	3,634,086	2,935,364
Net income	$76,303	*$62,601*	$133,047	$64,377	$31,603	$18,960	$154,192	.....	$128,316	$500,000
Operating ratio	0.744	0.836	0.614	0.682	.....	.....	.....	.....	0.729	.....

	Havana Electric Ry., Havana, Cuba		Underground Electric Rys., London, England[10]		Christchurch Tramway Board, Christchurch, N. Z.		New South Wales Govt. Tramways, Sydney, N. S. W.		Melbourne & Metropolitan Tramways Bd. Melbourne, Vic., Aus.	
	1929	1928	1929	1928	1929[16]	1928[16]	1929[2]	1928[2]	1929[2]	1928[2]
Railway operating revenue	$5,694,051	$5,415,175	£15,097,592	£14,941,553	£265,363	£273,761	£4,457,890	£4,556,561	£2,435,548	£2,494,100
Railway operating expenses	4,608,568[1]	4,494,473[1]	12,288,229[1]	12,046,381[1]	183,462	193,962	3,835,644	3,937,356	1,704,678	1,722,967
Net revenue, railway oper.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Taxes	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Operating income	$1,085,483	$920,702	£2,809,363	£2,895,172	£82,101	£79,799	£622,246	£619,205	£730,870	£771,133
Non-operating income	31,457	39,171	1,080,003	1,052,917	.....	.....	.....	.....	.....	.....
Gross income	$1,116,940	$959,873	£3,889,366	£3,948,089	£82,101	£79,709	£622,246	£619,205	£730,870	£771,133
Deductions from gross income	643,360	643,951	2,738,940	2,774,902	69,258	82,970	631,589	591,397	345,885	325,955
Net income	$473,580[4]	$315,922[4]	£1,150,426	£1,173,187	£12,843	*£3,171*	*£9,343*	£27,808	£384,985	£445,178
Operating ratio	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

Italic figures indicate deficit.
[1]Includes taxes.
[2]Years ended June 30.
[3]For comparative purposes taxes are computed for 1929 at $332,402 and for 1928 at $328,116.
[4]Before depreciation.
[5]After deducting depreciation of $3,572,648 in 1929 and $2,907,939 in 1928.
[6]After depreciation.
[7]Years ended Jan. 31.
[8]Includes City's 55 per cent of divisible net receipts.
[9]These figures represent balance transferred to stabilizing fund. In 1929 after adjustment for taxes, power refund and payment of bond interest and dividends on preferred stock the net increase in stabilizing fund was $45,387; in 1928 after similar action the net increase in stabilizing fund was $125,150.
[10]Combined statement of "common fund" companies.
[11]Deduction of $64,335 for retirements from this amount was made in 1929.
[12]Net after equipment and joint facility rents.
[13]Includes depreciation.
[14]Subject to adjustments.
[15]Twelve-month statement for calendar year.
[16]Before depreciation and federal taxes; Years ended Mar. 31.
[17]Net revenue from auxiliary operations, $1,605,102 in 1929 and $1,431,367 in 1928.
[18]Net revenue from auxiliary operations, $6,628 in 1929 and $59,602 in 1928.
[19]Net deficit from auxiliary operations, $120,828.
[20]Net deficit from auxiliary operations, $46,377 in 1929 and $73,391 in 1928.

Table IV—Electric Railways or Controlled Bus Companies on Which the Passengers Carried in 1929 Exceeded Those in 1928

Company	Increase Per Cent 1929 Over 1928
Aurora, Elgin & Fox River Electric Company, Aurora, Ill.	2.81
Chicago & Joliet Electric Railway	3.98
Chicago Surface Lines	1.00
Illinois Northern Utilities Company, Freeport	10.37
Illinois Power & Light Corporation, Galesburg	1.48
Illinois Power & Light Corporation, Peoria	3.93
Chicago, South Shore & South Bend, Michigan City, Ind.	15.40
Gary Railways Company	4.86
Indiana Service Corporation, Ft. Wayne	8 54
Southern Indiana Gas & Electric Company, Evansville	1.22
Houghton County Traction Company, Houghton, Mich.	0.33
Saginaw Transit Company, Saginaw, Mich.	1.73
Public Service Co-ordinated Transport, Newark, N. J.	0.02
Salem & Penns Grove Traction Company	8.29
Manhattan & Queens Traction Corporation	1.59
Interborough Rapid Transit Company	3 94
New York Rapid Transit Corporation	3.84
Poughkeepsie & Wappingers Falls Railway	1.48
Third Avenue Railway System	3.39
Community Traction Company, Toledo	5.22
Dayton & Troy Electric Railway	11.14
Dayton & Western Traction Company	0.38
Ohio Public Service Company, Mansfield, Ohio	6.43
Pennsylvania-Ohio Public Service Company, Youngstown	0.56
Altoona & Logan Valley Electric Railway	1.00
Beaver Valley Motor Coach Company, New Brighton, Pa.	7.39
Beaver Valley Traction Company	0.79
Citizens Transit Company, Oil City, Pa.	16.07
East Penn Traction Company, Pottsville, Pa.	74.55
Lewistown & Reedsville Electric Railway	1.70
Pittsburgh Motor Coach Company	20.35
Milwaukee Electric Railway & Light Company	1.19
Northern States Power Company, Eau Claire, Wis.	10.55
Wisconsin Power & Light Company, Madison	4.83
Alabama Power Company	1.24
Atlanta Coach Company	14 67
Kentucky Utilities Company, Paducah	1.85
Gulfport & Mississippi Coast Traction Company	10.06
Lynchburg Traction & Light Company	0.99
Virginia Public Service Company, Hampton	1 60
Des Moines & Central Iowa Railroad	5.21
Des Moines Railway	5.08
Mason City & Clear Lake Railroad, Mason City, Iowa	6.71
Tri City Railway, Davenport, Iowa	8.70
Waterloo, Cedar Falls & Northern Railway	5.16
Mississippi Valley Public Service Company	3.62
Missouri Power & Light Company, Jefferson City	3.52
St. Joseph Railway, Light, Heat & Power Company	2.99
Butte Electric Railway	10.00
Utah Rapid Transit Company, Ogden	10.09
Northeast Oklahoma Railway, Miami, Oklahoma	21.74
Dallas Railway & Terminal Company	1.81
Eastern Texas Electric Company, Beaumont	14.89
El Paso Electric Company	6.56
Houston Electric Company	1.50
Texarkana Street Railway	5.41
Texas Electric Railway, Dallas	3.03
Pacific Electric Railway, Los Angeles	2.14
Yakima Valley Transportation Company	4.68
British Columbia Electric Railway, Vancouver	0.46
Hamilton Street Railway	7.46
Montreal & Southern Counties Railway, St. Lambert	0.0
Montreal Tramways	5.85
Nova Scotia Power & Light Company, Halifax	25.20
Niagara, St. Catherines & Toronto Railway	1.81
Quebec Railway, Light, Heat & Power Company	0.46
Sherbrooke Railway & Power Company	11.22
Toronto Transportation Commission	6.81
Winnipeg Electric Company	1.69

Boston Railway, 0.621; the Texas Electric Railway, 0.631, and the Houston Electric Company, 0.631. In this list are found railroads of widely differing types, including city, interurban and rapid transit. Among large systems operating in the low ratio class are the United Railways & Electric Company of Baltimore, 0.678; the Long Island Railroad, 0.671, and the Philadelphia Rapid Transit Company, 0.691. Here again is a wide variance in class of service.

Traffic Increase on Many Properties

That traffic increased on many electric railways is indicated by figures collected by the American Electric Railway Association for the past five years. From these it is found that there were increases in passenger traffic on 77 properties last year. Some few of these are not representative, since they are due in whole or in part to inclusion of additional lines purchased, or for other reasons have been excluded from consideration. The remaining companies are listed in Table IV, together with the per cent increase in traffic of 1929 over 1928. The gains range all the way from 0.02 to 74.55. As in the other figures, the gains are distributed over the small, medium and large properties. Some of the largest increases in traffic are on small systems. This indicates that the need for transportation, even in communities of minor importance, has not disappeared, and that there is an opportunity for improvement in small city systems and on certain of the interurban lines.

Private Car Converted for Parlor-Buffet Service

FOR the use of parties on chartered trips a private car of the Terre Haute, Indianapolis & Eastern Traction Company has been converted into a luxurious parlor-buffet car. Built several years ago, this car was recently rehabilitated in the company's shops and furnished with new draperies, linen and tableware. A large lounging compartment, library nook and front and rear observation platforms provide accommodations for 25 passengers. Large windows of circular glass reaching almost to the floor afford a clear view from both front and rear platform. In addition to leather upholstered easy chairs, the car is furnished with a long center table, folding card tables and several commodious divans. A small galley and pantry, containing an alcohol range, refrigerator, cupboard and serving table, is located at the center of the car, as is a lavatory. The car may be chartered for trips to any point on the T. H. I. & E. system or connecting electric lines for a minimum of 25 full fares. A porter is assigned to the car to prepare refreshments and attend to the needs of the passengers. The car is motorized and is operated as a single unit under ordinary circumstances. Illustrated circulars are mailed to those who contemplate chartering the parlor-buffet car for private parties. If a party numbering more than 25 has to be accommodated, a trailer is attached to the car, or the car is attached to a regular train if the service permits.

Attractive interior of converted parlor-buffet car of the Terre Haute, Indianapolis & Eastern Traction Company

Trends in Material Purchasing *Analyzed*

Survey shows that the inventory value of materials and supplies kept on hand by the electric railway industry totals approximately $72,500,000, representing 1.2 per cent of company valuation and 5.6 per cent of annual gross receipts. Total annual expenditures amount to $181,500,000. Railways buying small lots more frequently. Speed of delivery and standardization important factors.

THROUGH their purchasing and stores departments the electric railways of the United States and Canada carry on one of the largest merchandising and industrial operations in America. In the course of a year these departments spend millions of dollars in the markets for materials, supplies and equipment with which to maintain their properties and carry out needed improvements. They also accumulate and sell scrap materials to the value of many thousands of dollars, while the elimination of waste products and obsolete materials runs, in the course of a year, into high figures.

Through a survey made by the JOURNAL, covering 42 electric railways, representing 21,755 passenger cars and 10,118 miles of track, it has been determined that the average total stores inventory for the entire industry is approximately $72,500,000. This investigation further showed that there is a complete turnover of stores materials slightly over 2½ times per year, which indicates that the total amount spent in the course of twelve months is $181,500,000.

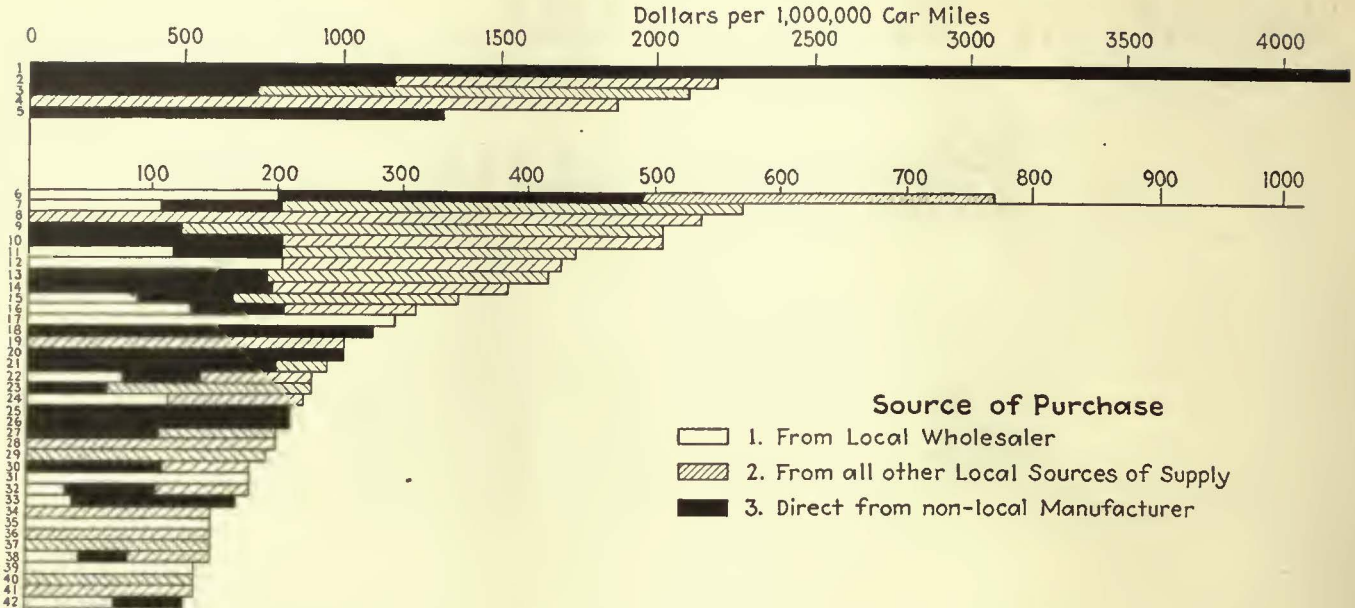
This figure checks closely with the data obtained from the electric railways for the record of expenditures, published in the January Statistical and Progress Number. For 1929, the industry expended $100,535,000 for maintenance materials alone. Most of these materials, of course, are handled by the stores department. To this amount must be added a large proportion of the $81,890,000 for way and structures, new plant and equipment, smaller proportions of the new plant accounts for cars, buses and power equipment, which had a combined total of $53,580,000, and a large proportion of the $20,720,000 for bus operating supplies. Assuming that these budget figures, submitted at the end of each year by the electric railways, are an indication of the amounts spent by the purchases and stores departments, the expenditures for materials have remained at a high figure for a number of years and have actually shown an increase in the past two years. According to estimates for the current year, another increase will be shown.

Other information secured in the survey indicates that the number of items kept in stock on a property of average size is over 8,000 and the inventory value is $460,000. This amount represents 1.2 per cent of the total railway valuation and 5.6 per cent of the annual gross receipts. It was also found that companies are buying small lots more frequently rather than occasional large lots; that compared with 1925 a majority of the companies are buying smaller quantities and buying more frequently; that wherever an increase in speed of delivery has been effected the railways have been able to reduce their inventory; that certain of the companies have been able to reduce their stocks by company or industry standardization, and that many companies use the A.E.R.E.A. standards.

Summarized Inventory Data of 42 Electric Railways

	Number of Passenger Cars	Miles of Track	Number of Buses	Items in Stock	Inventory Value, in Dollars	Ratio of Inventory Value to Total Company Valuation, in Per Cent	Ratio of Inventory Value to Annual Gross Receipts, in Per Cent
14 large railways: total	14,670	6,872	1,847	216,184	13,166,000	....	....
14 large railways: average	1,047	491	132	15,450	941,000	1.03	5.61
13 medium-sized railways: total	5,126	2,328	1,018	120,615	4,875,000	....	....
13 medium-sized railways: average	394	179	78	9,280	375,000	1.15	5.37
15 small railways: total	1,959	918	283	54,230	1,281,000	....	....
15 small railways: average	131	61	19	3,620	85,400	1.41	5.75
Total of 42 railways: total	21,755	10,118	3,148	341,029	19,322,000	....	....
Total of 42 railways: average	518	241	75	8,120	460,000	1.20	5.60

Annual Purchases of Large Electric Railway System



THIS chart represents the annual purchases of a large city electric railway company expressed in dollars per million car-miles.

Each class of purchase has been summarized separately and given a rank on the chart according to its importance. The prices of all materials used are net to the operating company, and do not include discounts, transportation charges, taxes or labor. Each bar is divided according to the percentage of the total amount purchased from the following sources: (1) from local wholesalers, (2) from all other local sources of supply, and (3) direct from non-local manufacturers.

1. Rail
2. Ties
3. Special trackwork
4. Car wheels
5. Brake shoes
6. Switches, electric
7. Cable, miscellaneous
8. Cable, lead covered, underground
9. Coils, armature
10. Wire, trolley
11. Bearings, ball, roller, plain, bronze, journal
12. Lamps, Mazda
13. Paving blocks
14. Castings, malleable iron
15. Plates, joint
16. Conduit steel for all types of wiring, underground and lead cable, etc.
17. Lubricants
18. Paint, oil and Japan
19. Oxygen
20. Lathes
21. Compressors, air, and parts
22. Insulators, porcelain, wood, glass, etc.
23. Heaters, car and building
24. Poles, trolley
25. Brushes, carbon
26. Ears, trolley
27. Castings, gray iron
28. Welding rod
29. Fence, iron and steel
30. Welding apparatus
31. Hose, rubber, all types
32. Bolts, machine
33. Axles, armature and car
34. Bonds, rail
35. Cement, Portland, asphalt and Lumnite
36. Bolts, track
37. Circuit breakers
38. Trolley wheels
39. Sleeves, pole and wire
40. Acetylene
41. Waste wool
42. Jacks and parts
43. Tampers, track
44. Solder, string, wiping, lineman's and wire
45. Castings, cast iron
46. Coils, field
47. Lockers
48. Varnishes
49. Brushes, paint
50. Lead, white
51. Castings, steel
52. Treads, safety
53. Tanks, steel
54. Wire, rubber covered with braid
55. Bushings, miscellaneous for cars
56. Tin, sheet
57. Rattan seating
58. Welding material
59. Soap, hand and car washing
60. Pumps, sump, oil, suction, circulation, etc.
61. Castings, truck
62. Splicers, wire
63. Registers, fare
64. Tape, miscellaneous types
65. Fire extinguishers
66. Wheels, emery
67. Castings, brass
68. Change carriers
69. Machines, tabulating
70. Locks, door, switch, cabinet padlocks, etc.
71. Wire, miscellaneous
72. Rods, tie
73. Bolts, special
74. Turpentine
75. Saws
76. Stokers
77. Pins, coupling, dowel, trunnion, channel, insulator, etc.
78. Holders, brush
79. Lock washers
80. Bolts, miscellaneous
81. Tape, friction
82. Valves, air, rubber, safety, check, etc.
83. Clocks, time recording
84. Drill bits
85. Wire, resistance
86. Batteries, dry and storage
87. Turnstiles
88. Asbestos, packing, sheet, cement, board, etc.
89. Gaskets, leather, rubber, asbestos, etc.
90. Line breakers
91. Hose, rubber, fire, pressure and air
92. Cable, rubber covered
93. Waste, cotton
94. Oakite
95. Wire, copper
96. Steel, tool
97. Tubes, boiler
98. Shovels
99. Cement, rubber, asbestos, etc.
100. Unions, pipe
101. Weed destroyers
102. Bells, buzzers, gong, parts and equipment
103. Rope, trolley
104. Mica, white sheet
105. Buckets, galvanized iron
106. Curtain material
107. Insulation tape
108. Varnish remover
109. Relays, electric
110. Hoists, chain, air and parts
111. Armature parts
112. Poles, line
113. Meters and parts, voltmeters, ammeters, Economy meters, etc.
114. Brooms, switch, paving, wire and rattan
115. Files, rail, wood, rasp, saw, cross, etc.
116. Connectors, cable and wire
117. Chamois
118. Paint, oil
119. Castings, bronze
120. Cloth, emery
121. Torches and parts
122. Cross arms
123. Cleaners, squeegees, brushes, scrapers and miscellaneous preparations
124. Catchers, trolley
125. Castings, miscellaneous
126. Cans, iron
127. Chains, sash, brake, jack, etc.
128. Lightning arresters
129. Handles, small tool
130. Brass, cold rolled, hand drawn and channel
131. Cocks, miscellaneous
132. Headlights
133. Plates, miscellaneous
134. Reflectors, headlight
135. Insulation, mica, porcelain, asbestos, etc.
136. Tubing, resistance
137. Tubing, steel
138. Enamel
139. Belting, leather and rubber
140. Bolts, fork, etc.
141. Paint, roof
142. Ladders
143. Hammers, hand and pneumatic parts
144. Straps, hand
145. Punches, shop
146. Duplicators, typewriting
147. Disinfectants
148. Door control devices
149. Plates, steel
150. Plates, tie
151. Tubing, brass
152. Wire, flameproof
153. Phosphor bronze-spring temper, wrought and filler
154. Wire banding
155. Wire magnet

For the purpose of analyzing the data secured, the 42 companies were divided into three groups, their representation in each group being determined by the number of passenger cars, number of buses and miles of track. Group one, consisting of the larger properties, includes fourteen electric railways with 14,670 passenger cars, 6,872 miles of track and 1,847 buses. Group two consists of thirteen medium-sized railways, with 5,126 passenger cars, 2,348 miles of track and 1,018 buses. The third group has fifteen companies, with 1,959 passenger cars, 918 miles of track and 283 buses. In analyzing the various factors investigated, reference will be made to these three groups.

The returns showed an extremely wide variation in the number of items kept in stock. In the large group this figure varied from 3,500 to 45,000; for the small group, it ranged between 1,200 and 6,500. So many factors govern the number of parts it is necessary to keep in stock, however, that considerable variation is to be expected. Standards of maintenance, whether or not the company generates its own power, whether or not it operates buses, and the degree to which materials are standardized, all have an important bearing on this figure. Naturally the larger companies require many more items than the smaller ones. For the former the number of items in stock averaged 15,450; for the medium-size railways it averaged 9,280, and for the smaller companies the average was 3,620. For all 42 railways, the average number of items was 8,120.

Analysis of the inventory values of the railway shows the same wide variations that exist for the items in stock. For the larger companies the inventory value ranged between $2,500,000 and $375,000; for the smaller ones it varied between $216,000 and $16,000. Average inventory values were $941,000 for group one, $375,000 for group two, and $85,400 for group three. For all 42 companies the average inventory value was $460,000.

Although the number of items in stock and inventory values showed wide variations, the percentages of total company valuation and annual gross receipts, represented by the inventory value, were more nearly constant within the groups. In group two, for example, the percentages of total company valuation ranged between .7 and 1.85. The average inventory figures by groups, in per cent of total company valuation were 1.03 for group one, 1.15 for group two, 1.41 for group three and 1.20 for the complete list. The larger percentages for the smaller groups is explained by the necessity for keeping a certain fixed number of parts for the maintenance of equipment, regardless of how many vehicles are in operation.

In relation to the annual gross receipts the inventory values for the larger companies averaged 5.61 per cent. For the medium-size companies, the per cent was 5.37, for the smaller ones 5.75, and for all 42 companies 5.60. Although there were a few wide variations from the average figures for each group, most of the companies were in the range of from 5 to 6 per cent.

Buying Small Lots More Frequently

Almost every company indicated that it was buying its supplies more frequently and in smaller amounts. This was particularly true for supplies for the maintenance of cars and even more so for buses. Materials for track construction and maintenance, on the other hand, are bought less frequently according to the reports. Several railways stated that they buy spikes, rail and other track supplies only once a year. Most of the railways which indicated that they were buying smaller amounts, qualified their statement by mentioning factors which influenced the buying of larger quantities occasionally. It is apparent that few railways are buying small amounts unless they can get the same price as would be tendered them for a quantity purchase. In those cases where discounts or other price inducements for large purchases are not offered for small quantities, most of the companies buy the larger amounts. Probably the generally accepted rule used is that small orders are placed unless the savings in cost obtained by a quantity purchase exceed the interest on the money tied up.

Another important factor with regard to ordering is the source of supply and the resulting time of delivery. Most companies specified that where the supplies were secured from local sources or nearby cities smaller amounts were secured. Products obtained from manufacturers at distant points are ordered in larger quantities. Of course, local and market conditions, as well as emergencies, have an important bearing on the amount and frequency of the buying. Only one company expressed itself in favor of large orders as a general principle. This company stated that it orders its supplies to last six months, to eliminate the added expense, mistakes and "red tape" of frequent ordering.

Compared with 1925 almost all of the companies are ordering smaller quantities and more frequently. Several of those who stated that there was no difference in their ordering of 1925 and 1929 added that they have been buying in as small quantities as possible for several years.

Speed of Delivery Reduces Inventory

That the increased speed of delivery has been an important contributing factor in reducing the inventories of many railways was affirmed by the majority of answers received. Although one or two stated very emphatically that speed of delivery had assisted in reducing their inventories, the majority indicated that it was a contributing but not a major factor.

The greatest factor in reducing stock has been standardization by both company and industry. On those properties which have made real attempts to standardize their materials, very substantial reductions have been obtained. Some of the reductions reported were 50 per cent, 40 per cent, 20 per cent and 18.4 per cent. One company said that it had reduced its stock from $3,096,000 in 1924 to $2,040,000 at the end of 1929. Still another reported a decrease from $1,250,000 in 1926 to $750,000 in 1929. A few companies mentioned that it was impossible for them to reduce their stock because of the frequent changes in equipment.

Standards of the American Electric Railway Engineering Association are used wherever possible on a majority of the properties which replied. Three stated that they did not use these standards to any great extent and one mentioned that they were used only for scrap sorting, but all the others indicated that they were using them wherever possible or practicable.

Two companies indicated that they were using the A.E.R.E.A. standards almost 100 per cent. In the case of one company, they are used 10 per cent for maintenance of way, 80 per cent for electrical parts and 15 per cent for mechanical parts. In general, the majority of companies are adopting the standards wherever possible, and there is a decided move in favor of their general adoption.

One of the four-track catenary and signal bridges. The old banjo signals seen on the mast near the left of the bridge will be removed and replaced by color light signals of the type shown supported from the bridge

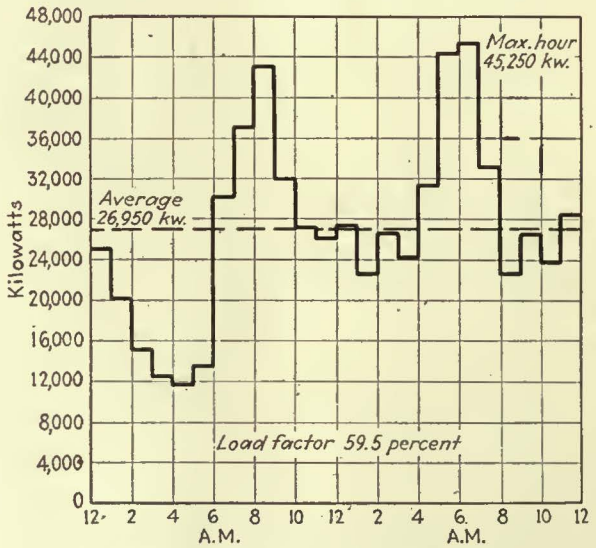
Reading Company's

Philadelphia Suburban

PROGRESS on the work of electrifying the lines of the Reading Railroad in the vicinity of Philadelphia is approximately up to schedule. It is expected to start operation a year from this spring or early summer. Ground was broken for the first of the catenary foundations June 18 of last year, and at present a force of 40 engineers and draftsmen is engaged in the design and about 650 men are on the outside construction, exclusive of work that is being contracted for.

The first stage in the electrification of the Reading was authorized by the board of directors on Oct. 25, 1928. Only preliminary work had been done prior to that date. Inasmuch as this is the first electrification work the company has done, it was necessary to develop all standards, plans, specifications, methods of procedure, etc., from the beginning, and to organize a force for this purpose. This of necessity has consumed some time.

The map shows the territory being electrified. The initial electrification extends from Reading Terminal to Lansdale on the Bethlehem branch, to Langhorne on the New York branch, to Hatboro, and to Chestnut Hill. It consists of 50 route-miles and 110 track-miles, and covers the most important of the suburban services. The suburban electrification may be extended to Norristown, Doylestown and Trenton, and when the through freight and passenger services are electrified, would be extended to Bethlehem, Bound Brook, and possibly Reading and Pottsville.



Typical power load curve after complete electrification of the Philadelphia district

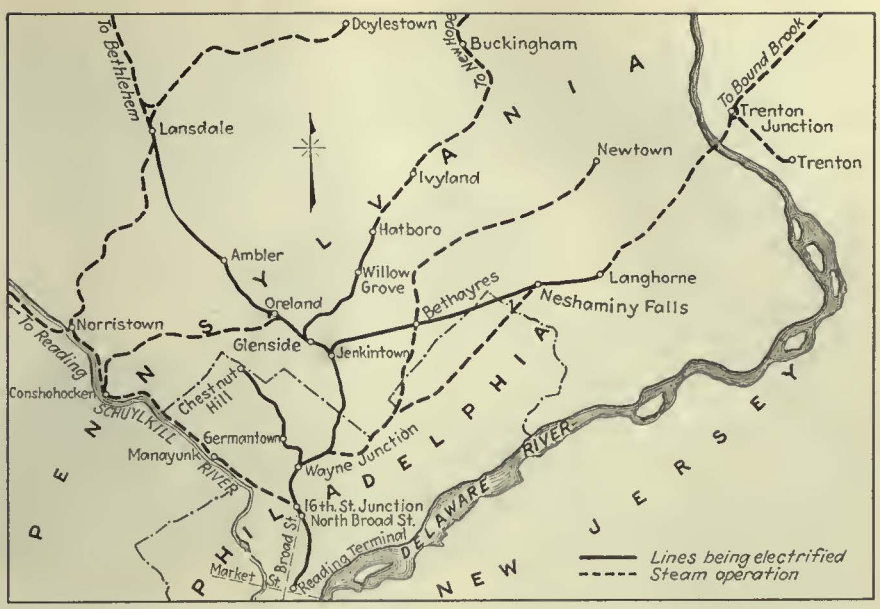
A contract for power has been entered into with the Philadelphia Electric Company for 25-cycle, 13,200-volt alternating current to be supplied at Wayne Junction, 5 miles from Reading Terminal. This contract is for a term of twenty years, which allows the power company to amortize the investment in equipment installed for the railroad. Initially, the power is billed at established rates for railroad loads in this territory. When the railroad demand reaches a definite amount, the rates are based on the actual cost of

Electrification

Making Rapid Progress

Heavy suburban service will be given by 11,000-volt single-phase motor car trains on the initial section of the Reading's electric system. It is planned to extend the road later and to include main line freight and passenger service

By
G. I. WRIGHT
Engineer of Electric Traction, Reading Company
Philadelphia, Pa.



Electric service in the Philadelphia district will be given first on the suburban lines out of the Reading terminal. It will later be extended to cover the main-line trains

power to the power company, including both operating and fixed charges. This will result in a very reasonable cost of power and will enable the railroad to share in the economies which the power companies have made and surely will continue to make in generation, transmission and distribution.

A load curve for the future suburban, through freight and through passenger load in the general Philadelphia area is reproduced. This shows a maximum hour demand of 45,250 kw. and a load factor of 59.5 per cent.

The importance of a favorable power rate, and one that is made more favorable by increasing loads as well as increasing load factor, is apparent when it is seen that the Reading Company's power bill, after through electrification for the Philadelphia territory, will be around $1,500,000 per year.

To furnish this power the Philadelphia Electric Company will run underground, 13,200-volt, 60-cycle lines from Westmoreland substation to Wayne Junction, and at the latter point erect a frequency changer station. Two 15,000-kw. motor-generator sets will be installed initially, while the station will have an ultimate capacity of six such sets. Power will be delivered to the railroad substation bus at its Wayne Junction substation.

The three-wire system, with 36,000-volt transmission will be used in the suburban zone. This system with a lower transmission voltage is used on the New Haven, and in a modified form on the Virginian electrification. It has also been successfully used in Sweden.

The substations consist of auto-transformers connected between the 36-kv. transmission wires and the trolley wire with the one-third point connected to the rails.

Due to the number of stub lines with consequent frequent substations and the narrow restricted rights-of-way this system is particularly economical in first cost. It is also advantageous from the standpoint of minimizing inductive interference in communication lines.

For extensions to Bethlehem, New York, etc., 66,000-volt, single-phase transmission lines will be used. Due to the Central Railroad of New Jersey's having a very heavy suburban service, a source of power for the New York end is considered a necessity.

The zone initally being electrified has an exceptional number of interlockings and junction points. There are nine interlocking plants in the first 10 miles of railroad between Reading Terminal and Jenkintown. All contact wires are sectionalized at these points and this results in complicated catenary wiring and the necessity for a large number of trolley circuit breakers.

In the event of trouble or faults in the catenary system, these being much more frequent than in a power company's distribution system, selective action of the circuit breakers is necessary. Several new schemes of obtaining selectivity have been studied and actually tested out, with small proportional currents in a network set up to duplicate the railroad's distribution system.

Supervisory control will be used to operate all circuit breakers and sectionalizing disconnects between substations.

Two Types of Catenary Structures

The catenary and transmission structures are of two general types. A fabricated truss supported by H columns is used in the four- and five-track territory be-

Catenary bridge with central supporting member, showing also the new signal installation

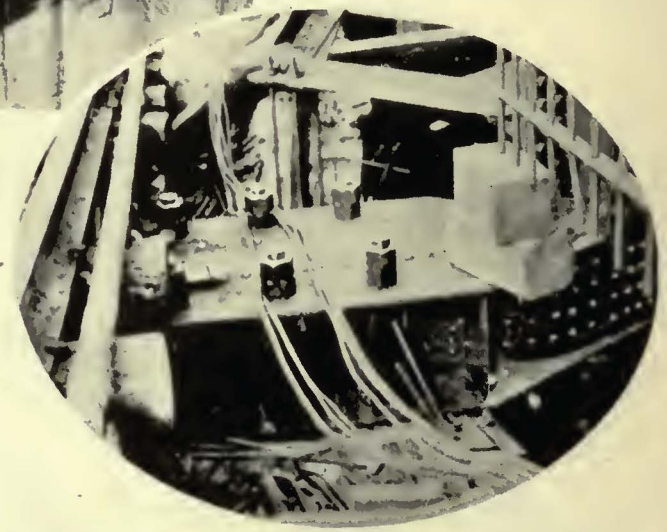
The space for installing supporting bridges is so restricted that in some places they had to be placed on the outside of the retaining wall

tween Reading Terminal and Wayne Junction. Here the restricted right-of-way and proximity of buildings along either side of the railroad makes necessary carrying the transmission wires on masts mounted on the truss. Due to the frequent interlockings, there are many signal bridges in this territory and the catenary bridges are designed to accommodate the new signals which are hung from the trusses. These bridges are fitted with ladders, walkways and cages for signal maintenance, all the old signal bridges are being removed.

North of Wayne Junction the H columns are run up to carry the transmission wires and H section crossbeams instead of trusses are used. Copper-bearing steel is used for all the lighter steel members as an additional protection against corrosion. No transverse guys are used but longitudinal guys for dead ends and at wire crossings. Considerable pains have been taken in the structure and catenary design to standardize as much as possible, keeping the number of types of structures, fittings, etc., to a minimum.

Foundations are all designed with anchor bolts and both gravity and side-bearing designs are used. An unusually large number of special foundations were necessary on account of interferences and restricted right-of-way. Some of these are shown in accompanying illustrations.

Two different types of inclined catenary are being installed. The first is the conventional type in which a bronze trolley wire is supported from an auxiliary copper messenger, which in turn is supported by a bronze main messenger, using three wires in all, and 300-ft. spans. This is being used between Reading Terminal and Langhorne. The second type has only two wires, a bronze trolley wire being supported from a composite

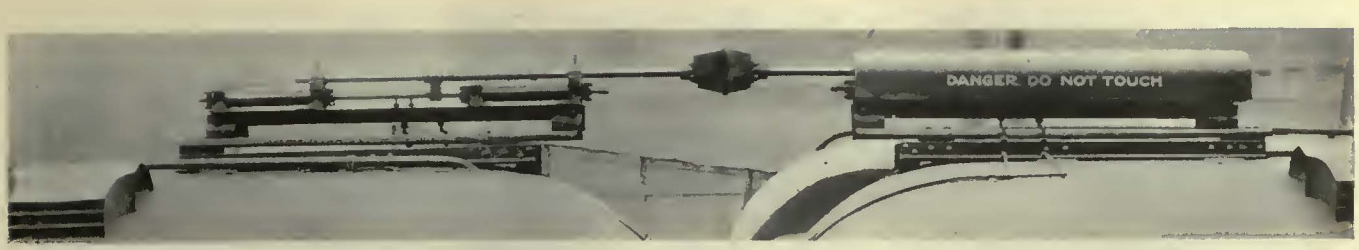


Another unusual location for a catenary bridge foundation. The proximity to the running rail at the left shows the limited space available for the construction

copper and bronze messenger cable with 250-ft. spans. It is to be installed between Jenkintown and Lansdale, and on the Hatboro and Chestnut Hill branches. This type is simpler, lighter and less expensive and the structures can be somewhat less expensive also. We will thus have a comparison of these two types to use in making decisions for further electrification work. It is felt, however, that the latter type of catenary will give entirely satisfactory results, particularly with the method by which we plan to collect the current.

New 11,000 Train Bus Line Connectors Developed

Two pantographs will be in contact with the wire at all times and connected together electrically on the car or locomotive. At least one of these pantographs will be sure always to be in contact with the wires, and as they are in parallel this should minimize if not eliminate sparking.



Connectors between cars couple the 11,000-volt train bus lines automatically. This device was designed and developed by the Reading engineers. The cover at the left is removed to show the construction

With this method, on a ten-car multiple-unit train only two pantographs would be in operation, instead of all ten as in the ordinary scheme where every motor car is independent of all others. This should result in materially less trolley wire and pantograph shoe wear, also less damage to wires and pantographs in the event of a pantograph fouling the wire system, a not infrequent occurrence.

However, the use of such a system for our trains necessitates an 11,000-volt bus line run along the tops of the cars and a means of connection between the cars which is automatic in its operation. Such a connector was not available and the manufacturing companies were requested to develop one. The designs proposed were not considered adequate or satisfactory, so we undertook to design such a device. This has been done and a bus line connector has been built and operated successfully on two steam cars for the last three months. This connector, shown in one of the illustrations, will be used on the new cars.

While this method of operation has not been used in this country, the use of two pantographs bussed together on locomotives is common practice in Europe and results obtained were carefully checked with operating and maintenance people abroad.

Lightweight Cars Will Be Used

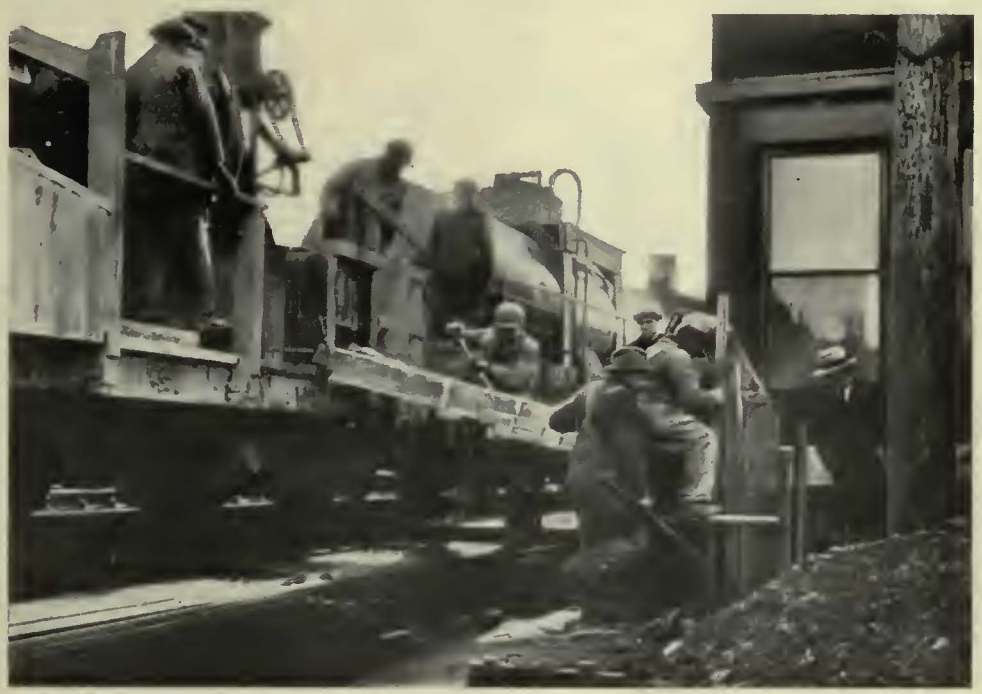
While there will be nothing radical about the new cars, they will incorporate many refinements and improvements and will show considerable weight reduction over most existing cars of their size. All will be motor cars and will seat 86 passengers, and each will be equipped with two single-phase commutating motors of 250 hp.

There has been great activity in the alternating-current single-phase traction motor field within the last few years. We now have six single-phase motor-car motors to choose from, where a few years ago there were only one or two. It is expected that the latest types will show superior performance and maintenance. Even greater activity in locomotive motor design has taken place and is taking place in anticipation of the Pennsylvania requirements, and the Reading will fortunately be able to profit by this when it buys locomotives.

There has fortunately been time to give considerable thought to the layout and equipment on the cars. This has resulted in reducing the amount of conduit, wire, and air piping to what seems to be an irreducible minimum. The layout has been made such as to be most accessible for inspection and maintenance. Improvements have also been made in the ventilating apparatus and ducts, and a new system, designed by the railroad, of filtering snow and dirt from the ventilating air is to be used.

Motors have been so arranged that they can be removed from the trucks without removing the truck from under the car and the car body can be lifted from the trucks without disconnecting ventilating connections. A new design of truck has been tested out for several months on one of our steam cars in regular service and may be used on the new cars.

The high cost of heating electric trains is not generally



Pouring concrete for a signal bridge foundation under difficulties. By the use of a concrete train no space for installing mixing machinery was needed

realized. The energy for this purpose during the heating season amounts on different roads to from 20 per cent to as much as 40 per cent of the total energy used. To reduce this to a minimum, consistent with comfort to the passengers, a double thermostat control will be used, a 70-deg. thermostat being used only during the time the engineman is in the cab and a 50-deg. thermostat at all other times. Also provision is made whereby the engineman can change from the high to the low thermostat for all cars in the train when approaching a terminal to economize on the heat.

A new automatic door-closing device will be used which automatically closes all end doors in the train as soon as the train starts after the station stop. This, in addition to having heat, will avoid drafts due to doors being left open until they are closed by the trainmen.

Shop Facilities at Wayne Junction

To handle the inspection and repair of the cars and future locomotives, and to store them during the day when not in use, a new car shop and storage yard is nearing completion at Wayne Junction. The shop has five tracks, three for inspection, two for repairs. It is 320 ft. long and can be extended to twice its present length for future requirements. This shop is being pushed to completion for use as a construction storehouse and headquarters for the overhead construction, as it is strategically located for this purpose.

Adjacent to the shop will be the frequency changer substation, the Wayne Junction transformer substation, linemen's maintenance headquarters, and the load dispatchers' office, which will make this location the electrification headquarters. This should make a compact and efficient operating arrangement.

Lastly, the large amount of work in preparing the railroad for electrification should be touched on. Additional clearance has to be provided where required for the overhead wires; grade crossings are to be eliminated; direct current signaling has to be changed over to alternating current; underground conduit has to be installed; telephone wires have to be put in cable and in some localities underground; foreign wire crossings rearranged and eliminated; new storage yards built, and many other changes made. Cost of this work in our case will be approximately equal to that of the electrification proper, including the new cars. Later will come training of the present personnel to operate and maintain the equipment.

All engineering work for the electrification is being done by the Reading Company; also all construction work, except buildings, is being done by railroad construction forces organized for this purpose.

Care Essential in Stringing Trolley Wire

Expansion and contraction with temperature must be taken into account if lines are to be kept tight and breaks prevented

By J. F. NEILD

Electrical Engineer, Toronto Transportation Commission

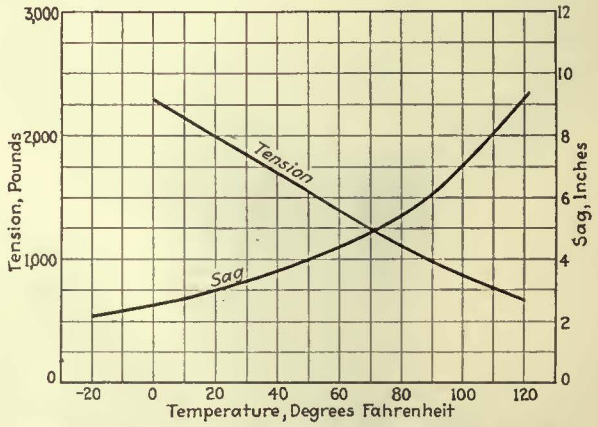
IN THESE days of rapid street car service operated on close headways, the trolley wire demands serious consideration, first as to kind and second as to method of erection. The kind of wire depends on such physical conditions as grades, curves, etc., and on such operating conditions as the amount of energy required for the starting and acceleration of the rolling stock, the frequency of stops, etc. The materials available for practical purposes range from hard-drawn copper trolley wire, which is suitable for long tangent routes having infrequent service, to high-strength low-conductivity bronze trolley wire backed up by heavy feeder capacity for close headway trains, curves, loops, etc.

This part of the subject has been fairly well covered in technical journals and manufacturers' advertising matter and information is easily obtained.

The erection of the wire is just as important as the use of the proper kind of wire. The greatest care must be exercised to avoid any nicks, cuts or scratches, as these materially affect the life of the wire.

The trolley wire should be as nearly parallel to the track as it is physically possible to make it, depending on a not too rigid cross-span for flexibility. It is in trying to erect the overhead structure in such a manner as to obtain this condition that one meets problems.

For instance, 1 mile of unstressed copper trolley wire will contract in length approximately 4½ ft. for a decrease in temperature of 100 deg. F. Consequently, if the trolley wire is strung too tightly at high summer



Tensions and sags for stringing 00 hard-drawn copper trolley wire at various temperatures, 100-ft. span

temperatures it will probably snap at the slightest provocation under sub-zero conditions. At the same time, to obtain the maximum life from the trolley wire, it is advisable to keep the sag as small as possible.

In Toronto, which has a climate similar to that of other Northern cities, temperature variations have been recorded during the period of electric railway operation from 20 deg. F. below zero to 104 deg. F. above zero. Trolley wire must be strung so that it will not fail at the extremes of this range. The tension and sag curves at various temperatures in the accompanying illustration have been computed for our own conditions; that is, so

Measuring the trolley wire tension with a dynamometer

that the maximum stress at 20 deg. F. below zero with a loading of ½ in. of ice and 8 lb. per sq.in. wind pressure, will not exceed half the ultimate strength of the wire. The fact that all of these maximum conditions are not apt to occur at the same time simply adds another factor of safety to the calculation.

On any other property it would appear that to obtain the maximum wear from the trolley wire it would be advisable to derive the relation between temperatures and tensions to conform exactly with normal expected weather conditions. Bronze trolley wire, of course, may be strung at greater tensions than the hard-drawn copper wire on account of its higher ultimate strength.

A dynamometer inserted between the trolley wire clamp and the blocks in pulling up the trolley wire gives a direct measurement of the tension. The measurement of sag, when made accurately with a level and corrected for exact length of span, is a good check on tension of trolley wire already in place. It is not accurate enough to measure the sag from the rail, as an almost imperceptible grade in the track is enough to throw the results out considerably.

At the present time the problem of the correct tension of trolley wire and span wire for varying conditions is being taken up in study by a special committee of the Power Division of the American Electric Railway Engineering Association with the idea of establishing a set of tables and curves that will cover more generally the different variable factors.

In Toronto, during the past few years, we have replaced as much trolley wire as possible in the cold weather while the wire is near its maximum contraction. As a result the wire is rarely called upon to exceed its original stringing tension.

I have not given any data as to the broken trolley wires per year on this system. Information on this subject appeared in the issue of Electric Railway Journal for January, 1930, page 48. The results indicate that, even under the severe conditions encountered in Toronto, little difficulty has been experienced with trolley wire breaks.

Thawing Frozen Water and Conduit Pipes

By H. A. Brown

Foreman Return Circuit, Switch and Signal Division Cleveland Railway

FREQUENTLY during the winter months. it is necessary to thaw out frozen water or conduit pipes. To do this work quickly and efficiently the Cleveland Railway often uses the regular rail joint bonding equipment. This unit consists of a 600-volt rotary converter and a transformer which provides 1,500 amp. at 12 volts potential across the two secondary leads, each of which is about 20 ft. long. The leads are connected to the ends of the frozen section of pipe or conduit and the current applied for about one minute. This is usually sufficient to thaw out the frozen pipe. The use of the bonding device for this purpose has saved a great amount of time and sometimes has saved a complete pipe renewal.

Checking up on tension of the trolley wire by measurement of the sag with a level

Preferential

Traffic Rights

for Street Cars

Mass transportation must be expedited. Many plans for relief of congestion are merely palliatives. Parking should be radically restricted or abolished on important thoroughfares. Dominant consideration must be given to the major movement

By

WINTHROP M. DANIELS

Professor of Transportation
Yale University

RAPID multiplication of motor vehicles has profoundly influenced both the street railways and the steam railroads. This new agency of transportation has made itself felt both in the competition it has offered in the field of passenger traffic and in the way it has affected the business of operation.

It is a commonplace to say that the private automobile has cut heavily into the passenger traffic of both the steam railroad and the street railway, and that the motor truck—in a lesser degree—has taken over some part of the short distance merchandise traffic of the steam railroads. The decline in the passenger revenue of the steam roads since 1923 has been not far from 10 per cent, and the reduction in passenger-miles about the same, the commutation traffic showing, however, an increase of about 10 per cent, with the shrinkage coming in regular passenger service where the average journey has increased from 54.6 miles in 1922 to 73.2 miles in 1928.

The decline in street railway and associated bus traffic is computed by the ELECTRIC RAILWAY JOURNAL to have been from 116 to 101 revenue rides per capita from 1902 through 1929, but riding patronage for the past few years has been about constant. This is the more encouraging from the fact that the registration of automobiles has in the same period been constantly rising. The gross passenger receipts of the street railways, unlike those of steam railroads for passenger service, have for the past four or five years shown a decided increase, those for 1929 being the greatest in their history. This is largely due to the increase in the individual fare which on the average has risen from the old nickel fare to about 8 cents.

From these rather bald facts several inferences may be drawn as to the influence of private motor car competition upon the two related industries. The menace to the street railways was immeasurably the greater. Passenger traffic is overwhelmingly their main source of revenue, whereas with the steam roads it contributes only one-fifth as much revenue as freight. In numerous cases the steam roads, by substituting gas-electric or motor-bus operation for regular passenger service over lines of sparse traffic, have actually saved by the lower cost of operation, whereas the diversion of trolley traffic to the private automobile is practically a dead loss to the street railway.

Nor do the street railways have much collateral compensation for this loss of traffic, whereas the steam railroads from the transportation of automobiles, auto trucks, auto parts and tires alone derived almost 5 per cent of their carload freight revenue in 1928. Petroleum oils, refined and other gasolines yielded more than as much again, and if road-building material be added, it can be seen that the steam railroads have had a handsome offset in increased freight tonnage and revenue to the not incon-

siderable shrinkage in their gross passenger revenue.

It ought, of course, to be added that the steam railroads have lost some of their short distance freight traffic to the motor trucks. But there are two considerations that diminish the importance of this factor. The first is the railroads' own adoption of the motor truck where it can be run to advantage, particularly in cutting down the daily number of way freight trains formerly operated. The second is that short-distance, less-than-carload merchandise traffic is commonly understood to yield very thin net revenue. So that the abatement to be made in the railroads' gain of tonnage and revenue, directly and indirectly traceable to the motor vehicle, is not of overwhelming significance.

The multiplication of the private automobile has relegated both the steam railroad coach and the street railway car to a wholly secondary place, if measured in the relative number of passenger-miles covered collectively by each type of vehicle annually. It has drawn from the rails much traffic that will never be regained. It has, however, created a much vaster amount of traffic than it ever attracted away from the railroads or the railways. But it has been demonstrated that there is a core of passenger traffic the automobile is powerless to absorb. It can never absorb long-distance high-speed passenger traffic. It can never absorb commutation traffic nor the mass movement of city traffic in commission hours.

There is still a no man's land where the competitive rivalry is acute — where it remains to be seen whether the railroads and street railways, both supplemented by their own automotive adjuncts of trucks and buses, can coax back to themselves and away from the private automobile and the private truck, the marginal traffic which for the moment can be handled by either.

In the matter of operation, the millions of private motor cars and trucks have created problems of an entirely different character for the steam roads and the electric railways. The former operate, of course, upon their own right-of-way, whereas the electric railway and the thousands of buses operated as extensions use the city streets and the public highways. Upon an exclusive right-of-way, the physical obstacles from motor vehicle operation are at a minimum. To this almost the only exception is at grade crossings where the many fatalities create a serious situation, and intensify the demand for more complete crossing protection or even the still more expensive separation of grades. But apart from this situation, it may fairly be said that the problem of physical operation of steam railroads has not been seriously complicated by motor vehicle operation.

Indeed, in some respects motor truck operation has been of direct advantage to the steam roads, particularly in their interchange of merchandise freight in large terminals. Of course, so far as railroads use the motor truck or motor bus as adjuncts, these vehicles encounter the same operating difficulties on the streets as confront the motor vehicle generally; and this field is one which in large centers is growing rapidly. The Pennsylvania Railroad only recently filed a schedule according free passenger transfer by bus to parties of 25 to points within Manhattan, the Bronx, Brooklyn and Newark where their tickets apply to or from designated territories upon that carrier's lines. But apart from this railroad use of buses and trucks, and from crossings at grade, the multiplication of motor traffic has not created serious operating problems for steam railroads.

While the motor vehicle disturbed in only a minor degree the physical operation of the steam railroad, it may be said to have almost disrupted the operation of street railways. The arteries of local street traffic in central shopping and business centers are suffering from high blood pressure; they are ordinarily congested, and not infrequently are wholly clogged. The ability of surface car lines to maintain the headways requisite for mass transportation morning and night has been threatened or impaired. The prospective dispersion of the car-riding public has also created bewilderment as to the permanency of routes to be operated. The dilemma has grown until it involves not the operation of the surface lines alone but the far wider problem of city planning in general.

The root of the difficulty lies, of course, in the fact that the area of our paved thoroughfares was a century ago designed to accommodate the horse-drawn traffic of that time. We are now engaged in the almost hopeless effort of trying to force a 3-in. stream through a ½-in. nozzle. And as if the job were not difficult enough, we have accentuated it by diminishing the already inadequate roadways by the practice of parking. The difficulty is intensified by the rapidly increasing number of motor vehicles. Plant an overplus of seeds in a garden patch and they will choke and kill each other just as surely as would so many weeds.

There have been devised numerous remedies which in different places operate with a differing degree of success. But they all suffer from one of two defects—either they are mere palliatives, or else they involve such vast expense that they can seldom be practically used. Among the palliatives—helpful in themselves, but incapable of affecting a radical cure—are: (1) abolishing the left hand turn; (2) restricting the narrower streets to one-way traffic; (3) staggering opening and closing hours of business houses and theaters; (4) confining heavy trucking of coal or garbage and refuse to night or early morning hours; (5) improving the operation of traffic light signals so as to speed and not to obstruct traffic; (6)

Editor's Note

PROBLEMS of transportation have long been familiar to Professor Daniels. For many years he was professor of political economy at Princeton University. From 1911 to 1914 he was a member of the Board of Public Utility Commissioners of New Jersey, and from 1914 to 1923 a member of the Interstate Commerce Commission, serving as its chairman for two years. Since 1923 he has been professor of transportation at Yale. The accompanying discussion of present-day problems of urban transportation is based on a talk made by Professor Daniels at a recent meeting of the New England Street Railway Club.

providing by-pass streets for traffic which has no need to occupy main thoroughfares; (7) the skip-stop plan for the trolley cars; (8) the boulevard-stop plan; (9) uniform traffic codes such as prescribing whether turns on the red light may be made without stopping, or only after stopping, or not at all; (10) requiring loading and unloading platforms for stores to be constructed within building lines and not projecting upon the sidewalk; (11) provision by the city, by private garages or by business houses (for their customers) of parking spaces off the streets; (12) limited parking (generally ineffectual and unenforcible); (13) prohibition of parking, or at least its restriction to non-congested areas. This baker's dozen of remedies, however, are merely palliatives. "Anti-Fat" is no remedy for the dropsy.

Then there come the more ambitious remedies such as street widening, double-decked streets, arcaded sidewalks, city-zoning with a limitation on the height of buildings abutting on the streets, over-passes at the junctions of crowded motor traffic lanes, underground escalators for pedestrians, and finally subways costing millions of dollars a mile. It is tolerably safe to say that except in the largest and densest urban centers these remedies will involve prohibitive expense.

Where, amid this jumble of ill-assorted plans, does the future operation of street railways come in, and along what lines does their hopeful future lie? As one wholly inexpert in street railway operation I would venture the following suggestions: First, they must put in a claim, not only in their own interest, but equally in the interest of the car-riding public, that in congested urban sections during commission hours they must be given a preferential use of streets and public thoroughfares. When it is remembered that a car with 60 passengers takes perhaps one-twentieth of the street area necessary for the accommodation of 20 or 25 private automobiles with the same number of riders, a strong argument can be made for such preferential right-of-way as may be necessary to expedite the mass movement of the riding public for definite periods both morning and night. Parking on such thoroughfares should be radically restricted or abolished. "The essence of the public easement in the highways is passage. Parking is the antithesis of passage," says one of our legal lights; and "Storage on the highways is trespass" on the abutting owner, and a common nuisance to the public. The inconvenience of the few ought to give way to the convenience of the many, and dominant consideration should be shown to the major movement.

This result will not be attained until a campaign of education has taught the merchant that parking before his door is not only an injustice to the public, but is dispersing his own customers to more accessible local sub-centers, and is opposed to his own long-run interests. Once the merchant is convinced, the road-hog and the curb-hog can be taken into camp.

It is also to be noticed that the very inertia which opposes any thorough remedy for street congestion is, in a way, self-corrective. The growth of sub-centers for independent shops and branch stores and even for banks, and the rapid migration of business away from the narrower streets to the wider avenues and thoroughfares should warn the standpatters that they are standing in their own light.

There can be little question that the present tendency is to contract rail mileage and to expand bus-route mileage. Figures can be given to show that bus-route mileage is already 50 per cent of street railway track mileage, and the passenger mileage by bus is a growing percentage of total passenger-miles. Absolutely and relatively, track mileage is on the decline. Last year witnessed a net shrinkage of track amounting to more than 1,000 miles. It has yet to be shown that the bus can ever wholly supersede the car on rails in city transportation.

One final suggestion is ventured. Is it too much to expect that the vehicle designer will contribute to the preservation and even the popularization of the riding habit, both by car and by bus? In some ways, the typical street car is an efficient instrument, but in the same way that a military tank or an armored car is an efficient instrument. It has about the same life as a railroad box car. It can and does stand up under heavy usage. Both the car and the efficient braking apparatus make notably for safe operation. Much of the older equipment, however, is unattractive. Access by steep steps, through narrow platform entrances, limited ventilation, and often a single difficult exit are not calculated to allure traffic. The street railway buses seem to have improved upon the car in these respects, and more particularly in the seats. The bus, however, has a life of only five to six years, and its upkeep and retirement costs must be high. It lacks the staunchness which is the street car's basic merit. But the lure of line, style and color, convenience and design cannot be permanently neglected if the electric street car is to maintain the popularity its utility deserves.

"Bus Transportation" Offers Awards

IN AN effort to stimulate further improvement in motor bus operating methods and practices among the motor carriers in the United States and Canada, *Bus Transportation* has set up six awards for the most outstanding examples of progress made in maintenance practices and methods.

The six awards are divided among three different classes of companies:

(a) Those companies operating 3,500,000 or more bus-miles annually in revenue service; (b) Those companies operating 1,000,000 and less than 3,500,000 bus-miles; (c) Those companies operating less than 1,000,000 bus-miles annually in revenue service.

For the most outstanding example of progress made in maintenance practices and methods to date by any carrier in each of the three classes mentioned, a medal plaque and a certificate of award to the carrier, and in addition $500 in cash to be employed in any manner it elects. For the second most outstanding system of maintenance practices and methods, honorable mention will be given in the shape of a certificate of award, and a medal plaque. All awards will be based on (1) the record of results achieved, and (2) the explanation of the maintenance practices and methods employed.

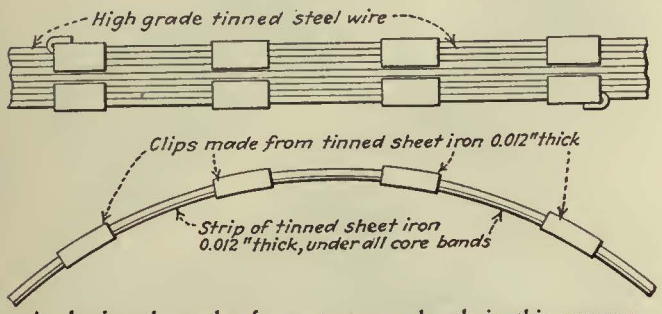
The committee of awards consists of the following: Arthur M. Hill, president National Association of Motor Bus Operators, chairman; E. P. Warner, president Society of Automotive Engineers; Charles Gordon, managing director, American Electric Railway Association; Carl W. Stocks, editor *Bus Transportation;* P. J. Neff, chairman Motor Coach Section, Motor Transport Division, American Railway Association.

The awards will be announced at the annual convention of the National Association of Motor Bus Operators, to be held in Chicago, Sept. 18 and 19, 1930.

Anchoring Armature Core Bands

By J. S. Dean
Westinghouse Electric & Manufacturing Company

BY ANCHORING the ends of core bands on railway armatures, which are subject to severe mechanical strain due to centrifugal force when the armature is rotating at high speed, the service life of these bands can be materially lengthened. The bands should be wound in place on the core, using a high-grade tinned-steel wire having an ultimate tensile strength of 200,000 lb. per square inch. Preferably a 14 B&S gage wire should be used and wound at a tension ranging from 200 to 250 lb. Under the core bands a strip of 0.012-in. tinned sheet steel extending the entire way around the armature should be installed. If these methods are followed it is not necessary to use tinned strips on the end bands over the extension of the coils, at both the front and the rear ends of the windings.



Anchoring the ends of armature core bands in this manner gives longer life under service operating conditions

Clips of 0.012-in. tinned sheet steel should be equally spaced (about every third or fourth slot) around the armature. These should be placed under the steel strip over the coils and not on top of the teeth.

At the start and finish of the band wire four of these clips should be placed about 1 to 1½ in. apart, to hold the ends securely. The ends of the wire should be anchored by bending them at the start and finish around the tinned clips for about ¼ in., as shown in the sketch.

While ordinary half-and-half solder is widely used for this class of work, pure tin is much stronger and has a much higher melting point than the half-and-half solder. A high-melting-point solder has recently been developed by one manufacturer which is used to solder the bands on all of his railway motor armatures. Reference to the table shows the relatively high melting point of this new alloy.

Materials	Melting Point Degrees Centigrade
Half-and-half solder	188
Pure tin	232
High-melting-point solder	300

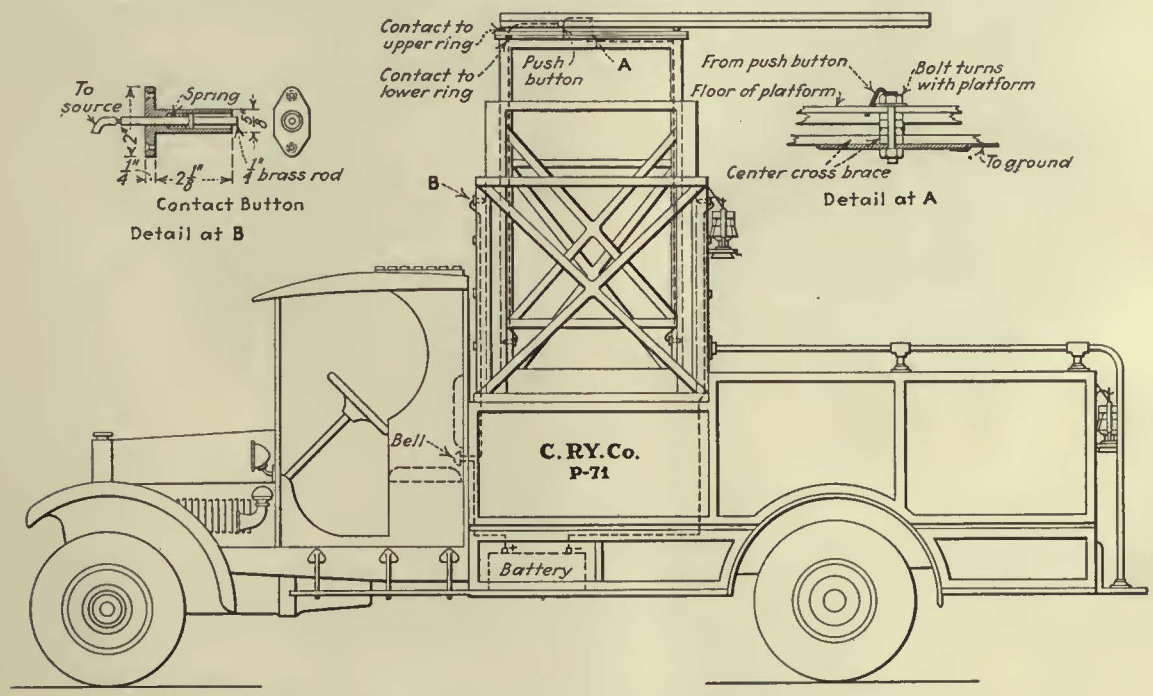
In connection with the use of this special alloy solder, the repairman will find it a big help to use a very hot soldering copper weighing about 5 or 6 lbs. This has been found essential to do a good soldering job on the bands.

Signal Bell on Tower Truck*

By H. A. Brown
*Foreman Return Circuit, Switch and Signal Division
Cleveland Railway*

POWER trucks of the switch and signal division of the Cleveland Railway have been equipped with signal bells, so arranged that a workman on top of the tower may signal the driver regardless of the tower height or position of the turntable. This device is a great help to the trouble crews, especially when working under noisy traffic conditions. Current for the signal is obtained from the regular battery, tapped at the required voltage, the iron tower leg plates and turntable being utilized as current conductors. The signal bell is mounted in the drivers cab and the push button control is mounted on top of the tower within convenient reach

**Submitted in* Electric Railway Journal *Prize Contest.*



Wiring diagram of signal system installed on tower trucks of the Cleveland Railway

ot the workmen. In order to assure good electrical contact at all times between the tower leg plates and the table plate, reconstructed push buttons are used in which the center has been replaced by a piece of ¼-in. brass rod through which it is possible to pass current. The push buttons are mounted in each of the tower leg plates, with the binding posts electrically connected to the iron leg plates, and with the ¼-in. brass rod (under spring pressure) in sliding contact with the adjacent parallel tower leg plate. The same method is used for obtaining good electrical contact between the tower leg irons and the table plate. In this manner a closed circuit is provided when the control button is closed, regardless of the tower height or the position of the table. These bell installations have resulted in a saving of time both to the maintenance crews and to cars on the line approaching a point under repair.

Increasing Height of Span Wire Poles

FOLLOWING street widening operations in New Haven, an effective method was recently adopted by the Connecticut Company for increasing the height of its span wire poles. When the pole line was set back it became necessary to raise the height of the span wire connection to the pole in order to maintain the trolley wire at the proper elevation. This brought the span

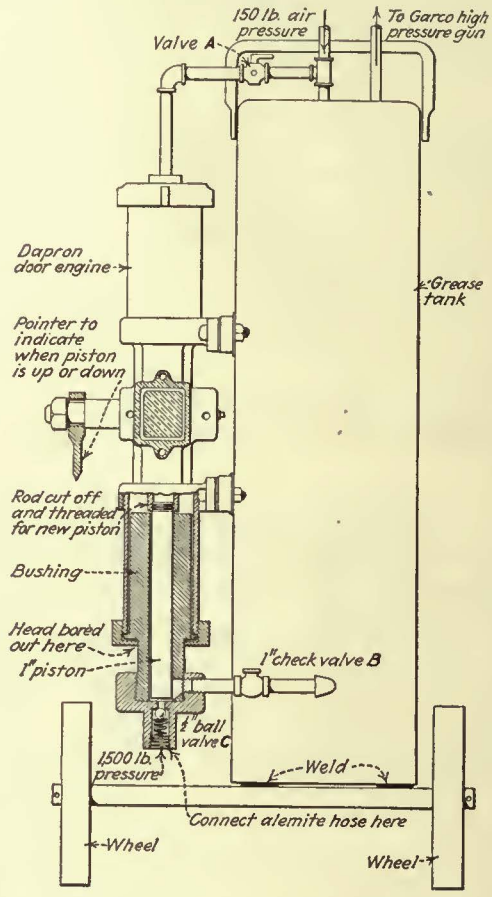
Pole height increased by clamping short extension to top of existing pole

wire too close to the feeder wires carried on crossarms at the top of the poles. Instead of installing taller poles, it was decided to add short sections of pipe to the top of the existing poles, holding the extensions in place by means of malleable iron clamps, as shown in the accompanying illustration. This permitted the necessary separation of the span wires and feeder wires without the expense of replacing the poles.

Door Engine Used for Pressure Lubrication*

By Charles Herms
General Foreman San Diego Electric Railway

FOR lubricating universal joints of the Spicer type, an obsolete door engine was reconstructed in the shops of the San Diego Electric Railway. With the aid of this apparatus, considerable time has been saved when universal joints had to be greased. A feature of this



Lubricating apparatus adapted from an old door engine by the San Diego Electric Railway Company

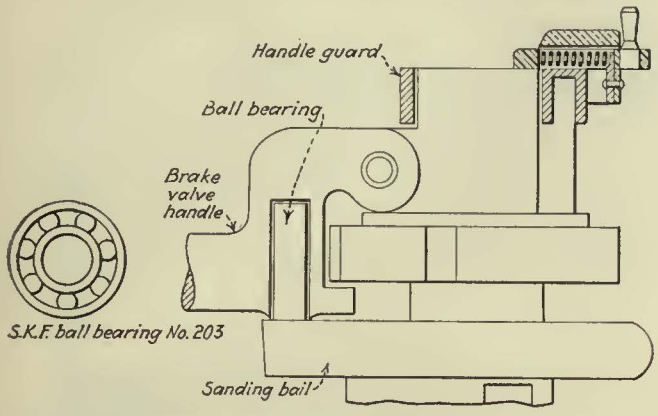
lubricator is that an indicator shows when the grease is entering the cylinder and when it is being pressed out and into the object to be lubricated. The apparatus has a nozzle pressure of 1,500 lb. and discharges 4 cu.in. of grease in ten seconds. It can be recharged in two seconds. To recharge the lubricator, a cock is turned to vent the air from the cylinder, after which the grease, under 150 lb. pressure, passes through the 1-in. check valve and forces the 1-in. piston up to its maximum position.

The Alemite hose also has a vent cock at the end which fastens on to the Alemite fittings. This is to permit the mechanic to cut off the flow of grease at will and at the same time release the pressure on the chuck so it can be removed from the fitting. A ½-in. ball valve is provided to prevent the compressed grease in the Alemite hose from expanding back into the 1-in. cylinder when releasing for recharge. The 1-in. bushing and head were made of an old car axle, while the piston of the same diameter has 0.002-in. clearance.

Ball Bearing Under Brake Handle*

By W. H. McAloney
Superintendent of Equipment Georgia Power Company
Atlanta, Ga.

ELIMINATION of wear on the sanding slide of the M-28 brake valve in general use on safety cars has been accomplished by the Georgia Power Company by placing an S.K.F. ball bearing under the handle. Wear on the slide of the brake valve handle formerly caused many complaints by car operators. In order to eliminate this trouble a type S.K.F. No. 203 ball bearing has been



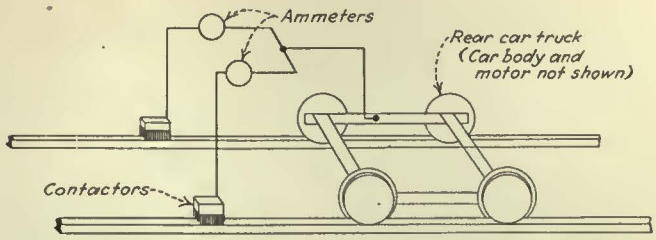
Ball bearing under brake handle has reduced wear of sanding bail on cars of the Georgia Power Company

installed in the brake handle, as shown in the accompanying illustration. This has greatly reduced the friction and overcome the wear on both brake handle and sand bail.

Detecting Broken Rails*

By Carl W. Evans
Underground Distribution Engineer
San Antonio Public Service Company

FINDING the location of broken rails has been greatly facilitated on the lines of the San Antonio Public Service Company by means of a car equipped with a direct-current ammeter on each rail and two steel-wire brushes used as track contactors. When trying to locate broken rails, the car is driven slowly over the track to



Broken rail is detected by the sudden swing of one of the ammeters shunted across a short section of track

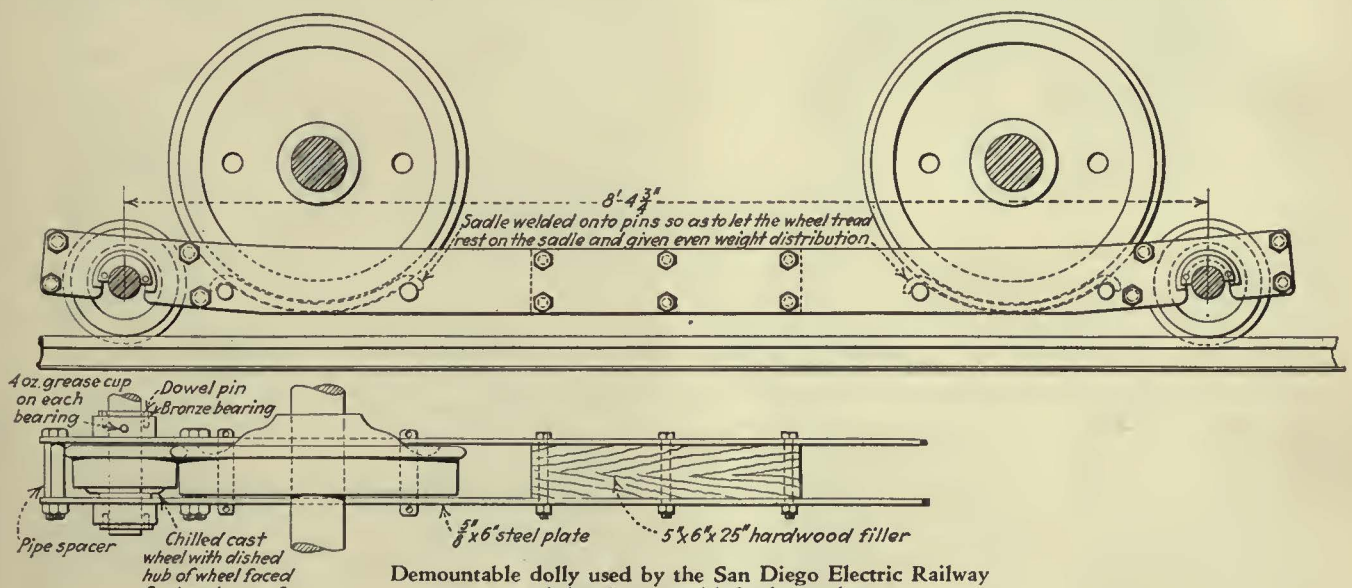
be tested. This is done after midnight when regular traffic has ceased, while one man is watching the ammeters. As long as continuity of the track is not broken the ammeters indicate only a small amount of current since they are shunted across only a short section of track. In passing over a broken rail, the ammeter shunted across the broken rail indicates almost the full car current during the interval that the break in the rail lies between the rail contactor and the wheels. If the car is traveling at a fair rate of speed the broken rail is indicated by a sudden swing of the ammeter, and notation is immediately made of the exact location.

Demountable Dolly Used in San Diego*

By Charles Herms
General Foreman San Diego Electric Railway

A DOLLY used by the San Diego Electric Railway to take the place of a street car's truck when one of the axles is broken consists of two axles with small wheels and two double side members resting on the axles, as shown in the accompanying illustration. This dolly can be assembled or taken apart in a few minutes. When using the dolly it is necessary to jack up the car, roll the dolly under it, and lower the car until the wheels rest on saddles between the sides of each member. Pins which support the saddles are made of 1½-in. steel bar. Due to the design of the dolly, the weight of the car is carried directly on the dolly wheels and no bending action is set up in the dolly axles.

**Submitted in* Electric Railway Journal *Prize Contest.*

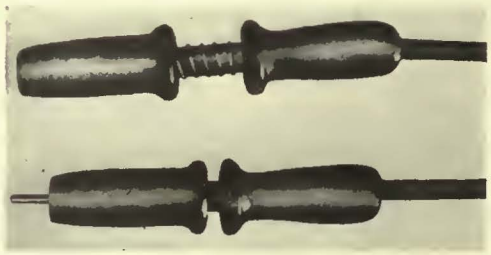


Demountable dolly used by the San Diego Electric Railway to bring in cars with broken axles

Insulating Sleeve Protects Test Points*

By T. E. Brindson
Electric Shop Foreman
Kansas City Public Service Company

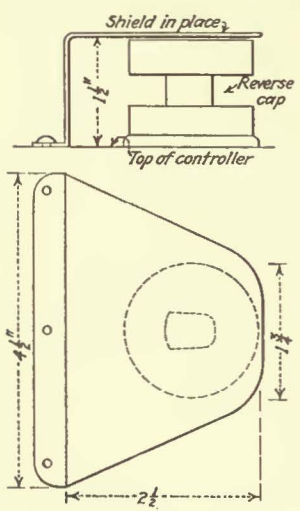
PROTECTION to the workmen engaged in testing electrical equipment in the shops of the Kansas City Public Service Company has been afforded by the development of an insulating sleeve which covers the positive test point. Previous to the development of this device both positive and negative test points were unprotected and workmen received electrical shocks on various occasions. With the new apparatus the negative point is left bare but the positive point is inclosed in fiber tubing inside a wooden sheath. When the apparatus is not in use this sheath covers the metal point, being held in position by a coiled spring. When it is desired to use the apparatus the sheath is pulled back thereby compressing the spring and leaving the test point exposed. This arrangement also provides protection for the test point should it fall on the floor or come in contact with grounded metal.



Fiber tubing in a wooden sheath protects positive point of electric testing apparatus. Above, sheath is in normal position over test point; below, the spring has been compressed, by pulling back the sheath and the test point is exposed

Reverser Protectors Prevent Tampering

By Benjamin H. Hall
Foreman West Penn Railways, McKeesport, Pa.



Sheet steel protectors on the reverse drums of controllers prevent tampering

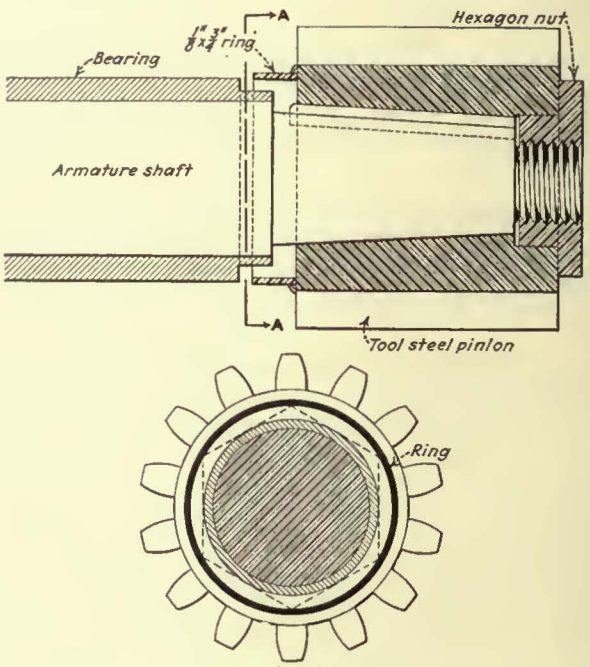
PROTECTORS have been installed on the tops of B-50 controllers by the West Penn Railways as a means of preventing passengers from turning the reverser barrels at the rear of the car with their hands. Without the shields it was found that passengers frequently would do this, making the rail brake inoperative or causing the motors to buck when the front end controller was turned on.

The protector is made of $\frac{1}{16}$-in. sheet steel and is fastened by means of three machine screws tapped into the top of the controller case. Dimensions and the method of installation are shown in the accompanying diagram. It costs little to install these shields and their use has removed a source of annoyance. As a safety precaution, they may save lives and damage to equipment.

Preventing Grease from Entering Armature Bearing

By W. B. Osborn
Master Mechanic
Southern Public Utilities Company
Charlotte, N. C.

TO PREVENT the heavy grease used for lubrication of gears from entering the armature bearing, the Southern Public Utilities Company, Charlotte, N. C., has adopted the practice of welding a ring to the pinion. This ring is placed against the pinion, on the opposite side from the nut which holds it on the armature shaft. A soft steel band of $\frac{1}{8}$x$\frac{3}{4}$-in. dimensions is used for the ring, the diameter depending on the size of the shaft. The bearing should be turned down at the pinion end in order to leave a little space between the bearing and the ring attached to the pinion. This method of preventing the heavy grease from entering the armature bearing has been used at Charlotte for several years and results have proved to be most satisfactory.

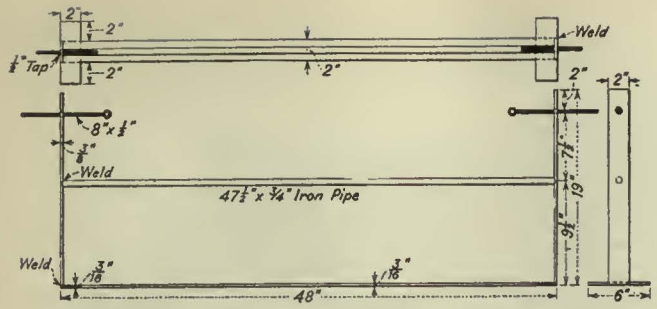


Ring attached to pinion prevents heavy gear grease from entering the armature bearing

Bus Wheel Aligner*

By W. R. Faircloth
Garage Foreman Virginia Electric & Power Company
Portsmouth, Va.

ACCURATE wheel alignment for buses of the Virginia Electric & Power Company at Portsmouth, Va., has been attained by the use of a wheel aligner, made in the company shops. The device used for this purpose has a base made from 2x$\frac{3}{16}$-in. flat iron with a



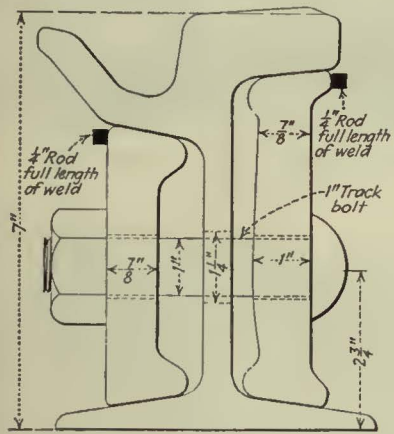
Aligner for wheels has reduced tire wear on buses of the Virginia Electric & Power Company

piece of ¾-in. iron pipe serving as a brace for two 19-in. uprights of 2x⅜-in. flat iron. Two ½-in. bolts 8 in. long are inserted through a ½-in. tap and can be so adjusted as to fit flush against the tire rims. In use the aligner is placed first in front of and then in the rear of the axle, permitting the mechanic to see at a glance whether or not the wheels are parallel. It was made at a cost of only $2.50. The life of tires has been greatly increased since the aligner has been in use, while the number of replacements is decreasing steadily.

Iron Rod Acts as Dam for Weld Metal*

By F. B. Habercam
Superintendent of Welding
United Railways & Electric Company
Baltimore, Md.

WHERE it is desired to electric seam weld rail joints fitted with standard bolted joint plates, the United Railways & Electric Company of Baltimore finds it effective to use a piece of ¼-in. square iron along the entire top edge of the plates as a dam for the weld metal. The ends are welded to hold the rod in place, and the usual welding procedure is then followed. This method applies where the splice bars are not disturbed, but whenever possible it is better to dismantle the joint and, while the splice bars are off, weld the ¼-in. square rod along the under side, to the bars. The joint is then reassembled and welded in the usual manner. The weld can be puddled so that the ¼-in. square rod, splice bar and rail are all thoroughly welded, with a maximum depth of penetration. This method may be used on any type of joint where there is not sufficient welding shelf on the splice bars. It applies particularly to cases of joint repairs to old bolted joint track, where it has been found satisfactory.



Iron rod is used by United Railways & Electric Company instead of copper as dam for weld metal in repairing rail joints

Submitted in Electric Railway Journal Prize Contest.

Hammer Operated by Compressed Air*

By A. G. Pirkle
Assistant Engineer Roadway Department
Georgia Power Company
Atlanta, Ga.

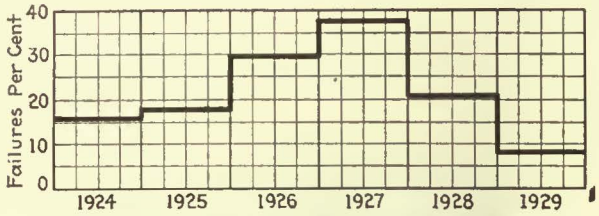
BY CONVERTING an old 3⅝-in. rock drill into a compressed air hammer, the Georgia Power Company has obtained an efficient machine for maintaining roadway tools such as tampers, cleavers, picks, etc., on which there is a considerable amount of blacksmith work to be done. The drill was mounted on a 10-in. I-beam anchored 4 ft. in concrete, and fastened to it by 3¼x5-in. steel plates bolted to the flange of the I-beam with 10⅝-in. bolts. The plates were bent and the ends welded to the frame of the drill. A ratchet which caused the drill to rotate at each stroke was removed. The hammer was forged from tool steel to the desired size and shape, and the stem made to such diameter and length as to fit in the drill socket. The hammer is held in the socket with a 1-in. U-bolt, in the same manner as the drill. Air pressure of 100 lb. is used in operating the hammer and a foot control was installed whereby the air valve may be opened or closed as the case may be. The feedscrew in the top is used in raising or lowering the hammer to suit the various sizes of work. It is estimated that at least three times as much work can be done with the air hammer than with a hand hammer in the same amount of time.

Air hammer made from an old rock drill speeds up blacksmith work in the track department of the Georgia Power Company

High Voltage Test Discloses Equipment Weakness

By H. S. Williams
Assistant Superintendent of Equipment
Department of Street Railways, Detroit

PREVENTION of equipment failures in service has resulted in Detroit from the use of a high voltage breakdown test. So successful has it been that the Department of Street Railways now makes it a practice to give all cars coming into the shops a test with 1,500 volts alternating current between wiring and ground.



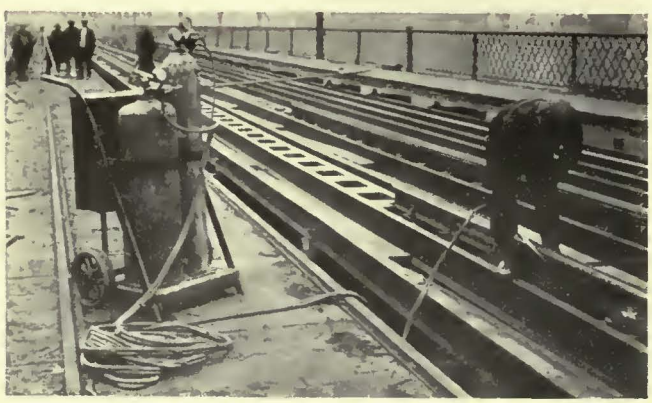
Equipment failures have been reduced at Detroit, due largely to high voltage tests

During 1924 and 1925, when this system was first used, not all incoming cars were tested, so the maximum benefit was delayed. In 1927, however, all were "shot" with a resulting breakdown of 38 per cent of the cars. The following year the number of cars which showed failure was reduced to 21 per cent and so far this year further reduction is apparent. In 1924 when these high potential tests were started the record showed a little over 7,000 miles per pull-in while the 1929 record shows over 14,000 miles. While this improvement is not due entirely to the high voltage testing, a large share of it is attributed to this method of detecting weakness.

Portable Oxyacetylene Apparatus*

By A. B. Copeland
Superintendent of Construction Way Department
Cleveland Railway

TO ELIMINATE the cumbersome handling of an oxyacetylene burning outfit, the Cleveland Railway has designed a special truck to carry the necessary apparatus. Often it was found that trucks or cars equipped with cutting equipment could not reach desired spots because insufficient room was available for maneuvering. The small carriage developed to solve this problem can be moved into any small space. It is mounted on two wheels of 12½-in. diameter, and when not in use stands in an upright position. A platform to support the tanks is made of two layers of 1½-in. oak plank, two holes being cut in the top layer to accommodate the lower ends of the tanks. This arrangement, together with a metal clamping strap at the top, holds the tanks firmly in position. A removable box, attached to the top of the truck, contains gages, tools and other implements. In the lower compartment of this box is a special space for carrying the hose. The weight of the carriage, equipped, is 600 lb.



Portable truck for oxyacetylene burning outfit used by the Cleveland Railway

Lighted Brooms Help Coach Cleaners*

By Hoy Stevens
Superintendent of Maintenance Motor Coach Department
Cleveland Railway

Lighted brooms facilitate sweeping coaches at night in the Cleveland Railway garage

ILLUMINATED brooms are one of the novelties developed in the coach maintenance department of the Cleveland Railway. The unit, as illustrated, consists of a broom, lamp, wire guard, extension cord and reel, the latter mounted on a standard dust box. The outfit is simple, and was made from ordinary garage supplies.

With this arrangement it is possible to illuminate any part of the floor of the coach, regardless of its location in the garage, and with little or no delay from short or tangled extension cords. The dust box can be run under the rear door of a double-deck coach or the front door of a single-deck coach. The floor can be swept thoroughly and dust and dirt seen where formerly they were not noticed, on account of the dark. The garage lights were found of little value and even the interior lights of the coach did not illuminate under the seats, in corners or under heater pipe guards. Morever, when the battery voltage was low the lighting was poor and it was not advisable to keep all the lights on for the time needed to do the cleaning.

**Submitted in* Electric Railway Journal *Prize Contest.*

Exterior of B.-M.T. mechanical department supply car

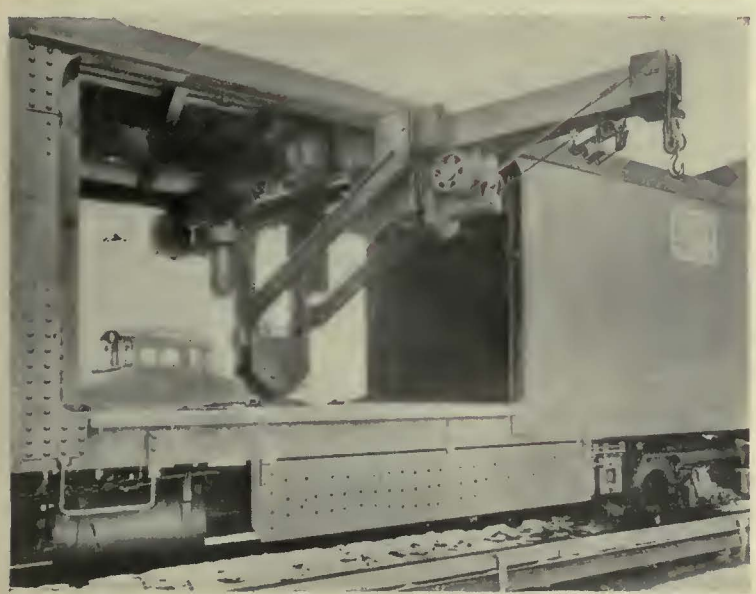
Supply Car for B.-M.T. System

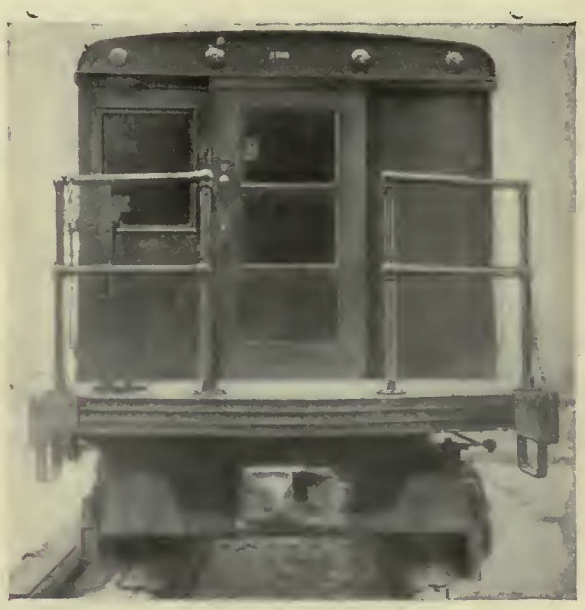
WHILE repairs to equipment for subway and elevated cars of the Brooklyn-Manhattan Transit System ordinarily are made at the Coney Island shops, it is frequently necessary to change armatures, field coils and wheels at other shops. To transport material to and from various shops a supply car is used. The car used for this purpose is provided with equipment for rapid and easy handling of heavy parts and for safe and convenient storage during transportation.

The car is equipped with a 2-ton circular crane in the center portion which is arranged to handle material in and out of the side doors. This crane is electrically operated and easily lifts and lowers material that formerly had to be loaded and unloaded upon flat cars or in box cars by manual labor when transported from one shop to another. The crane is circular and may be swung out either side of the car when the doors are open, and an electrically-operated extension may be projected from the arm, if it is necessary, and then withdrawn back inside the arm when the crane is ready to be swung back into the car. A switch near the motorman's cab controls the power for the operation of the crane, so that it cannot be operated unless the switch is thrown in place. This is one of many safety features governing the operation of the crane.

Loading and unloading are done by the shop forces and not by the car crew. A shopman at each shop is instructed in the operation of the crane and his task on the arrival of the car is to operate it. The car resembles a U. S. mail car in appearance, with sliding doors on either side. It is painted red and has the symbol of the B.-M.T. Lines in colors. It is 48 ft. 3 in. over all and is 8 ft. 7 in. wide. The car body itself is 37 ft. 6 in. long with open platforms at either end on which guard rails are mounted.

About 72 sq.ft. of open storage space is provided at one end of the car for large size material, while the other end is occupied by steel lockers which are suspended from the ceiling. These are used for small size material and for broken lots. Room is also provided for the storage of some material under the lockers. The center of the car is taken up by the crane.



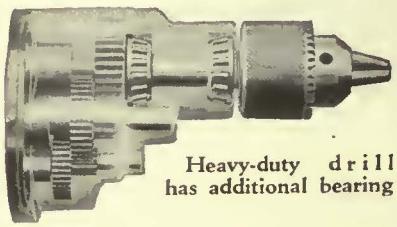


The circular crane is swung out of the door with extension projecting. At right, end view of the car

New Products for the Railways' Use

Chuck Spindle Equipped with Roller Bearings

TO PROVIDE for double thrust which occurs in cylinder reconditioning work, an additional roller bearing has been introduced in the chuck spindles of the $\frac{5}{8}$-in. and $\frac{3}{4}$-in. heavy-duty drills manufactured by



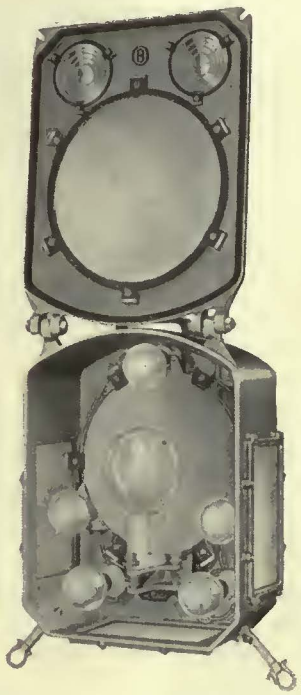
Heavy-duty drill has additional bearing

the United States Electrical Tool Company, Cincinnati, Ohio. It is claimed that this additional bearing facilitates operation and prolongs the life of the drill.

Special Dash-Illuminating Headlight

INCORPORATING the advantages of the standard O-B Type DCP 500-watt incandescent headlight, a new interurban light has been designed which illuminates the car dash and also provides sufficient track illumination for city and suburban service. Completely enclosed in an aluminum case, weighing only 29½ lb., it is fitted with a heat-resisting plain glass lens in the door, an 11-in. glass reflector and a 500-watt incandescent lamp set in a mogul receptacle making it possible to pick up dark objects as far away as 1,500 ft. in clear weather. Dash illumination is furnished by means of five smaller lamps connected in series and arranged to direct the light beams through prismatic lenses set in the sides and bottom of the headlight case. When in use in interurban service, the 500-watt lamp with the aid of the prisms supplies the dash as well as the track illumination. Dimming is accomplished by cutting out the large light and only employing the five small lights, using a single switch fitted with two on and one off positions. Two of the five smaller lights are set directly behind 4-in. semaphore lenses in the bottom of the door. These lights are sufficient to pick up switch points while traveling at a moderate rate of speed.

This new headlight is made for either portable or stationary mounting and can be used on any car wired for 4-amp. headlights, and using resistances of 500 watts and 115 volts. The five small lights are in-

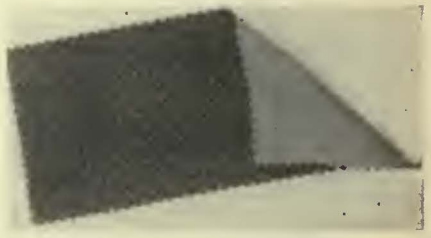


Headlight manufactured by the Ohio Brass Company illuminates both dash and track

terchangeable with the lights used inside the car within the range of 23 to 56 watts. This apparatus is designed to provide adequate illumination at all times.

Waterproof Upholstery Material

NUMEROUS advantages are claimed for a new waterproof upholstery material recently brought out by Lesher-Whitman & Co., Inc., 881 Broadway, New York. The front surface of this material is mohair cloth while the back is coated with 14-oz. rubber. Since moisture does not damage the fabric, it can be cleaned by washing in the regular way. The smooth, hard surface is said to retain its original freshness for a long time. It is also moth proof and vermin proof. These qualities are



A new upholstery material with mohair surface and rubberized back

said to make it an extremely serviceable material for upholstering the seats of electric railway cars and buses.

Car Loading Plate with Patterned Surface

LOADING of freight cars is said to be facilitated by use of a "diamondette" plate developed by the Alan Wood Steel Company of Conshohocken, Pa. This plate is rolled from open hearth steel, of either $\frac{5}{16}$-in. or $\frac{3}{8}$-in. thickness. It has a raised, patterned surface which will accommodate the smallest of truck wheels without jolting or shifting the load. The raised diamonds give the truck operator a firm foothold, the absence of which in plain plates has created a certain hazard. "A.W." diamondette car loading plates are flanged on one end and bevelled on the other end. This construction automatically gives the plate a grip on both car floor and platform as soon as the load comes on to the plate.

Patterned loading plate facilitate car loading

Monthly and Other Financial Reports

	Operating Revenue $	Operating Expenses $	Taxes $	Gross Income $	Net Income $
Market Street Railway, San Francisco, Cal.					
February, 1930	728,404	678,268*a*		100,136	44,224*j*
February, 1929	724,808	629,915*a*		94,893	34,852*j*
12 mo. end. Feb., 1930	9,585,605	8,028,102*a*		1,557,503	856,289*j*
12 mo. end. Feb., 1929	9,683,273	8,292,217*a*		1,391,056	654,679*j*
Jacksonville Traction Co., Jacksonville, Fla.					
January, 1930	94,815	80,597	9,271	4,525*b*	
January, 1929	97,358	77,139	9,683	10,012*b*	
12 mo. end. Jan., 1930	1,138,597	932,048	108,478	92,045*b*	*66,055*
12 mo. end. Jan., 1929	1,192,756	964,371	107,033	114,895*b*	*48,303*
Honolulu Rapid Transit Co., Honolulu, Hawaii					
January, 1930	86,856	54,506	8,819	24,771	12,943
January, 1929	88,606	51,591	12,861	25,375	14,164
Chicago Surface Lines, Chicago, Ill.					
January, 1930	5,239,755	4,043,147*a*		1,196,608	909,248*c*
January, 1929	5,400,638	4,236,029*a*		1,164,610	887,843*c*
Chicago Surface Lines, Chicago, Ill.					
February, 1930	4,751,766	3,900,460*a*		851,306	711,622*c*
February, 1929	5,014,245	4,017,519*a*		996,726	785,195*c*
United Railways & Electric Co., Baltimore, Md.					
January, 1930	1,423,517	987,151	141,261	306,012	24,005
January, 1929	1,387,494	977,061	136,634	286,127	2,326
Boston Elevated Railway, Boston, Mass.					
January, 1930	3,101,063	2,087,830	133,033	891,811	195,210
January, 1929	3,072,585	2,155,799	146,888	780,384	74,244
Eastern Massachusetts Street Ry., Boston, Mass.					
February, 1930	684,616	418,490	29,090	247,197	67,278
February, 1929	726,869	437,655	32,695	271,772	79,797
2 mo. end. Feb., 1930	1,443,429	866,775	66,846	529,557	149,734
2 mo. end. Feb., 1929	1,523,272	928,746	68,412	558,603	160,489
Department of Street Railways, Detroit, Mich.					
February, 1930	1,922,327	1,568,683	65,090	297,112	158,026
February, 1929	2,248,074	1,830,216	62,516	362,386	242,466
12 mo. end. Feb., 1930	25,883,821	20,645,509	756,068	4,588,792	2,897,415
12 mo. end. Feb., 1929	25,210,645	19,795,532	774,108	4,874,814	3,020,617
Kansas City Public Service Co., Kansas City, Mo.					
February, 1930	689,173	576,085*a*		113,089	38,488*g*
February, 1929	724,758				57,760*g*
2 mo. end. Feb., 1930	1,451,109				80,230*g*
2 mo. end. Feb., 1929	1,505,233				128,930*g*
Illinois Terminal Co., St. Louis, Mo.					
January, 1930	577,391	421,931	24,000	131,461	84,226*e*
January, 1929	625,190	424,748	21,262	179,160	135,303*e*
St. Louis Public Service Co., St. Louis, Mo.					
December, 1929	1,649,588	1,213,820	167,781	276,920	127,413
December, 1928	1,656,372	1,026,067	177,217	448,419	292,118
12 mo. end. Dec., 1929	19,249,779	14,326,528	1,922,814	3,005,363	1,155,461
12 mo. end. Dec., 1928	19,451,917	14,616,828	1,885,450	2,916,566	1,043,401
Omaha & Council Bluffs Street Railway, Omaha, Neb.					
January, 1930	236,776	186,397		10,870	*36,450*
January, 1929	262,443	186,387		47,358	1,138
Fonda, Johnstown & Gloversville R.R., Gloversville, N. Y.					
January, 1930	94,674	68,018	4,800	27,113	*8,899*
January, 1929	89,222	64,785	7,840	19,042	*12,573*
Brooklyn-Manhattan Transit Corp., New York, N. Y.					
February, 1930*f*	4,628,946	3,020,029	340,311	1,339,361	569,829
February, 1929	3,687,623	2,309,625	278,152	1,156,008	438,909
8 mo. end. Feb., 1930*f*	40,172,997	26,825,506	2,593,973	11,340,666	5,136,488
8 mo. end. Feb., 1929	31,800,539	20,616,110	2,219,268	9,568,432	3,984,859
Brooklyn & Queens Transit Corporation, New York, N. Y.					
February, 1930	1,775,394	1,383,112	114,014	297,995	171,777
February, 1929	1,809,557	1,463,427	104,835	262,345	133,606
8 mo. end. Feb., 1930	15,682,525	12,352,784	914,683	2,585,683	1,575,311
8 mo. end. Feb., 1929	15,880,622	13,192,947	843,565	2,006,023	976,362
Fifth Avenue Coach Co., New York, N. Y.					
October, 1929	525,185	460,847*a*		76,770	76,042
October, 1928	585,673	479,999*a*		106,130	103,640
4 mo. end. Oct., 1929	2,199,959	1,778,922*a*		409,326	406,760
4 mo. end. Oct., 1928	2,321,584	1,845,923*a*		432,853	422,894
Hudson & Manhattan Railroad, New York, N. Y.					
February, 1930	992,769	497,424		495,345	161,096
February, 1929	992,536	501,781*a*		490,754	155,354
2 mo. end. Feb., 1930	2,080,454	1,046,635*a*		1,039,818	361,951
2 mo. end. Feb., 1929	2,053,427	1,047,726*a*		1,005,700	334,782
Interborough Rapid Transit Co., New York, N. Y.					
January, 1930	6,407,365	3,885,013	210,522	2,311,829	*210,329d*
January, 1929	6,081,211	3,810,916	203,735	2,075,559	278,382*d*
7 mo. end. Jan., 1930	42,157,170	26,381,006	1,412,955	14,363,208	*1,139,508d*
7 mo. end. Jan., 1929	39,743,556	24,884,036	1,402,830	13,456,689	853,983*d*
Long Island Railroad, New York, N. Y.					
January, 1930	2,929,253	2,346,899	99,372	482,882	341,626*e*
January, 1929	2,904,424	2,264,348	91,756	544,973	409,699*e*
New York, Westchester & Boston Ry., New York, N. Y.					
January, 1930	211,322	122,640	24,308	65,093	*166,494*
January, 1929	190,835	130,851	18,793	41,911	*172,616*
Staten Island Rapid Transit Co., New York, N. Y.					
January, 1930	188,377	152,249	17,500	18,628	9,879*e*
January, 1929	228,151	176,209	19,000	32,937	*1,782e*
Philadelphia & Western Railway, Norristown, Pa.					
January, 1930	62,319	53,043			9,276
January, 1929	65,624	55,543			10,081
12 mo. end. Jan., 1930	801,663	630,388			171,275
12 mo. end. Jan., 1929	838,698	656,765			181,933
Philadelphia & Western Railway, Norristown, Pa.					
February, 1930	52,923	51,190*h*			1,733
February, 1929	58,218	51,353*h*			6,865
2 mo. end. Feb., 1930	115,242	104,233*h*			11,009
2 mo. end. Feb., 1929	123,842	105,896*h*			17,946
United Electric Railways, Providence, R. I.					
December, 1929	643,070	588,373		54,697	5,217
December, 1928	656,657	605,758		50,899	*557*
12 mo. end. Dec., 1929	7,193,230	6,272,354		1,007,506	397,237
12 mo. end. Dec., 1928	7,423,475	6,482,551		1,027,483	410,597
Galveston-Houston Electric Railway, Houston, Tex.					
January, 1930	41,658	24,921	2,658	14,078	
January, 1929	46,782	26,882	2,574	17,325	
12 mo. end. Jan., 1930	579,366	327,059	32,441	220,058	*49,859*
12 mo. end. Jan., 1929	639,405	367,301	31,753	240,350	*29,769*
Houston Electric Co., Houston, Tex.					
January, 1930	271,140	175,685	23,422	72,032	
January, 1929	281,336	181,205	25,499	74,630	
12 mo. end. Jan., 1930	3,365,661	2,080,284	271,848	1,028,328	630,538
12 mo. end. Jan., 1929	3,355,797	2,073,295	291,505	990,995	578,946
Pacific Northwest Traction Co., Seattle, Wash.					
January, 1930	76,618	59,628	5,813	11,175	
January, 1929	69,452	63,565	5,589	297	
12 mo. end. Jan., 1930	971,238	713,439	54,400	203,397	84,756
12 mo. end. Jan., 1929	879,345	741,635	52,323	85,386	*64,048*
Calgary Municipal Railway, Calgary, Alta.					
January, 1930	99,705	54,199		45,506	19,791
January, 1929					16,243
Edmonton Radial Railway, Edmonton, Alta.					
January, 1930	85,235	53,022		32,213	2,327
January, 1929	79,112	46,258		32,854	3,506
Regina Municipal Railway, Regina, Sask.					
January, 1930	48,149	28,693		19,456	7,662
January, 1929					7,730

a Includes taxes. *b* Net operating revenue. *c* Balance for return on investment. *d* In 1930 payment for rental on Contract No. 3 of $737,996 for January and $2,947,966 for the seven months were made to the city of New York which were not made in 1929. *e* Net after joint facility and equipment rents. *f* Including Brooklyn & Queens Transit System. *g* Before reserves. *h* Operating and income deductions. *j* Before depreciation and federal taxes.

Business Conditions Show Improved Trend

ROBERT M. DAVIS, statistical editor of the McGraw-Hill Publishing Company, Inc., publisher of ELECTRIC RAILWAY JOURNAL, says there is little doubt but that the closing weeks of the first quarter of the year witnessed a distinct upward trend in general trade and industrial operations. He has just returned from a 17,000-mile tour which covered every section of the United States, and advances as a composite view of business men that while current business is only fair and collections are slow, both are decidedly more favorable than was thought possible last November and that material improvement may be expected as the spring opens up. Mr. Davis sees the general business and industrial outlook for the second quarter as well as for the remainder of 1930 distinctly favorable as the first quarter closes. With most of the industrial groups, including general construction, now definitely on the upgrade, and general trade expanding with the unusually late spring demands, prospects are brighter than at any time since the recession set in last fall. Admittedly, the first quarter of the year was definitely one of adjustment to an entirely different economic plane, but the year 1930 promises to stand out as one of unusual stability in trade and industry. Mr. Davis feels that the closing months of 1930 should witness the opening of a period of prosperous business and industrial operations.

NEWS *of the Industry*

LATE NEWS

Seattle, Wash.—Roy E. Furse, superintendent of transportation for the municipal railway and bus system, requests operators so to regulate the running time of buses that they will arrive at transfer points just about the time street cars arrive with which their service must connect. He is endeavoring to arrange schedules so as to help make meetings easy.

✦

Philadelphia, Pa.—Trial operation of the $10,000,000 South Broad Street subway begins when the first train is run from the City Hall to South Street. Thorough tests for clearance and operation of switches and signals are being conducted under supervision of Transit Director Myers and H. M. Van Gelder, electrical engineer of the department.

✦

Fort Worth, Tex. — The Northern Texas Traction Company is reported to contemplate the removal of its tracks from these thoroughfares when the work of widening and repaving Azle Avenue and 25th Street from North Main Street to the city limits is begun by the city early in May. The plan is to substitute service by bus. It has been stated unofficially that seven new vehicles will be bought for this service, but up to March 25 the new equipment had not been ordered although the orders were said to be pending.

✦

Louisville, Ky. — Employees of the Louisville Railway operated an average of 42,264 miles per accident in February. Five street railway lines and seven bus lines were operated with a record of 100 per cent safety during the month.

✦

Albany, N. Y.—Ernest Murphy, president of the New York Electric Railway Association and executive of the United Traction Company, Albany, made a plea to the Legislature on March 25 to relieve the trolley lines of the state of the costs of the paving between their tracks under the terms of the so-called Thayer bill.

✦

Chicago, Ill.—Tuesday, June 17, has been set tentatively by the City Council's local transportation committee as the date for submitting the new railway co-ordination ordinance to a referendum vote in Chicago. If the referendum is not held by that date the committee members are confident that it will be within two or three weeks from then. A special election would be called, to be paid for out of the city's traction fund.

✦

San Francisco, Cal.—The Board of Public Works has directed Fred Boeken, superintendent, Municipal Railway, to install meters on municipal street cars to check the amount of power used.

(*Late News Continued on Page 232*)

The Interstate Bus Bill Passed by House March 24

Regulatory Measure Providing Board of Administration Amended Slightly. Large Majority Recorded. Goes Now to Senate for Approval

WITH slight amendments to the grandfather clause and the administrative sections, the House passed the Parker interstate bus bill on March 24 by a vote of 219 to 115. Although the opposition was somewhat more pronounced than had been expected it was not altogether surprising to House leaders, who anticipated that effective use would be made of the "state rights" argument. Despite these protests and the objections of those opposed to bus operation by steam and electric railways, it was evident during the passage of the bill that the majority of the House members do not look with suspicion upon long-distance operations by large companies.

This was indicated by the ease with which amendments were voted down that sought to prevent the acquisition of interstate bus lines by competing carriers. Other amendments designed to restrict bus operations by steam carriers and electric railways also were rejected. It was decided, however, to adopt a provision to permit the establishment of competing service in cases where the existing bus line is operated or controlled by a railroad. In this connection, the charge was made that the bill was not conceived to answer public demand, but was written by the steam and the electric railways.

The administrative section was amended so as to provide for the extension of greater regulatory powers to the state groups at the discretion of the Interstate Commerce Commission. In bus operations covering no more than three states, the groups of state commissions already are permitted to initiate regulation. The amendment allows the Interstate Commerce Commission to refer matters pertaining to regulation to groups of more than three states. At the suggestion of members of the committee that drafted the bill, it was agreed to make decisions by the state groups by a majority of the members rather than by unanimous consent, as was provided in the original language.

It was also decided to permit the state boards to waive such matters of regulation as they may agree upon and to allow the Interstate Commerce Commission to make direct determination of the points involved. In this manner, smoother enforcement is provided and the state boards are relieved of the necessity of deciding questions considered of minor importance, it was stated. As to the grandfather clause, as the section is called dealing with the issuance of certificates for operation, an amendment was adopted that extends the time of priority of operation from Jan. 1 to March 1, 1930. It is thus provided that bus lines that were in operation on March 1 shall be given prior consideration in the issuance of the authorizing certificates.

The bill now goes to the Senate.

COMING MEETINGS

April 4—Metropolitan Section, A.E.R.A., Engineering Societies Building, New York.

April 9-10 — Central Electric Railway Master Mechanics Association, Mansfield, Ohio.

April 29-May 1—United States Chamber of Commerce, Washington, D. C.

May 14-15—Association of Electric Railway Equipment Men, Middle Atlantic States, Scranton, Pa.

June 23-26—American Electric Railway Association, 49th annual convention, San Francisco, Cal.

July 23-25 — Electric Railway Association of Equipment Men, Southern Properties, Nashville, Tenn.

Fare Case on Chicago "L" Dragging

Corporation Counsel Ettelson of Chicago, called upon by the City Council three months ago to explain his handling of the elevated rate case, has failed to meet the Council's demand. His reply to inquiries is "too busy." The plea of the Chicago Rapid Transit Company, made to the Illinois Commerce Commission two years ago, was backed by a mass of testimony in favor of increased fares, but was combatted by only one witness for the city. Attorneys for the "L" lines obtained the raise on a temporary injunction from the federal court, and there the matter has rested. Two weeks ago Mr. Ettelson sought an order from the federal court to force the city to appropriate money to enable him to continue litigation, which involves appraisal of the properties of the elevated company. The Council also asked Mr. Ettelson to report on the leases under which the Chicago, North Shore & Milwaukee, the Aurora, Elgin & Chicago and other lines enter Chicago over the tracks of the "L" and on the question of whether the federal court has any jurisdiction to rescind or revise these leases.

New Snow Fighting Methods Adopted in Buffalo

Alertness of International Railway Wins Editorial Commendation from Local Newspapers—Plea for Public Co-operation Effective

LAST winter the International Railway, Buffalo, N. Y., maintained the largest snow-fighting fleet of equipment in its history. It comprised 30 plows of two different types, 23 sweepers, one ice cutter and 18 trucks to sand viaducts as well as to transport switch and shovel gangs from point to point.

Encourage your motoring friends to keep clear of street car tracks, when they can, so that the vast majority of users of city streets, who ride the street cars, may have an unobstructed right-of-way, and may reach their destinations without delay.

Letters embodying similar recommendations were sent by President Yungbluth to officials of all the community business organizations in Buffalo with the suggestion that the recommendations be given the widest possible publicity. The company pointed out in these letters that all-night parking on streets where car lines are operated interrupts the efficient cleaning of the streets of snow from curb to curb, thus forcing motor vehicle traffic into the car tracks with subsequent delays and congestion.

Parked cars rob the city of the use of half the street, forcing snow fighters to readjust their equipment to clean around the parked cars

Within the city limits of Buffalo, the company operates 220 miles of track and its total system covers 450 miles of track. During the winter, the company kept a staff of more than 200 men ready for snow fighting. Men who do this work are paid on a basis of time and a half for actual time on the snow-fighting equipment.

While snow fighting was at its peak during December, the company placed a poster in all stations commending car operators for their helpful co-operation. This poster said:

I.R.C. Co-operators:
Every one of you is to be heartily congratulated and commended for your supercooperation during the many trials we have endured during the past week.
Beset by almost every concelvable handicap—sleet, snow and the partlal destruction of our car shops, capped by the severe blizzard on Frlday—every man on the system threw himself into the fray and made it possible for I.R.C. to continue its service to the Nlagara area.
I wish I might shake the hand of every one of you—your accomplishment makes me more proud than ever of the splendid body of I.R.C. men for whom no task is too great.

B. J. Yungbluth, President.

Folders placed in the "Read As You Ride" boxes on all street cars and buses urged the public to co-operate in the effort to fight snow and keep traffic moving. A bulletin signed by President Yungbluth gave five suggestions for helping to maintain adequate service. They were:

Clear only such sidewalk space as is necessary for free movement of pedestrians.
Heap all snow along the curb. Avoid throwing it into the street.
Discourage parking on main arteries and all-night parking on any trolley street.
Discourage the practice of backing trucks to the curb.

Formerly the railway cleared its own tracks and left the accumulated snow along the rails where it was removed by the city operating large fleets of snow plows. As a result thousands of automobiles and trucks attempted to get through the narrow lane cleared for street cars, causing partial paralysis of traffic. To meet this problem, the railway redesigned and rebuilt its entire snow-fighting equipment. Wings that reach all the way to the street curb were attached to special heavy car bodies with the result that during the recent winter the company cleared snow from all streets upon which it operates cars from curb to curb. This placed an additional financial burden upon the company, but it eliminated traffic congestion almost entirely so that the number of cars reported on time at terminals reached a new high figure.

Midnight photograph showing how a parked automobile blocks the snow fighters in their effort to rid the streets of snow from curb to curb

Ambitious New Jersey Rapid Transit Plan Revived

Officials of the North Jersey Transit Commission have announced their intention to submit to Governor Morgan F. Larson within the next two weeks a recommendation for enactment of pending legislation to create a rapid transit financing body.

The pending bill calls for creation of a district or regional plan organization, in the nature of a public corporation, to finance any or all of the comprehensive program included in the 1926 report.

The legislation now pending in Trenton would, if passed, provide the machinery for carrying out, in part or in whole, the recommendations of the 1926 report. The commission has already adopted a general policy of pushing the local New Jersey improvements first. The 1926 report suggested a Manhattan loop originating in the Jersey meadows near the present Manhattan Transfer, and running by tube to Battery Place, in New York City, and thence uptown to 57th Street and thence crosstown and under the Hudson River to New Durham and back to the point of origin.

The report called also for a Paterson-Newark-Irving high-speed line. Included in the report were suggestions for other rapid transit routes serving the 240 municipalities in the North Jersey area. It was suggested that the Manhattan loop could be operated by the Interborough, or, failing that, by the Hudson & Manhattan Railroad.

LATE NEWS

(*Continued from Page* 130)

Rochester, N. Y. — The New York State Railways, Rochester Lines, has established a corps of uniformed motorcycle officers to patrol its lines and terminals. The object is to prevent boys from stealing rides on the rear of street cars and buses, to guard company property from vandalism and to protect patrons in stations on the outskirts, particularly at night. The men assigned to this work will be equipped with high-speed cars. The city police are co-operating with the railways.

✦

Toronto, Ont.—Comptroller Robbins, secretary of the Toronto Street Railway Employees' Union, has announced that the 38 trainmen who lost employment when the Toronto Transportation Commission abandoned the Metropolitan Radial Railway had been absorbed into the Toronto system.

✦

Wilmington, N. C.—Formal application for the privilege of modifying and extending the operation of the bus service previously granted to the Tide Water Power Company on Market Street to Seventeenth Street, so that the service may be continued through the downtown section and back out to East Wilmington, via Grace and Front Streets, has been made to the city board of commissioners.

✦

Jersey Shore, Pa.—The Jersey Shore Street Railway has informed the City Council that it will surrender its franchise to operate in the city if action is taken to compel it to carry out changes in its tracks on that part of the line in Allegheny Street which is slated for improvement.

✦

New Orleans, La.—Trackless trolley cars must pay a vehicle tax and drivers must carry chauffeurs' licenses, according to an opinion handed down by Attorney General Percy Saint in reply to the request for an opinion made by D. H. Clark, chief enforcement officer of the Louisiana highway police. The opinion was requested on the operation of the new trackless trolley by the New Orleans Public Service, Inc. The ruling apparently hinges on whether the vehicle operates on self-contained power. Attorney General Saint ruled that it did.

✦

San Francisco, Cal.—Investigation of the depreciation fund of the Municipal Railway and a comparison with the similar fund of the Market Street Railway is to be undertaken by the public utilities committee of the Board of Supervisors. A request of the Market Street Railway for an increase in the car-hour charge for power furnished the Municipal lines on lower Marker Street has been referred to the Board of Public Works.

✦

Pontiac, Mich.—No immediate action is planned by the City Commission on a request of the Eastern Michigan Railways for permission to charge an 8-cent fare rather than the present 7-cent city fare in Pontiac.

Philadelphia, Pa.—Stockholders of the Philadelphia Rapid Transit Company have elected Alexander Knox and Boyd Garbutt directors to succeed J. McCartney and N. H. Pettit. These two men, together with J. J. Haungs, constitute the employees' representatives on the board. Other directors were re-elected. The stockholders also approved a management fee of 2 per cent of Philadelphia Rapid Transit gross earnings to Mitten Management.

✦

Seattle, Wash.—An appropriation for double-tracking the Municipal Street Railway line on Eighth Avenue South, estimated to cost $37,452, asked of the City Council by Superintendent of Public Utilities Avery, has been taken under advisement by the Council utilities committee, pending a study of the whole improvement program and the financing plans involved.

✦

Michigan City, Ind.—Officials of the Chicago, South Shore & South Bend Railroad have filed papers with the secretary of state, certifying to a change in the number of directors to thirteen and to an increase in the capital stock by 10,000 shares of preferred having no par value.

✦

Trenton, N. J. — The Senate has passed a bill which would appropriate $375,000 from toll revenue as New Jersey's share in the construction of rails over the Camden-Philadelphia bridge. The measure now goes to the House of Assembly. Pennsylvania is also to contribute $375,000. Senator Richards pointed out that the original bond act for the construction of the span specifically designated that all revenues collected aside from maintenance and operation costs should be applied to retirement of the bonds. Senator Stewart and Senator Powell declared that the Bridge Commission intended to lay rails and that the action had only been deferred. Presumably both Philadelphia Rapid Transit and Public Service Coordinated Transport would be in a position to operate cars over the structure.

✦

Colorado Springs, Col.—The Myron Stratton Home Corporation, owners of the Colorado Springs & Interurban Railway, in its financial report for 1929, shows that the tramway was operated at a loss of $64,631. The company is substituting buses on some lines, and keeping the overhead at a minimum, hopeful that service will not have to be curtailed materially.

✦

Trenton, N. J.—Wage contracts for a three-year period have been entered into by the Trenton Transit Company and its employees. The present wage scale is to endure for three years. Platform men receive 61 cents an hour for the first three months and 63 cents hourly for the next nine months. After the initial year of service the rate becomes 65 cents an hour. Power house and other employees are also paid on a sliding scale.

✦

Oakland, Cal.—Alfred J. Lundberg, president of Key System Transit Company, and vice-chairman of the readjustment committee, announced on March 22 that subscriptions to new preferred stock under the company's reorganization plan to date total $3,682,875, or $182,875 more than necessary to insure payment of first mortgage bondholders. Deposits of first mortgage bonds now are more than 98 per cent of total outstanding; general and refunding more than 95 per cent; collateral trust notes more than 76 per cent; prior preferred stock more than 66 per cent; preferred stock more than 52 per cent, and common less than 1 per cent.

✦

Binghamton, N. Y.—A contest is being conducted by the Triple Cities Traction Company at the Binghamton Central High School for verses for car cards. For some time now, cards have been run in cars, the size of the regular advertising cards but placed in a rack—furnished by Collier—at the end of the car on the signal box. In the past the company has made its own copy, emphasizing safety, comfort, convenience, etc., but about the first of the year the company put in a four-line bit of poetry signed by a patron. That started something. Copy began to come in so that now the message is being changed every week and the poetry contest started.

✦

New York, N. Y.—On April 3, beginning at 10:30 a.m., the Department of Plants and Structures will offer for sale at public auction at the office of the department, Room 1800, Municipal Building, Borough of Manhattan, old structural steel trolley plates, gratings, columns, girders, steel trolley poles, rails, copper trolley wire, etc., now stored at the various locations mentioned in the advertisement and under the terms and conditions set forth in the *City Record*. This equipment was part of the property of the Manhattan Bridge Three-Cent Line, now no longer operated but replaced with a bus route.

✦

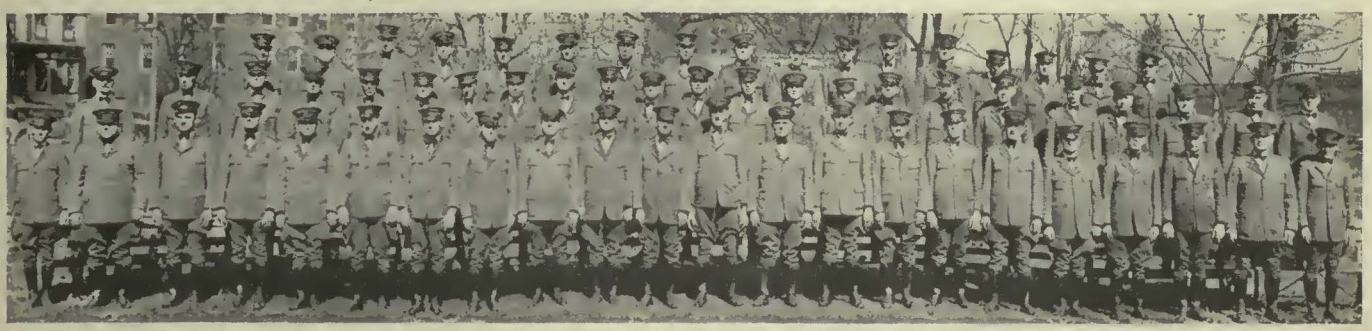
Philadelphia, Pa. — An ordinance to permit the Philadelphia Rapid Transit Company to operate the South Broad Street subway on its completion, April 20, has been sent to the Council by Mayor Mackey. The ordinance also authorizes the Mayor to negotiate a new lease with P.R.T. for operation of the entire Broad Street subway, subject to approval by the Council. The P.R.T. is at present operating the Broad Street subway under a "gentlemen's agreement," under which it is retaining all of the subway receipts pending a permanent agreement. On negotiation of the latter its provisions as to rental will be retroactive to the date of the "gentlemen's agreement," effective, Dec. 1, 1928.

Roanoke's Circulating Sales Manager

Since August, 1929, the Roanoke Railway & Electric Company has employed a sales manager and public relations man whose labors are both diversified and unusual.

One of his primary jobs is to ride the cars and buses to observe the operating habits of the men, the appearance of the vehicle and the attitude of the patrons. In this respect, his work is not unusual, but his ways of correcting any difficulties found are out of the ordinary.

Instead of passing on his findings for action by C. B. Short the general manager, the sales manager is authorized to try personal instruction or persuasion first. As an expert in equipment, he discusses and demonstrates correct starting and stopping with the man at fault, and emphasizes what correct handling of equipment means in the easier sale of the ride. Uneven starting, overmuch running in second, and rough and excessive braking are all shown to be avoidable.



Meticulously Garbed Men Who Sell the Service in Roanoke

All this is handled in good humor, and not even the superintendent of transportation would be notified unless indifference should be shown after several attempts to cure.

In like manner, equipment annoyances like soiled ceilings or shabby upholstery are passed on to the shop superintendent for correction.

In discussing the work of this official, Mr. Short said that success of the job depended almost entirely on starting with the right type of man. The Roanoke man is a native of the city who started as a policeman, then made good as a plain clothes man, was an automobile salesman for eight years, then changed to the jobs of Pullman conductor and dining-car steward in turn. Here is a man who knows how to cater to the whims of the public, and to deal with the infirmities of operating men and transportation equipment. It took some time to find the right combination, but the results indicate that there is a market for the ride salesman.

A Cordial Welcome to the Pacific Coast

Routine matters were the principal subject of discussion at a meeting of the executive committee of the American Electric Railway Association held in New York on March 21. Reports of various committees and of the managing director and the general secretary were presented. Plans for the 49th annual convention were considered and a vote of thanks tendered to Labert St. Clair for his work in preparing an attractive booklet in conjunction with the committee on transportation. Recent legislative developments in Washington were outlined by Leslie Vickers. Changes in the method of selecting winners in the Brady Safety Award Contest were announced. In behalf of the California Electric Railway Association, G. J. Kuhrts, president Los Angeles Railway, assured those present a cordial welcome on the Pacific coast next June.

Jurisdiction of Court in Louisville Fare Case Upheld

The United States Court of Appeals at Cincinnati, Ohio, on March 22 upheld the decision of the Western Kentucky District Federal Court, at Louisville, Charles I. Dawson, judge, in the 10-cent cash fare case of the Louisville Railway against the city of Louisville. The decision at Cincinnati affirmed jurisdiction of the United States District Court at Louisville, the city having contended that the federal court had no jurisdiction in the matter. A constitutional question was involved, and the company had endeavored to show that enforcement of a 7-cent fare would be confiscatory and in violation of the fourteenth amendment.

The decision will probably mean further trial in the local federal court on the merits of the case, as the matter of jurisdiction has been settled.

The district court in Louisville formally granted a temporary injunction to the railway last fall, preventing the city from interfering with the company in the matter of collecting a higher rate of fare. The city then went to the appellate court for a ruling on jurisdiction.

Decree of Foreclosure Entered Against New York State Railways

Foreclosure of mortgages covering the property of the New York State Railways, ordered by Federal Judge Bryant upon application of owners of mortgage bonds on which interest is in default, will become effective April 1.

Benjamin E. Tilton and Wallace E. Pierce, receivers, will continue in that capacity during the foreclosure, which Judge Bryant authorized on March 25 on application of the Security Trust Company, Rochester. The trust company is acting as trustee for owners of $16,457,000 in consolidated mortgage bonds on which interest was defaulted on Feb. 1 and $1,500,000 in other bonds. Judge Bryant also ordered a complete audit and survey to be made of the railways' property.

Indiana Merger Arguments Concluded

Arguments in the proposed $70,000,000 merger of Insull-controlled utilities in Indiana were concluded on March 21 before the Public Service Commission. The hearings were resumed on March 17, after a recess of nearly three months. Attorneys for the petitioning companies were given until April 5 to file a brief, and counsel representing objectors fifteen days after that. The commission will then take action on the petition of opposing attorneys for dismissal of the case on grounds that merger of gas, electric, water, ice and transportation utilities is unlawful and that the commission has no jurisdiction in the matter.

Wage Scale Renewed in Memphis

Trainmen of the Memphis Street Railway, Memphis, Tenn., have agreed to the renewal of the present wage scale for another year. In a letter addressed to E. W. Ford, vice-president of the railway, the operators said:

"We are not at this time agreeing to the present wage scale because we feel it is just or fair, but we are doing so as a matter of patriotic duty with the hope that at the expiration of twelve months, officials of the railway will be glad to show the same consideration towards our membership and agree to an increase commensurate with the cost of living, standard of living, services performed, and conditions under which the services are performed."

Selling Tickets from House to House in El Paso

An interesting experiment is now being made by the El Paso Electric Company, El Paso, Tex., in house-to-house selling of street car rides. F. L. Grissom has been selected as the operator-salesman and has been calling upon residents in Kern Place. Results of the experiment are encouraging but they do not cover a period long enough to make them conclusive. The outlook is promising, however, and should ticket sales warrant it, the plan will be extended to other sections.

Full- and half-fare tickets are sold in strips in any amount desired and the customer may buy for cash or on credit. The primary object is to sell full-fare tickets sufficient to permit two rides a day for a 30-day period. All sales are made at the regular rate of fare, but the opportunity to have these charged on the regular bill for electric service is an advantage that appeals to many patrons.

Through Limited Bus Service Suggested for Akron

The Northern Ohio Power & Light Company, Akron, Ohio, has submitted a suggestion to the Akron City Council that an experiment be made on the West Exchange Street bus lines looking toward a through limited service in an effort to speed up service.

In general, the plan is to provide limited service on the long-haul lines; i.e., after a bus makes the last regular stop in the downtown business area it will proceed to a certain outlying point without any intermediate stops. The intermediate section between the business area and the outlying point which will be the first stop of the limited bus is to be served by local buses making all stops. This system will give the long-haul passengers faster service without undue sacrifice on the part of the close-in riders. The company realizes that to deprive close-in riders of frequent headway will discourage short-haul riders, but it also realizes that to encourage long-haul riders it must make the service more attractive by getting riders to their destination in less time than is now required.

The suggestion is also based on the theory that most of the company's bus routes were established to render service to outlying territories which had no other transportation service and it was never intended that these bus routes should supplement or rather compete with the already established rail service. The attitude of the company is that when two or more lines are operated on the same street or on parallel streets through necessity on account of routing, the bus routes serving outlying districts should not be required to serve the intermediate territory also in competition with routes already established and capable of rendering adequate and sufficient service within the intermediate territory.

Wants Columbus Railway to Be Self-Sustaining

A reduction in electric current rates in Columbus, Ohio, hinges entirely on the allowance of an increase in car fare to 8 cents cash, five tickets for 35 cents, according to Benjamin W. Marr, president and general manager of the Columbus Railway, Power & Light Company. The City Council has asked that the company promise to reduce power rates when the higher fares become effective. Mr. Marr believes it will be possible to reduce power rates by fall.

Some time ago Mr. Marr announced that the fare will be increased, effective on April 5. Immediately, the City Council directed City Attorney Davies to block the proposed increase by injunction. The issue is complicated by the fact that the company is operating without a franchise. The position of the council is that no change in fares will be countenanced unless the company obligates itself to serve the city over a period of years. The present fare is 6 cents cash and five tickets for 25 cents.

Conspectus of Indexes for March, 1930

Compiled for Publication in ELECTRIC RAILWAY JOURNAL by

ALBERT S. RICHEY

Electric Railway Engineer, Worcester, Mass.

	Latest	Month Ago	Year Ago	Last Five Years High	Last Five Years Low
Street Railway Fares* 1913 = 4.84	Mar., 1930 7.94	Feb., 1930 7.87	Mar., 1929 7.75	Mar., 1930 7.94	Mar., 1925 7.26
Electric Railway Materials* 1913 = 100	Mar., 1930 141.6	Feb., 1930 142.9	Mar., 1929 144.8	Dec., 1926 159.2	Feb., 1928 139.5
Electric Railway Wages* 1913 = 100	Mar., 1930 231.7	Feb., 1930 231.7	Mar., 1929 230.1	Feb., 1930 231.7	Mar., 1925 221.5
Electric Ry. Construction Cost Am. Elec. Ry. Assn. 1913 = 100	Mar., 1930 203.0	Feb., 1930 203.6	Mar., 1929 203.4	Nov., 1928 205.7	July, 1929 199.0
General Construction Cost Eng'g News-Record 1913 = 100	Mar., 1930 206.8	Feb., 1930 206.5	Mar., 1929 207.8	Jan., 1927 211.5	Nov., 1927 202.0
Wholesale Commodities U. S. Bur. Labor Stat. 1926 = 100	Feb., 1930 92.1	Jan., 1930 93.4	Feb., 1929 96.7	Nov., 1925 104.5	Feb., 1930 92.1
Wholesale Commodities Bradstreet 1913 = 9.21	Mar., 1930 11.22	Feb., 1930 11.51	Mar., 1929 13.00	Dec., 1925 14.41	Mar., 1930 11.22
Retail Food U. S. Bur. Labor Stat. 1913 = 100	Feb., 1930 153.0	Jan., 1930 155.4	Feb., 1929 154.4	Nov., 1925 167.1	April, 1925 150.8
Cost of Living Nat. Ind. Conf. Board 1914 = 100	Feb., 1930 158.8	Jan., 1930 160.4	Feb., 1929 161.0	Nov., 1925 171.8	Feb., 1930 158.8
Industrial Activity Elec. World, kw.-hr. 1923–25 = 100	Feb., 1930 123.5	Jan., 1930 121.8	Feb., 1929 140.4	Feb., 1929 140.4	Aug., 1925 94.3
Bank Clearings Outside N. Y. City 1926 = 100	Feb., 1930 96.5	Jan., 1930 95.2	Feb., 1929 110.1	Oct., 1929 111.8	Nov., 1926 94.0
Business Failures Number	Feb., 1930 2150	Jan., 1930 2368	Feb., 1929 1737	July, 1929 1581	Sept., 1928 1348
Liabilities, Millions of Dollars	69.13	78.55	62.15	102.09	23.13

*The three index numbers marked with an asterisk are computed by Mr. Richey, as follows: Fares index is average street railway fare in all United States cities with a population of 50,000 or over except New York City, and weighted according to population. Street Railway Materials index is relative average price of materials (including fuel) used in street railway operation and maintenance, weighted according to average use of such materials. Wages index is relative average maximum hourly wage of motormen, conductors and operators on 136 of the largest street and interurban railways operated in the United States, weighted according to the number of such men employed on these roads.

Wage Scale Renewed on New York State Lines

The New York State Railways and its employees in Rochester, Utica and Syracuse have reached an agreement on a wage and working contract for the coming year. At simultaneous meetings held in the three cities, the members of the Amalgamated Association voted to continue the present contract for the period of the receivership.

Benjamin E. Tilton and Wallace Pierce, appointed by Federal Judge Frederick H. Bryant as receivers of the railways in January, conducted the negotiations for the company.

The present wage scale calls for payment of 55 cents an hour for platform men on city two-man cars; 57 cents for interurban employees and 60 cents for one-man car operators.

It was provided that should the receivership be terminated within a year the contract will be carried over to April 1, 1931.

In other years negotiations have been prolonged and usually the contract was signed in May or June and made retroactive to April 1.

Wage Proposal Rejected in Oregon

Employees of the Pacific Northwest Public Service Company, Portland (formerly Portland Electric Power Company), have rejected the company's offer to split 50-50 with them any increase in gross revenues over the revenues of the year 1928 accruing to the company in the year 1930, as a result of the increase in fare recently made effective. Nearly a year ago members of the Amalgamated Association sought an increase of about 10 cents an hour for platform men and like increases for shop and track men, but the management stated that while it could not consider increasing wages under then existing conditions it would negotiate the question as soon as it might be granted an increase in fare, then pending before the Public Service Commission.

The present offer was rejected because it did not provide for any definite amount of relief. The management insists that it is too soon yet to estimate accurately the effect of the fare increase, but is willing to adopt this revenue-sharing plan as an expedient for the current year in lieu of a definite wage increase.

If an agreement is not reached by negotiation, the case will be arbitrated in accordance with existing arrangement.

Proposal for City Operation in Springfield, Ohio, Rejected

The City Commission, Springfield, Ohio, has denied the request of the Cincinnati & Lake Erie Railroad to take over and operate the Springfield Street Railway. The Commission held that the company's proposal was impractical. After turning down the company's proposal to operate the local service, the commission ordered it to cease and desist from operating freight trains through the city. Following action of the Commission in ending negotiations with the Cincinnati & Lake Erie company, the city began advertising for bids for a local transportation system which may include bus, electric lines or a combination of both. The bids will close on April 4.

Militant Policy Helps Indiana Interurban

During the first two months of 1930, the Indianapolis & Southeastern Railroad carried 15 per cent more passengers than in the corresponding period last year. Important improvements in service effected since the reorganization of the line in August, 1928, are largely accountable for this steady increase in patronage.

Within the last eighteen months, thirteen new one-man parlor type cars have been purchased and all passenger service on the railroad is now operated with this new and modern equipment. A bus connection from Greensburg, serving Batesville, Sunman, Manchester, Aurora, Lawrenceburg and Cincinnati, was put into effect a little more than a year ago and five round-trips daily are made on this line.

For the better handling of freight an additional freight motor car was equipped in 1929; twelve freight trailers were constructed in the company's shop and new stock pens were erected at Arlington for the shipment of live stock.

The main high-tension line has been rebuilt for more than 75 per cent of the entire distance and the trolley wire has been rehabilitated and reinforced. It is expected that by May 1 the entire overhead structure will have been gone over and put in first-class condition.

Where the old company gave approximately two-hour service, the new company is giving hourly service on both the Connersville and Greensburg divisions, and on the Greensburg division half-hour service in the forenoon and evening rush hours. A truck connection out of Greensburg has been established to give direct overnight service to Osgood, Versailles, New Point and Batesville.

On Sundays, a rate of one-way fare plus 10 cents for the round-trip, is in force. On Jan. 1 the company began giving patrons, after 4 p.m., from any agency station on the line to any other station, the privilege of buying a round-trip ticket for the regular one-way fare, good after 4 p.m. and returning the same evening.

Several months ago all live stock rates were materially reduced.

Once Overs

By C. D. Batchelor

New York Evening Post.

Snapshooting the Millennium

"Madam, we are happy to welcome you as a patroness of our service. Just take your time, we are but your humble servants."

Pertinent Papers Read at Illinois Meeting

Of the four addresses delivered at the annual convention of the Illinois Electric Railway Association at Springfield, March 19, one dealt with the trolley bus, one with increasing interurban passenger revenue by reducing fares and one with Chicago's front entrance, center exit car. At an election of officers, Guy A. Richardson, Chicago Surface Lines, was elevated from vice-president to president, succeeding C. H. Jones, Chicago, South Shore & South Bend Railroad, Michigan City, Ind. R. B. MacDonald, Moline, Tri-City Railway, was made first vice-president and H. A. Johnson, Chicago Rapid Transit Company, second vice-president. George W. Schwaner, Springfield, was re-elected secretary-treasurer not only of the Electric Railway Association but also of the Illinois State Electric Association and the Illinois Gas Association which held their annual conventions in conjunction with the railway meeting.

F. G. Hamilton, Gary, Ind., of the Gary Railway, recited incidents where his company has made a large reduction in fares to increase passenger revenue. Among other things he said:

Revenue dropped from $4,136 per month in 1924 to $1,767 per month during the first six months of 1928. It was at this point that it was decided to try a severe rate reduction in an attempt to retrieve the diminishing business. Nine cents, or 37.5 per cent, was sliced off the one-way fare between Gary and Indiana Harbor, rates being reduced from 24 cents to 15 cents.

As a result traffic increased by leaps and bounds during the next few months. Whereas the average number of passengers carried per month during the six months previous was only 8,000, the average for the six months following the reduction jumped to 15,000. Average monthly revenue for the six months previous to July, 1928, was only $1,767, but following the 37.5 per cent fare reduction average monthly revenue increased to $1,986. The average monthly revenue for 1929 was $2,636, which compares with $4,136 in 1924, the best year, and $1,876 in 1928, the poorest revenue year.

The one-way fare between Crown Point and Gary was reduced from 45 cents to 30 cents, a decrease of 33.3 per cent. Similar reductions averaging 39.6 per cent were put in effect to intermediate points. At the same time the improved road bed and the speedier equipment permitted a reduction of five minutes in running time between Gary and Crown Point. The old cars made the trip in 55 minutes, whereas the new cars made the trip in 50.

Figures on revenue are not so encouraging as the figures on passenger traffic. Still, they seem to indicate that the new cars and low rates have arrested the decline of the past four years. The monthly average of $3,077 for 1929 is $50 under the monthly average for 1928. The average monthly revenue for the three months of 1929 previous to the change is $3,075, while for the eight months following it is $3,079.

W. C. Wheeler, engineer of equipment, Chicago Surface Lines, asserted in his address on "Chicago's Front Entrance, Center Exit Car," that "for congested city traffic where riding habit is such that interchange is frequent, it is possible to separate the entrance and exit too far, causing confusion by the people who must work through in a short distance. It is thought that this condition will remedy itself to a certain extent as the passengers become more accustomed to the cars," he said.

John B. O'Connell, assistant superintendent of transportation, Chicago Surface Lines, quoted from a table showing that the rides on public transportation systems in New York, with its population of more than 6,000,000, are more than five times per capita those of Lexington, with its population of 60,312. He said:

It is obvious that the popular usage of automobiles is greater in the smaller cities. These cities do not have the traffic problems of the larger ones and it is possible for the private automobile to serve its owner more easily. To attract riders the public transportation vehicle must offer a very attractive service and must, therefore, approach the desirable features of the passenger automobile. This task is not altogether impossible since the factors of economy and elimination of the inconvenience of terminal facilities necessary for private automobile usage are in favor of the public transportation vehicle.

After describing in detail the construction of the overhead system in his address on "Solving the Overhead and Collection Problems of Trackless Trolley," Lee Birch, engineer transportation department, Ohio Brass Company, said:

At the present time experiments are being conducted on a special device for making the swivel harp rigid at the will of the operator. Other experiments are being conducted on a "pull down" mechanism for lowering one trolley pole. Experiments are also being made on a ground shoe which will enable the coach to make negative contact with the street car rail. These three devices are being developed to permit a coach to operate with the positive wire and the track rail which is deemed necessary in some instances.

Chicago Co-ordination

Real progress is being made on Chicago's new transportation co-ordination ordinance, and the committee of bankers, heads of transportation companies and councilmen expected to fill in the missing financial sections by March 29, so that the ordinance can be submitted to the holders of the many different issues of securities embraced among the present outstanding obligations of the transportation companies. It is hoped that the Council will now pass the ordinance by April 15, and that the measure can be presented to the people at a special referendum on or about June 15. One of the most important steps recently taken toward this end came on March 20 when the local transportation committee of the Council adopted unanimously most of the recommendations on a financial set-up made by the committee of bankers, and allowed most of the points desired by the companies.

Eighteen Lines to Be Rerouted in Busy Brooklyn

During the next few weeks the Brooklyn & Queens Transit Corporation, Brooklyn, N. Y., will put into effect a plan for rerouting the various surface lines in the downtown Brooklyn area for the purpose of improving trolley operation and traffic movement.

To carry out the plan, decided in cooperation with the Brooklyn Borough President, the Police Commissioner, the Transit Commission and representatives of Brooklyn civic organizations, new curves, switches and special track work are being installed by the railway at a cost of approximately $100,000. The complete rerouting plan affects eighteen surface lines entering the downtown Brooklyn area and is designed to simplify the operation of surface cars by eliminating, wherever possible, crossings and left-hand turns.

The changes in surface car operation and traffic regulations are based on intensive study of the factors affecting the traffic situation in downtown Brooklyn in an effort to find some means of providing immediate relief for the existing congestion. In addition to spending $100,000 for changes in track layout, the Brooklyn & Queens Transit Corporation is purchasing 100 new cars, with modern equipment, such as to provide for rapid acceleration and retardation, at a cost of $1,600,000 to help speed up the movement of surface cars. All of the changes proposed are of an experimental character. The results of this experiment in the Borough Hall area will aid in the development of plans to improve trolley service and traffic movement in other sections.

Revere Beach Increase Authorized

The establishment of an exit fare in addition to the fare paid on boarding the train has been authorized by the Department of Public Utilities in permitting an increase between certain stations in the schedule of the Boston, Revere Beach & Lynn Railroad. The new schedule becomes effective May 4.

The company had filed a new schedule, in which it was proposed to increase the fare between stations in Lynn and stations in Boston and Winthrop from the present cash fare of 10 cents to 15 cents, providing, however, for the sale of twelve tickets for $1.50, thus establishing a 15-cent cash fare or a 12½-cent ticket fare.

The commission held that the proposed rates per mile of transportation are less than those charged by any railroad in the commonwealth. On this basis the commission held that the proposed rates were not unreasonable. The fare between Lynn and Revere is 10 cents. It is neither unreasonable nor unfair to require passengers riding from Lynn to Boston or Winthrop to pay an additional charge of 2½ cents, if tickets are used, or of 5 cents, if a cash fare is paid, for riding the extra distance from Revere to Boston or Winthrop. If by reason of the changed rates the company derives a revenue in excess of that necessary to maintain its credit, the commission directs that the excess be devoted to necessary repairs and to the improvement of the service.

Under the company's proposal, all persons leaving the stations at West Lynn and Lynn were to pay 5 cents, or present an exit coupon, in addition to the 10-cent cash fare already paid, and all persons entering those stations were to pay a 15-cent fare. Those passengers intending to leave the train within the 10-cent zone would obtain in the Lynn stations a redemption coupon entitling them to receive 5 cents at the station where they left the train. This plan the commission did not approve.

The commission also directed a change in the schedule to provide half-fare for students.

Free Shoe Shines for London Subway Passengers

Two automatic shoe-cleaning machines have been installed at Morden station, the south London suburban terminus of the Underground Railway, and passengers may now polish their shoes free of cost. If a traveller is not satisfied with the first operation of the brush, he may give repeat orders to the machine, and there is still no charge.

This innovation is due to the large quantities of mud which have been brought to the station and the railroad cars by laborers employed in the neighboring building estates in course of development. The machines have been placed between the ticket barrier and the platform. If the experiment proves successful the Underground may install similar machines at other London subway stations in areas where building estates are being developed or where many laborers patronize the subway.

Passenger's shoes are polished for nothing at this London station

New Omaha Rerouting Acclaimed

During the first week of the latest rerouting of the Omaha & Council Bluffs Street Railway, which went into effect on March 2, not one complaint was registered in contrast to the many received during the original rerouting, put into effect on Dec. 8.

Under the latest rerouting there has been a drop of 25 per cent in the number of transfers issued, compared to the first rerouting program, indicating that the desired result of taking the largest possible number of commuters directly from their homes to their work is being achieved.

The new system requires 114 "base cars" as against 108 on the first rerouting and 112 on the original system. The bus system, consisting of seventeen buses, has not been changed. It met with immediate approval.

The new routing was made easier by the fact that power from three new substations was available for the change. One more new power substation is now in the process of construction.

An effective good-will gesture on the part of the company was the running of page advertisements in the Omaha newspapers the evening of the first business day the new system was in effect, with large headlines which read "Thank You For Your Co-operation." Extracts from the advertisement read:

> The people who were inconvenienced by the rerouting seemed to remember that we, too, are just human beings doing the best we can. It is therefore natural that our relations with our patrons be friendly. . . . We want to thank all the car riders for their friendly co-operation with us in making the routing changes. We are confident that this co-operation will continue. . . . It will be a few days before all the lines and schedules work smoothly. Time and energy mean nothing to us in bringing about this desired result.

Harvard Award to Westinghouse

The Harvard Award, for the "general or institutional advertising campaign conspicuous for the excellence of its planning and execution," established by the late Edward W. Bok, has been presented to the Westinghouse Electric & Manufacturing Company. It is the first made to a national institutional advertising campaign in newspapers since the founding of the event.

The award was established in 1923 in the belief that recognition of this kind would stimulate excellence in the planning and execution of advertising. It also would afford, the founder stated, an educational opportunity through the focussing of public attention upon advertising of excellence and provide a means to encourage advertising workers through public recognition of their work.

The Westinghouse advertisements consisted of a series of twenty announcements, nearly all of which were a full newspaper page in size. They appeared in the leading newspapers of the United States and for the most part were included in rotogravure sections.

The advertisements told, in simple terms, of the great service electricity is rendering today's world—in industry, in transportation, in home, in office. They were "institutionalized" by citing the important contributions made by Westinghouse in expanding the uses of electricity.

The series was part of a Westinghouse newspaper advertising campaign which had its inception in 1928.

PERSONAL MENTION

Guy A. Richardson Heads Illinois Association

Vice-President and General Manager of Chicago Surface Lines Honored by Election to Important Sectional Association Post

GUY A. RICHARDSON, vice-president and general manager of the Chicago Surface Lines, was elected president of the Illinois Electric Railway Association at the recent meeting of that body in Springfield. Thus another association activity is added by this executive, never too busy to render aid in the councils of the industry with which he has so long been identified. Few executives have larger responsibilities than he, yet he has always given freely of his time to work of this kind, more recently as a member of the policy and the membership committees of the American Electric

Guy A. Richardson

Railway Association and at present as second vice-president of that body.

Guy Richardson has had a wide experience in railway operation. He first attracted national attention by his work at Seattle, Wash., in which city he rose from the post of assistant superintendent of the Seattle Electric Company to superintendent, only to be drafted by the U. S. Shipping Board. But that is getting a little ahead of the story. For the sake of sequence it would perhaps be better to stick to the strictly chronological order.

Born in Boston, Mass., in 1882, Mr. Richardson secured his education in the public schools of that city and of Newton, Mass., and was graduated from the Mechanic Arts High School in 1900, later taking a postgraduate course in machine shop work and mechanical drafting. In 1901 he entered the service of the Boston Elevated Railway with the status of an apprentice and an understanding that his education was to include training in a number of the company's departments. In this capacity he worked in the shops, power stations and on the cars as motorman.

During the summer of 1903 he was transferred to the electrical engineering department and remained there until September, 1904, when he accepted a position with the Boston & Northern Street Railway as inspector of car repairs. In May, 1905, he went with Stone & Webster and was assigned to the Houghton County Traction Company, in the copper country of the Michigan peninsula, as assistant superintendent. On Nov. 1, 1906, he was promoted to the position of superintendent of the property.

Prior to Mr. Richardson's advent on the job at Houghton it was the custom for the line to be snow-bound for weeks at a time with little more than a perfunctory effort to keep it clear. Mr. Richardson interpreted it to be his job to keep the line open, which he succeeded in doing. And anyone who knows what the snows are in the Michigan copper country realizes the prodigious task that confronted Mr. Richardson.

In January, 1910, Mr. Richardson was transferred to Seattle, as assistant superintendent of transportation, and by the end of the year had been made superintendent of that department. In a hair-trigger situation as regards public relations, the new superintendent acquitted himself in a manner that won the respect of a hypercritical city administration and did much to restore the property to public esteem. During the war period Mr. Richardson was drafted by the shipping board to assist in layout out a transportation system to serve the Hog Island ship yard, near Philadelphia. Other work of a consulting capacity at about this period included surveys for the Brooklyn Rapid Transit Company and the Chicago Elevated Railways.

When the property of the Seattle Electric Company was acquired by the municipality, although he received flattering offers from the then Mayor of the city, Ole Hanson, to stay and run the job, Mr. Richardson chose to try his fortune elsewhere and accepted a position as superintendent of transportation with the Philadelphia Rapid Transit Company. With that company he rose rapidly to the position of vice-president in charge of transportation, but resigned in October, 1922, and shortly afterwards went with the Chicago Surface Lines, with which property, as stated before, he now fills the position of vice-president and general manager.

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Thomas A. McConnell, for seven years assistant manager of the Yellow Cab, Inc., Newark, N. J., has been appointed acting manager of the Yellow Cab Division of Public Service Co-ordinated Transport, operating electric railway and bus lines. Mr. McConnell and his staff will have their headquarters in Public Service Terminal, Newark.

W. A. Robertson in Fort Worth Post

W. A. Robertson, recently appointed general superintendent of the Northern Texas Traction Company, Fort Worth, Tex., has been connected with Stone & Webster properties since 1910. Before going to Fort Worth he was connected with the Jacksonville Traction Company for more than four years, having been made general superintendent of that Florida property in June, 1924.

Mr. Robertson was born in Gallatin, Tenn., in 1889. After completing his education in the schools of that state he moved to Houston, Tex. His first business connection was with the Southern Pacific Railroad in the stores department as general clerk and price clerk. He served in these capacities from January, 1909, to Aug. 1, 1910. On leaving the Southern Pacific Railroad he went to work for the Houston Electric Company in the accounting department, and has been connected with Stone & Webster properties since August, 1910. Mr. Robertson worked in various capacities for the Houston Electric Company until June, 1920, at which time he was transferred to the Galveston-Houston Electric Railway as superintendent of transportation of its interurban line between Houston and Galveston. On Jan. 1, 1921, he was made superintendent of railways of the Eastern

W. A. Robertson

Texas Electric Company, Beaumont, Tex.

As stated previously he was transferred to Jacksonville, Fla., in June, 1924, as general superintendent of the Jacksonville Traction Company and from that company after more than four years he was transferred to Fort Worth, Tex., where his work has to do with a system of about 200 miles of railway.

✦

D. E. Watson Heads Terre-Haute-Indianapolis System

David E. Watson, Indianapolis, was elected president of the Terre Haute, Indianapolis & Eastern Traction Company at a special meeting of the board of directors. He takes the place left vacant by the death of Robert I. Todd. Mr. Watson assumed his new duties immediately. He has been general attorney for the company for some years and has had charge of all legal matters connected with the merger now under consideration. He will continue to supervise the company's legal business. L. T. Hixson was re-elected vice-president of the company.

Peter Witt in New Cleveland Post

Accepts Five-Year Contract as Consultant to Van Sweringens, Now Engaged in Co-ordinating Street Railway and Rapid Transit Services

PETER WITT, street railway consultant and former street railway commissioner at Cleveland, Ohio, has accepted a five-year contract as consultant for Metropolitan Utilities, Inc., the Van Sweringen company which controls the Cleveland Railway under a voting trust arrangement, and also controls the Cleveland Interurban Railway, the Van Sweringens' Shaker Heights rapid transit lines, and Rapid Transit, Inc., the company which will control other Van Sweringen rapid transit lines radiating along railroad rights-of-way from the new Cleveland union terminal.

The contract was negotiated by George

Peter Witt

D. McGwinn, vice-president of the Cleveland Union Terminals Company. On two occasions in the past few weeks, Mr. Witt declined the job of consultant, but he was finally persuaded to accept the post because he felt he would have an opportunity to assist in the creation of the co-ordinated transportation system in Greater Cleveland. Mr. Witt said:

"I was informed by Mr. McGwinn that the people back of him are going to do everything possible to give the car riders what they are entitled to. Since they approached it in that light, I concluded it was a real opportunity. I will consult with Metropolitan Utilities officials, and also offer my own proposals."

Mr. Witt was railway commissioner of Cleveland from 1912 to 1916 during the regime of former Mayor Newton D. Baker. After leaving the commissioner's office, Mr. Witt took up consulting work, giving advice on railway problems in Seattle, Boston, Philadelphia, Toronto and other cities. He also developed the Peter Witt type of street car.

During the period from 1924 to 1928 Mr. Witt was a member of the Cleveland City Council, which, under the Tayler grant, has sole authority over railway operations. The Republican-Democratic coalition which controlled the Council declined, however, to heed Mr. Witt's proposals on railway matters. Oddly enough, one of the reasons Mr. Witt ran for the Council was to try and block the union terminal project. He was one of the original proponents of the plan to have the union station built on the lake front.

The fact that Mr. Witt is to advise the Van Sweringens not only on the coordination of rapid transit and street railway services, but also on the operations of the Cleveland Railway, is regarded as an indication that the Van Sweringens are of the opinion that the Tayler grant is no longer an effective plan for operations, so far as placing control of operations in the hands of the city is concerned.

As he started on his new job, Mr. Witt pointed out that the entire Cleveland Railway system is now carrying no more passengers than it did in 1914. He quoted figures and then added:

"These figures show that the remedy thus far applied, increasing the rate of fare, is worse than the disease. If the potential car rider is to be captured the rate of fare for the man who rides 8 blocks must be made considerably less than for one who rides 8 miles."

Peter Witt is acknowledged to be one of Cleveland's most picturesque public figures. At 60, his hair is black, with hardly a trace of gray. His figure is slender and tall, and his manner is bitter and sarcastic in public criticism from the platform, but mild and benign in private. He began life as a molder, single taxer and a Socialist street corner orator and was won over by Tom Johnson (whom he had been attacking). He was a tax expert and city clerk under Johnson; as mentioned previously, under Mayor Newton D. Baker he was railway commissioner.

✦

L. B. Herrington Heads Lexington Company

Announcement was made on March 22 at Lexington, Ky., by J. P. Pope, vice-president of the Lexington Utilities Company, owner of the Kentucky Traction & Terminal Company, that L. B. Herrington, president of the Kentucky Utilities Company, Louisville, had been elected president of the company, controlled by the Kentucky Securities Corporation, which was recently bought by Middle West Utilities Company from International. Included in the Lexington Utilities Company is the Consolidated Coach Corporation.

The Lexington Utilities Company operates the railway, power and other services in Lexington and through its subsidiary, the Kentucky Traction & Terminal, the interurban lines to Frankfort, Paris and other points.

Mr. Herrington succeeds P. M. Chandler, New York, as president. Martin and Samuel Insull, G. T. Bogard and A. A. Tuttle, Louisville, are new members of the board of Lexington Utilities. Mr. Pope and Thomas A. Combs, of Lexington, are hold-over members. Mr. Chandler, F. W. Bacon, R. P. Buell, New York; H. A. Loeb and H. P. Clark, Philadelphia, have retired from the board. Mr. Bogard of Kentucky Utilities becomes vice-president; Mr. Tuttle, treasurer; G. C. Jones, secretary treasurer; Miss Ollie B. Pherigo and L. W. Haley are to be assistant treasurers.

T. H. Steffens Heads Oklahoma Association

At the Oklahoma Utilities Association convention, held in Tulsa, March 11, 12 and 13, T. H. Steffens, president of the Sand Springs Railway, was elected president of the association. Prior to this he served as vice-president of the state utility body.

In addition to being president of the Sand Springs Railway Mr. Steffens is a director in a number of industrial enterprises. He is deeply interested in civic affairs and is a member of the Rotary, Optimist, Tulsa Traffic and Tulsa Athletic clubs. Tulsa Chamber of Commerce, vice-president of the Tulsa State Fair, and is a Shriner and a trustee of the Sand Springs Home.

Mr. Steffens was born in St. Louis, Mo., on March 1, 1883. There he was educated and there he entered the service of the Frisco Railway in 1900, where he was employed until May, 1911. He then became associated with the late Charles Page and went to Oklahoma in connection with the

T. H. Steffens

building and operating of the Sand Springs Railway, between Sand Springs and Tulsa. This property has grown from a 7-mile single track to a double-track line with an industrial trackage of 30 miles serving approximately 80 industries and distributing houses. The line was constructed in a virgin territory with no outstanding industries.

✦

Henry B. Wood Assumes Broader Duties

Henry Blake Wood has been appointed chief electrical engineer of the Stone & Webster Engineering Corporation, Boston, Mass. Mr. Wood was graduated in 1896 from the electrical engineering course at Purdue University. After four years in the testing and switchboard engineering departments at the Schenectady works of the General Electric Company he was assigned to the Boston office of that company in switchboard sales and engineering activities.

In 1917 Mr. Wood entered the Stone & Webster Engineering Corporation's organization as engineer in the electrical division, and in the summer of 1926 was made assistant to the chief electrical engineer. His work has embraced a wide variety of public utility and industrial undertakings, including a hydro-electric investigation in Japan in 1928 and numerous engineering jobs in continental United States.

New Officers for Reorganized Indiana Road

Raymond R. Smith, formerly vice-president and general manager of the Chicago, South Bend & Northern Indiana Railway and the Southern Michigan Railways, later receiver for the two lines, has been elected president of the new Northern Indiana Railway, Inc., which will take over these properties.

Mr. Smith, as receiver for the lines, conveyed the title to the new company and this marked practically the end of the period of involved legal technicalities which have been in progress for months.

In accordance with a policy of placing the lines as far as possible under local control, three other South Bend men were elected to important posts.

George R. Green, general superintendent of the lines as formerly organized, was made general manager of the new company.

Harry Weir, local attorney, was made vice-president and general counsel.

Oren A. Small, former secretary of the old lines, was made secretary and treasurer under the reorganization plan.

Alfred E. Dieterich, New York City, whose father, the late C. F. Dieterich, was president of the lines as formerly constituted, was elected chairman of the board of directors.

Mr. Smith, in addition to being president, was chosen chairman of the executive committee.

No change in the rest of the official personnel of the lines is contemplated.

The new directors are as follows: A. E. Dieterich, New York City, chairman of the board; R. R. Smith, South Bend, Ind.; Amos H. Plumb, Emporia, Kan.; Alva L. Kitselman, Muncie, Ind.; Harry R. Wair, South Bend, Ind.; William Carnegie Ewen, New York City, and one vacancy to be filled later.

The executive committee is to be R. R. Smith, chairman, and Alva L. Kitselman and Harry R. Wair.

The terms of the reorganization of the company were made the subject of a detailed study in the ELECTRIC RAILWAY JOURNAL for March, 1930, page 168, at which time they were also the subject of editorial comment.

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C. L. Seavey Heads California Commission

Clyde L. Seavey was recently elected president of the California Railroad Commission for 1930, in conformity with the policy followed by the commission in recent years of rotating the presidency among its members for a one-year term.

Commissioner Seavey succeeds Commissioner Thomas S. Louttit as the presiding officer of the commission, who held that position during 1929. He has served on the commission since Jan. 1, 1923, having been reappointed by Governor C. C. Young on Jan. 1, 1929. He served as president of the commission in 1923 and 1924.

Prior to his appointment to the Railroad Commission President Seavey served as city manager of Sacramento. Before accepting that appointment, he had been connected with the state government for many years as member of the state board of examiners, state board of control, state tax commission, state civil service commission, as well as in other special capacities of importance. Mr. Seavey is a Republican. He was born at Dixon, Ill.

✦

H. R. Frederick, for the last two years assistant manager of the Steubenville, East Liverpool & Beaver Valley Traction Company, Steubenville, Ohio, which operates between Beaver, Pa., and Steubenville, has been named general manager. He succeeds C. A. Smith, who has been elected president. Mr. Frederick has been associated with the company for eight years. He was engineer in charge of maintenance of way for six years. Prior to that he was a civil engineer for the Pennsylvania Railroad.

A. Stuart Pratt Retires

A. Stuart Pratt, vice-president of the Stone & Webster Service Corporation, Boston, has resigned, following many years of executive responsibility in the management of utilities with which this house is associated. His long and distinguished service in the supervision of the power companies at Cape Breton, Lowell, Brockton and Abington, Mass., was recognized some years ago by his promotion to the vice-presidency of the centralized management organization at Boston. He now retires to be freed from some of the exactions of business life. He is one of the best-known and most highly regarded executives in the Stone & Webster organization.

✦

Morse DellPlain Honored for His Utility Leadership

Morse DellPlain

Morse DellPlain, Hammond, Ind., was honored at a testimonial banquet at the Union League Club in Chicago on March 15 in recognition of his leadership in public utilities. Mr. DellPlain is now president of the Northern Indiana Public Service Company, vice-president of the Midland United Company, vice-president of the Chicago, South Shore & South Bend Railroad, and president of the newly organized Calumet Railways, Inc., which proposes to rehabilitate the Hammond, Whiting and East Chicago railway lines.

Mr. DellPlain has rapidly made a name for himself in and about Chicago by his able handling of utility problems and the versatility he has displayed in the discharge of his duties, explained in part by the range of his previous experience. He was born in New Orleans, La., in September, 1880. Most of his early life was passed in the Republic of Mexico. From 1890 to 1896 he was employed by the Central & South American Telegraph Company as an operator on the Isthmus of Tehuantepec. He later took up the electrical engineering course at Syracuse University.

In 1903 to 1905 he was an apprentice in the shops of the Westinghouse Electric & Manufacturing Company at East Pittsburgh, Pa., and worked for the company as sales engineer in the Syracuse, N. Y., office from 1905 to 1909. He became power engineer for the Syracuse Lighting Company in February, 1909, and on Jan. 1, 1918, was appointed sales manager for that company. This position he resigned to become vice-president and general manager of the Northern Indiana Gas & Electric Company, predecessor of the Northern Indiana Public Service Company at Hammond, Ind. Mr. DellPlain is a member of the American Institute of Electrical Engineers and the American Society of Mechanical Engineers. He is also a member of the Illinois Athletic Club and the Collegiate Club of Chicago.

✦

Joe Brennan New Carhouse Superintendent at Cincinnati

Joe Brennan has stepped up another rung on the ladder of promotion with the Cincinnati Street Railway, Cincinnati, Ohio, which has taken him away from Eighth Street division. Joe is now superintendent of carhouses, succeeding the late Walter Lee Frazier. Mr. Brennan began his street railway experience with the company at Cincinnati as a hill boy in 1895. Two years later he became a mechanic in the Clifton-Elm carhouse and was promoted a few years later to the position of night foreman in that division. In 1901, he transferred to Brighton carhouse, taking the position of day foreman there. In 1905, he took the same position in the Avenue carhouse, and in 1921 he went to Eighth Street, where he served as foreman up to his present promotion.

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A. F. Townsend, manager of the Northern Texas Traction Company, the Northern Texas Electric Company and the Tarrant County Traction Company, Fort Worth, Tex., has been elected president of these three firms, replacing George H. Clifford, Boston, now president of the Stone & Webster Service Corporation. Mr. Townsend will continue as manager of the three Stone & Webster subsidiaries located at Fort Worth. Amatus A. Chamberlain, treasurer of the Northern Texas Traction Company and Tarrant County Traction Company, was named treasurer and assistant secretary of those companies. The Northern Texas Electric Company is the parent company of the Texas Motor Coaches, Northern Texas Traction Company and the Tarrant County Traction Company, the latter operating the Fort Worth-Cleburne interurban line.

C. D. Emmons Resigns as President at Baltimore

C. D. Emmons, for eleven years president of the United Railways & Electric Company, Baltimore, Md., resigned on March 26. His resignation was accepted after the board had passed resolutions expressing their appreciation of his service. Lucius S. Storrs, executive chairman, was elected to succeed him. Mr. Storrs will continue as chairman as well as discharging the duties of the president of the company. Mr. Emmons announced that he would establish an office as an engineering consultant in New York. It was indicated that he would specialize in public utilities. He planned to sail from New York on March 29 on the *Minnetonka* for a short visit in Europe.

✦

Mr. Maltbie to Finish Philadelphia Work

Appointment of Dr. Milo R. Maltbie as chairman of the New York Public Service Commission is not expected to interfere with completion of his work in connection with the audit of the Philadelphia Rapid Transit Company's books. Mr. Maltbie was selected as Comptroller Hadley's representative at a conference of experts before President Judge Harry S. McDevitt of the Common Pleas Court, where a reorganization of the relations between the city and the company is under consideration. Other experts are drawing up separate recommendations for the Mayor, the City Council and the company.

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"Bert" Sanders Leaves Kansas City Public Service

E. B. Sanders, for ten years in charge of the commercial department of the Kansas City Public Service Company, Kansas City, Mo., has resigned to open an advertising agency in Cleveland, Ohio, as representative of the Barron's Advertising Company. He is succeeded at Kansas City by A. H. Wood, son of B. F. Wood of Stevens & Wood, Inc., New York City. Mr. Wood has been a cadet engineer with the Public Service Corporation of New Jersey. Before that he was with Barron Collier, Inc., in New York. "Bert" Sanders, as he is familarly known, has long been connected with newspaper and advertising activities, his apprenticeship including intensive training under Henry J. Allen, former Governor of Kansas, known as one of the most expert mentors and appraisers of newspaper talent in the United States. The work of few men in the public relations field with utilities has attracted more favorable attention than has that done by Mr. Sanders.

✦

E. R. Norris has been appointed assistant to the vice-president according to an announcement issued by J. S. Tritle, vice-president in charge of manufacturing of the Westinghouse Electric & Manufacturing Company. Mr. Norris, formerly general works manager, will now be responsible for all plant facilities of the company, manufacturing methods, cost reduction and inspection. Mr. Norris has been associated with the Westinghouse company since 1892.

John B. O'Connell

John B. O'Connell in New Chicago Post

On March 1, John B. O'Connell became assistant superintendent of transportation for the Chicago Surface Lines, succeeding M. B. Quinn, who has been assigned to public speaking and trainmen instruction.

Mr. O'Connell was first employed by the Surface Lines in 1915 as a substation helper. During that time he was a student at the Armour Institute of Technology. He enlisted in the United States Navy in 1917 for the period of the war, serving as chief electrician. After leaving the navy, he worked for a short time as a journeyman electrician and then went to sea again as a licensed engineer officer, retiring from this service in 1920 when his ship, "Snug Harbor," was wrecked off Block Island.

He entered the University of Illinois and took a course in electrical engineering and electric railway engineering, graduating in 1923. Following a brief employment with the electrical department of the Pennsylvania Railroad and with the Public Service Company of Northern Illinois, he returned to the Chicago Surface Lines as a cadet engineer. After being connected with several departments, he was made division superintendent of North Avenue, the largest division of the Surface Lines, in 1927. Last April, he was appointed assistant to E. J. McIlraith, staff engineer, and served in that capacity until his appointment as assistant superintendent of transportation.

Mr. Quinn has been with the Surface Lines 43 years, serving in all capacities in the transportation department, including the posts of division superintendent and assistant superintendent of transportation. In recent years, he has been closely identified with the Speakers Bureau work and the training of trainmen, to which he now devotes all his time.

✦

Duties of A. P. Gale Widened

A. P. Gale, for nearly four years manager of the Beloit division of the Wisconsin Power & Light Company, with headquarters in Beloit, has been transferred to Fond du Lac, and promoted to the management of the entire eastern division of the organization. He will have charge of the districts of Sheboygan, Fond du Lac, Oshkosh and Clintonville, together with all the bus and railway systems operated by the company excepting the bus line at Janesville. He will be in charge of the $6,000,000 development program at Sheboygan. Mr. Gale will be succeeded as manager of the Beloit division by James G. Allen, who has been manager of the Lake Geneva division which has been consolidated with the Beloit division.

✦

J. W. Rich, general manager of the Mount Vernon, Alexandria & Washington Railway, Washington, D. C., has resigned, his resignation to take effect May 1, 1930. He has been connected with this property and its predecessor, the Washington-Virginia Railway, as division superintendent, general superintendent and general manager, for the past 22 years.

OBITUARY

E. F. Peck

E. F. Peck, long connected with the engineering and management firm of Peck, Shannahan & Cherry, and its predecessor, Allen & Peck, Inc., is dead. Mr. Peck had not been active in utility work since 1921 when he was run down by an automobile and injured, but he was active in that field, very active, for many years, the years of the formative stages of the industry, in which he played a conspicuous part.

To electric railway men, he is perhaps best known as a member of the firms previously mentioned, as an officer of the Schenectady Railway, and as an associate of John N. Shannahan in the work of rehabilitating the railway property at Hampton, Va. To men in the light and power field, he is perhaps best known as a pioneer Thomson-Houston man, an officer of the Citizen's Electric Illuminating Company, and the Kings County Electric Light & Power Company, Brooklyn, N. Y., now both included in the system of the Brooklyn Edison Company, Inc., and as an officer of the Schenectady Illuminating Company and the Mohawk Gas Company. Incidentally the credit is his indirectly for securing the financial co-operation of the late Charles A. Coffin in the Thomson-Houston Company, later succeeded by the General Electric Company.

Born in New Britain, Conn., in 1861, he entered the electrical field in 1880 with the American Electrical Company, New Britain, Conn. This company subsequently became the Thomson-Houston Company. Mr. Peck was one of the first electrical experts to be entrusted by this company to install its apparatus. Moreover, he was in charge of the Thomson-Houston Company's exhibit at the Franklin Institute Fair in 1884, the first exhibit devoted solely to electrical apparatus held in the United States. Afterward, he had charge of the exhibit of the same company at the World's Fair in New Orleans in 1884-1885. It was from the Thomson-Houston Company that Mr. Peck resigned in 1885 to become general manager of the Citizens' Electric Illuminating Company, Brooklyn, N. Y. He continued in this capacity until 1897,

when he entered the engineering and supply business in New York City under the firm name of the Peck Electrical Company.

In 1899 Mr. Peck was appointed general manager of the Kings County Electric Light & Power Company, Brooklyn, a position he held until 1902, when he was appointed general manager of the Schenectady Railway. As indicated before, at Schenectady he was an officer in both the Schenectady Illuminating Company and the Mohawk Gas Company in addition to being general manager of the railway, all being under General Electric control at that time. Later these companies passed to joint ownership by the New York Central Railroad, and the Delaware & Hudson Company, but Mr. Peck continued with them in active charge until 1912, when he resigned to devote his entire time to the interests of Allen & Peck, Inc. The following year, he was elected president of the Hagerstown & Frederick Railway, serving also at the same time and in after years as vice-president of the Newport News & Old Point Railway & Electric Company.

Among the cities in which Mr. Peck assisted in installing electric light plants in the early days of the industry are Boston, Fall River, Lynn and Haverhill, Mass., Columbus and Springfield, Ohio, St. Louis, Mo., and Brooklyn. His work for the Schenectady Railway also was conspicuous. Not only did he introduce many innovations in the operation of the local city lines, but he made the company's interurban between Schenectady and Albany one of the outstanding lines of its kind in the East.

When Peck, Shannahan & Cherry was organized, Mr. Peck brought to it just that leaven of matured judgment and experience needed to balance the work of the younger men, fired with enthusiasm for accomplishment in a field in which it is not by any means so easy to score an outstanding success. One of the offices which Mr. Peck filled outside the direct line of his managerial work was that of president of the New York Electric Railway Association in 1909-1910. He had long been a member of the American Institute of Electrical Engineers.

✦

Alexander L. Black

Alexander Leslie Black, a vice-president of Ford, Bacon & Davis, and a vice-president of the Market Street Railway, San Francisco, from 1916 to 1925, died at San Francisco on March 3 at the age of 60. Mr. Black had been vice-president of the New Orleans & Lake Ponchartrain Bridge Company. He joined the organization of Ford, Bacon & Davis, New York, N. Y., in 1912 as engineer in charge of their Southern properties. Mr. Black was born in New Orleans, La., in 1871. He attended private schools in New Orleans and New York and was graduated from the School of Mines, Columbia College, in 1890. He engaged in mining work in the West and Mexico for three years, and was employed for a few months as assistant engineer on the Topographical Survey of New Orleans. In 1894-1895 he had charge of the reconstruction for electric operation of the St. Charles Street Railroad, New Orleans, and remained with that company supervising operation and constructing extensions until 1901, when the New Orleans properties were consolidated. For a long while he was engineer for the New Orleans Railway & Light Company, controlling the New Orleans street railways and lighting properties.

✦

Peter Junkersfeld

Peter Junkersfeld, since 1922 a vice-president with the construction and engineering division of Stone & Webster, is dead. Starting from the humblest beginnings, a farm near Sadorus, Ill., he acquired his early education at the school in the vicinity of his home, and then entered the University of Illinois, from which institution he was graduated as Bachelor of Science.

In the fall of 1895 he established a connection which lasted for a period of 24 years, when he entered the employ of the Chicago Edison Company, now the Commonwealth Edison Company. From various capacities in power plant operation, he rose in the organization until in 1909 he became assistant vice-president, supervising contracting, engineering, construction and operating work.

After serving with distinction in the army during the World War he returned to the Commonwealth Edison Company, but only for a few months. In April, 1919, Stone & Webster engaged him as engineering manager in charge of the engineering department and as an executive of the division of construction and engineering. In February, 1922, he became a member of the firm of McClellan & Junkersfeld, Inc., engineers and constructors. Six years later his firm was merged with the division of construction and engineering of Stone & Webster and Mr. Junkersfeld became a vice-president.

✦

Joseph H. Bragdon

Joseph H. Bragdon, publishing director of *Textile World* and vice-president and general manager of the Bragdon, Lord & Nagle Company division of the McGraw-Hill Publishing Company, publishers of that paper, died suddenly of pneumonia on Feb. 19.

Mr. Bragdon was a member of the executive committee and of the board of directors of the McGraw-Hill Publishing Company. He was past president of the New York Business Publishers Association and a past president of the Associated Business Papers, the latter office being the highest honor which the business publishing profession can offer. At the time of his death he was a member of the board of governors of the Advertising Federation of America.

Mr. Bragdon was born in Melrose, Mass., on June 9, 1887. His father, Joseph H. Bragdon, founded *Textile Manufacturers Journal* in 1894. When the son graduated from Yale in 1911, he joined the staff of that publication. In 1915 he was active in a merger which joined *Textile Manufacturers Journal* and *Textile World Record* into one publication, *Textile World*.

✦

C. A. Kincade

C. A. Kincade, head of the electrical distribution department of the Kansas City Public Service Company, Kansas City, Mo., since 1918, died unexpectedly on March 14, from heart disease. Mr. Kincade was born on Jan. 2, 1877, in West Virginia. He entered the employ of the old Metropolitan Street Railway in Kansas City in 1900 as a gripman on the old Twelfth Street cable line. Three years later he was transferred to the electrical department as a substation operator and a year later became assistant to the electrical engineer. In 1907 he was placed in charge of all overhead and conduit construction and maintenance work and in 1918 became superintendent of electrical distribution.

✦

John Wernsdorfer, 80 years old, employed by the United Railways & Electric Company, Baltimore, Md., for 58 years, died on Feb. 20. He was pensioned about ten years ago, but continued to serve as vice-president of the United Railways Twenty-Five Year Club. Mr. Wernsdorfer started as a track walker, but advanced step by step to be foreman of the track construction department.

✦

Cecil R. Pillsbury, assistant treasurer of the General Steel Castings Corporation at Granite City, Ill., died at Philadelphia, Pa., on Feb. 19. Mr. Pillsbury was 53 years old. He started with the Commonwealth Steel Company as a checker at $2 a day sixteen years ago. He gradually advanced until he was made treasurer, a position he held when that company merged with the General Steel Castings Corporation last July.

✦

Jacob H. Maag, foreman of maintenance of way and structures of the Los Angeles Railway, Los Angeles, Cal., died in that city on Feb. 27, at the age of 71. Fifty years of his life had been spent in railroad construction work, and he was one of the eye-witnesses to the joining of the rails uniting San Francisco and Los Angeles by railroad on Sept. 5, 1876, at Lang Station, near Newhall, Cal. From 1882 to 1904 he was section foreman for the Southern Pacific Railroad and then he entered the employ of the Los Angeles Railway as foreman of maintenance of way and structures, a position which he held for nearly 26 years.

✦

Nathaniel C. Robbins, New York advertising sales representative of *Power*, a McGraw-Hill publication, and veteran of service with the Astor Battery in the Spanish-American War, died at Nyack, N. Y., on March 16, following an illness of three months. Mr. Robbins was graduated from Cornell University in 1894. In addition to his service with the Astor Battery, he was a widely known veteran of the Seventh Regiment, New York National Guard. At the close of his service in Cuba, Mr. Robbins became associated with the Hill Publishing Company, then publisher of *Power*. He had served that company and its successor, the McGraw-Hill Publishing Company, since 1900.

✦

Oliver B. Barrows, for more than 30 years St. Louis representative of the American Steel & Wire Company, died on Feb. 25. He was born in Janesville, Wis., in 1863. He was made St. Louis representative of the American Steel & Wire Company in 1900.

✦

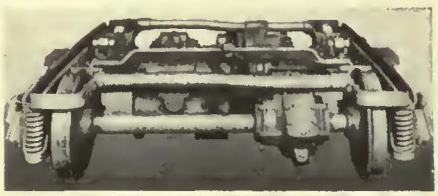
George Wright, chairman of the Toronto Hydro-Electric Commission, died at his home in Toronto, Ont., on March 17, in his 64th year. Mr. Wright was for many years a member of the Toronto Transportation Commission, operating the municipally-owned railway and bus system in Toronto. He was among the first of those in the province of Ontario who saw the possibilities of public development of hydro-electric power and light, and was closely associated with the late Sir Adam Beck in the early days of the enterprise.

Comfort and Speed on New Allegheny Valley Cars

By J. G. Inglis
General Engineering Department
Westinghouse Electric & Manufacturing Company

TWELVE new, high-speed, light-weight cars have completely modernized the rolling stock on the lines of the Allegheny Valley Street Railway, a subsidiary of the West Penn system.

The line runs parallel to the Allegheny River near the city of Pittsburgh, Pa. One branch extends upstream from New Kensington to Natrona, approximately 7 miles; the other extends downstream to Aspinwall, 11.73 miles. Service on the upper branch was formerly provided by six cars operating on a 15-minute headway with a 90-minute round-trip time. Two extra cars were operated in the rush hours, as the community is an industrial center.



Ample clearance under motor and gear unit is provided with 22-in. wheels

On the lower branch to Aspinwall four cars operated on a 30-minute headway with a round-trip time of two hours. No extra rush-hour service was necessary on this branch.

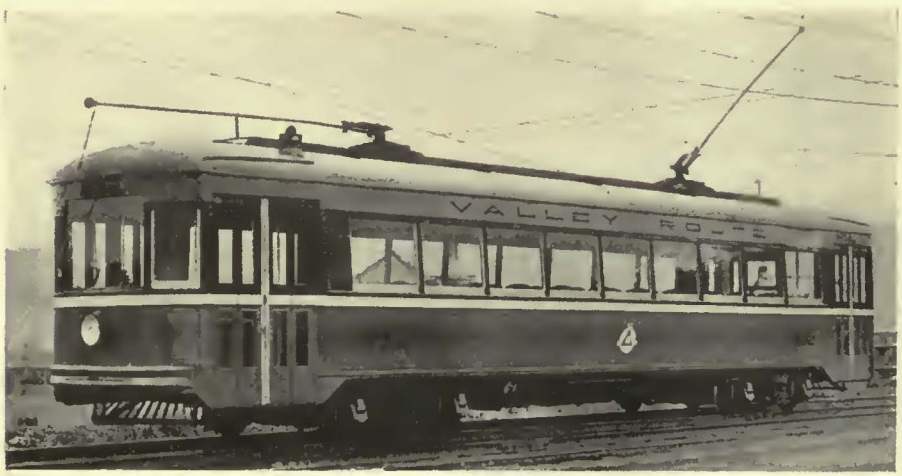
In considering modern equipment to replace the old cars, several refinements were necessary to meet the ideas of the company's engineers. One-man car operation was to be instituted, a low car floor was desired, and the running time on the Aspinwall line was to be cut 25 per cent, also the car weight was to be held to a point so that satisfactory operation could be obtained with 35-hp. motors.

Complete but without load, the new cars weigh 32,100 lb., have quadruple 1425-A motors (35 hp., 300 volt) geared 4.75:1 with WN drive to 22-in. wheels. The control is double-end K-75 with TA handle switches and lightweight Type M resistor. The free running speed of the new cars is 43.5 m.p.h., approximately 10 m.p.h. faster than the old ones. Seating capacity has been provided for 48 passengers, with well-upholstered, reversible seats finished in Spanish brown leather. Wide windows, narrow sashes, good lighting and an unobstructed view at the front of the car have been combined to make the ride of the passenger as pleasant as possible.

The mounting of the motors and WN drive as well as some of the features of the truck construction are of especial interest. The trucks are the Cincinnati Car Corporation's cantilever type with certain modifications to care for WN drive. A transverse tubular motor support carries one-half of the motor weight, while the other half of the motor weight and half of the gear unit weight are held by clevis castings supported by the transom. Positively centered thermoid disk couplings are used. The link between the gear unit and the clevis casting has a ball and socket joint at each end, permitting freedom of motion in any direction to take care of the movement of the car axle. The brake rigging is the West Penn standard, helping to give a very neat appearance to the truck. Tranverse leaf springs and coil journal-box springs contribute to the riding qualities of the car. Brake hangers are so constructed that noise is prevented even when the parts become worn. Rigid attention was given to all factors which would promote riding comfort.

There are several ways in which the motor and drive helped to meet the requirements of the railway company in this application. Chief among these is the matter of weight reduction. By utilizing a high-speed motor wound for 300 volts, high temperature insulation and a double reduction drive, sufficient clearance was obtained to permit the application of 22-in. wheels. The resulting economies in weight were sufficient to bring the total car weight to 32,100 lb., without the necessity of utilizing aluminum construction except in the seats and around the control panels. The body weighs 18,700 lb., while one truck complete with motors weighs 6,600 lb. with rolled-steel wheels, or 6,800 with cast-steel wheels. This truck weight is the lightest of any WN drive truck in operation. The 6,600 lb. for the truck with rolled-steel wheels corresponds to 7,850 lb. for a truck recently built and equipped with axle-hung 35-hp. motors and 26-in. rolled-steel wheels. This corresponds to a reduction of 2,500 lb. per car and, if axle-hung motors had been considered for the Allegheny Valley cars, such an increase in car weight would have been almost certain to prohibit the application of 35-hp. motors for the schedule desired.

Through the utilization of 22-in. wheels, it has been possible to construct the cars with only one step and without a ramp in the floor. This reduces accident hazards and claims and cuts down the stop time, permitting higher schedule speeds. The latter is of especial interest to the transportation department of the company because the schedule under which the cars will operate is a difficult one. The gear ratio had to be chosen so that a high balancing speed would be available where there was an opportunity to use it, while a high accelerating rate was desired in the frequent-stop service.



Wide windows, narrow sashes and a single step contribute to attractive appearance of new West Penn cars

New Brooklyn Cars Now in Service

The first of an order of 100 trolley cars, ordered during the latter part of last year by the Brooklyn & Queens Transit Corporation, have arrived and are now in service in that city. It is expected that the entire 100 cars will be in service within the next two months. The order was divided between the Osgood-Bradley Car Company, of Worcester, Mass., and the J. G. Brill Company, each concern supplying 50 cars.

Cars are equipped with four 35-hp. motors, and the control equipment is of the automatic acceleration type similar to that used on subway cars. This feature makes the new cars especially effective in congested traffic areas as it is expected to enable them to keep abreast of, if not outdistance, automobile traffic using the same streets. This type of control permits the car to pick up speed rapidly and automatically and without any noticeable jolting as it changes from one speed to another. Acceleration is provided at the rate of 3 m.p.h.p.s. and deceleration, or braking, at the rate of 2½ m.p.h.p.s. This is an unusually high rate of acceleration for a surface car and is required to enable the cars to pick up speed, when starting, as rapidly as an automobile. Control and motor

Wide windows, ample and well distributed illumination and comfortable seats contribute to the attractiveness of the new Brooklyn cars

Forward platform of new Brooklyn car, showing motorman's control and arrangement of automatic turnstile at entrance to passenger well

equipment was provided by the Westinghouse Electric & Manufacturing Company.

The new cars are of the front entrance, center exit type, and are equipped with prepayment fare turnstiles. In order to give maximum seating capacity, single-end control is provided. The cars have seats for 54 passengers. Leather upholstered, spring cushion seats are supplied, the supports and backs of which are made of aluminum. Thirty-two of the seats are arranged in pairs—ten pairs on one side of the car and six pairs on the other—and the remaining 22 seats are single seats running lengthwise along the sides and around the rear end. This arrangement is designed to provide a maximum of aisle space.

Detailed specifications include:

Air brakes	Westinghouse
Armature bearings	Plain
Axles	3½x7-in. Carnegie
Car signal system	Faraday
Compressors	Westinghouse D-H-16
Conduit	Metal
Destination signs	Hunter illuminated roll
Door mechanism,	Consolidated Car Heating Company
Doors	Folding
Energy saving device	Arthur
Fare box	Percy, on passimeter
Finish	Enamel
Floor covering	Tuco
Gears and pinions	Nuttall
Hand brakes	National Brake Company
Heaters	Railway Utilities Company
Headlights	Ohio Brass Company
Headlining	Aluminum
Journal bearings	Plain
Journal boxes	J. G. Brill
Lamp fixtures	Electric Service Supply Company
Motors	4 Westinghouse, No. 510-A, inside hung
Roof material	Wood, canvas covered
Safety car devices	Westinghouse
Sash fixtures	O. M. Edwards Company
Seating material	80 cars, leather; 20 cars, wood
Slack adjusters	Westinghouse
Steps	Stationary
Step treads	Feralun
Trolley catchers	Ohio Brass Company
Trolley base	Ohio Brass Company
Trolley wheels	Ohio Brass Company
Trucks	J. G. Brill, 177-E-1
Ventilators	Railway Utilities Company
Wheels	Rolled steel, 26 in. diameter
Lifeguard	H-B

By the use of aluminum for interior panels and headlining, with the car body itself constructed of steel, the weight is kept to 37,000 lb. The roof is of the arch type with twelve ventilators. Porcelain handrails suspended from the ceilings at a height of 6 ft. from the floor take the place of hand straps. The floors are of the same composition as the floors of subway cars, a ½-in. layer of this composition being laid over steel sheets ½ in. thick. Each car cost approximately $16,000.

Contracts Awarded for New Baltimore Cars

Of the 150 new street cars which have been ordered by the United Railways & Electric Company, of Baltimore, announcement of which appeared in Electric Railway Journal News of March 22, 1930, 100 will be built by the J. G. Brill Company and 50 car bodies will be supplied by the Cincinnati Car Company. The Brill Company is to supply trucks for the entire order. The total estimated cost of the new rolling stock is set at $2,550,000.

The new cars are to be of all-steel construction and will embody all of the latest developments making for passenger comfort, quick loading and alighting, and quiet operation. Front entrance and center exit arrangements will be incorporated in the design, the passengers depositing their fares as they pass the conductor, who is to be stationed near the center of the car. Quick acceleration and deceleration will be provided so as to enable the new cars to take their place in high-speed traffic.

Prior to the awarding of the contracts, representatives of a number of car builders as well as appliance manufacturers were invited to Baltimore and acquainted with the company's ideas, following which a number of tests were made at the Carroll Park shops of the United Railways & Electric Company. Complete specifications are not at present available but will be announced at an early date.

North Shore Line Receives 25 New Motor Cars

Twenty-five new all-steel passenger motor cars, costing approximately $850,000, have been delivered to the Chicago, North Shore & Milwaukee Railroad by the Standard Steel Car Company, of Hammond, Ind. This makes a total of 40 new all-steel motor cars purchased by the North Shore Line during the past two years.

The new cars are provided with easy-chair type seats upholstered in Byzantine plush, a double heating system (hot water

General view of five-car train made up of new all-steel coaches, 25 of which have been placed in limited service on the North Shore Line

and electric) thermostatically controlled, two toilets and a smoking compartment in each car, an auxiliary lighting system for emergencies, larger windows increasing visibility for passengers, and individual ventilators in each window, as well as electric fans and ceiling ventilators in each car. Each car has four motors with a total of

Individual easy chairs are a feature of the new coaches recently acquired by the North Shore Line for service between Chicago and Milwaukee

560 hp., and weighs 51 tons. Improved air-brake equipment and motor control are important mechanical features. The cars are painted in the new North Shore Line colors, orange with maroon trimmings, adopted as a measure of public safety by increasing the visibility of trains.

Trolley Buses Arrive in Knoxville

Four trolley buses, intended for service on the Cumberland and Kingston Pike lines of the Knoxville Power & Light Company, have arrived in that city and will be placed in regular service about May 1. The coaches, which seat 42 passengers each, were supplied by the Cincinnati Car Corporation at an approximate cost of $50,000.

ANNOUNCEMENT is made that the City of Detroit, Department of Street Railways, will open bids on April 11, 1930, for the furnishing of 130 cars of the Peter Witt type.

Considerable additional line work has been entailed in erecting a second overhead trolley wire parallel to the existing wire but the work is now well on the way to completion.

Chicago Surface Lines Orders Trolley Buses

As the result of the substantiation of the rights of the Chicago Surface Lines to supply bus service to certain sections of that city, orders have been placed for a total of 41 trolley buses to provide service over about 17 miles of route. The necessary expenditure has been authorized by the court and the new rolling stock is expected to be in service before many weeks. Twenty-nine of the vehicles will be built by the Twin Coach Company, of Kent, Ohio; six are to be supplied by the J. G. Brill Company, and six by the St. Louis Car Company. The buses are to be powered with two 50-hp. motors and will be supplied with four-wheel air brakes.

Twin Coach Company has also recently supplied two urban type coaches to the Milwaukee Electric Railway & Light Company and five 40-passenger urban type coaches to the Boston Elevated Railway. The Boston Elevated Railway has also added two 40-passenger metropolitan type coaches, which were supplied by the American Car & Foundries Motor Company. North Coast Transportation Company, of Seattle, Wash., has also received two ACF 264-in. wheelbase chassis.

The White Company, of Cleveland, reports the sale of eight of its Model 65 buses to the Denver Tramway Company; four Model 50B buses to the Middlesex & Boston Street Railway, of Newtonville, Mass., and one Model 54A bus to the Super Power Company, of Springfield, Ill.

J. G. Brill Orders for Equipment Exceed 1929

Receipt of an order from the United Railways & Electric Company, of Baltimore, for car bodies and equipment aggregating in value more than $2,000,000, puts the business of the J. G. Brill Company for the first quarter of 1930 about 100 per cent of orders received during the same period of 1929. Sales in the first three months of the current year have been running at the same rate as in 1929, but with the addition of the order from Baltimore sales will amount to approximately $4,000,000, or just about double the amount of the first quarter of that year. Unfilled orders on the books on Jan. 1, 1930, are said to have been approximately the same as those for the previous year.

Bendix and Westinghouse Form New Company

Announcement is made jointly by the Westinghouse Air Brake Company and the Bendix Aviation Corporation of the formation of a new company to be known as Bendix-Westinghouse Automotive Air Brake Company, the entire capital stock of which is to be held by the Bendix Aviation Corporation and the Westinghouse Air Brake Company.

The new company will continue the operation of what has heretofore been the automotive division of the Westinghouse Air Brake Company and will continue to supply the well-known Westinghouse air brake equipment for buses, trucks and other types of automotive vehicles. Westinghouse will continue the manufacture of the automotive air brake equipment for the new company.

General Electric Had Record Year in 1929

In volume of orders received, shipments billed, and in total profits and earnings per share of common stock, the year 1929 was the best in the history of the General Electric Company, according to the annual report for that year, just released by Gerard Swope, president. Orders received increased 28 per cent over 1928. Sales billed increased 23 per cent, net income from sales showed an increase of 24.5 per cent and earnings per share of common stock increased 25 per cent. Profits available for dividends amounted to $67,289,880, equivalent, after dividends on special stock, to $8.97 per share on the no par common.

Substantial expenditures were made during 1929 for the consolidation of manufacture of related products at one place. This policy has been found to improve service and efficiency and to reduce costs. No new buildings of importance were added, but a number of existing buildings were rearranged, and a total of $20,000,000 was expended upon plant improvements.

Star Brass Works, Kalamazoo, Mich., is distributing an attractive catalog illustrative of its products, which include trolley wheels and harps for street railways, mining operations, electric cranes and other uses.

ELECTRIC RAILWAY MATERIAL PRICES—APRIL 1, 1930

Metals—New York

Copper, electrolytic, delivered, cents per lb.	18.00
Lead, cents per lb.	5.50
Nickel, cents per lb., ingot	35.00
Zinc, cents per lb.	5.25
Tin, Straits, cents per lb.	37.62
Aluminum, 98 to 99 per cent, cents per lb.	24.30
Babbitt metal, warehouse, cents per lb.:	
Commercial grade	41.00
General service	31.00

Bituminous Coal

Smokeless mine run, f.o.b. vessel, Hampton Roads, gross tons	$4.35
Somerset mine run, f.o.b. mines, net ton	2.00
Pittsburgh mine run, Pittsburgh, net ton	1.40
Franklin, Ill., screenings, f.o.b. mines	1.50
Central, Ill., screenings, f.o.b. mines	1.15
Kansas screenings, Kansas City	1.75

Track Materials—Pittsburgh

Standard steel rails, gross ton	$43.00
Railroad spikes, drive ⅞ in. and larger, cents per lb.	2.80
Tie plates (flat type), cents per lb.	2.15
Angles bars, cents per lb.	2.75
Rail bolts and nuts, cents per lb.	3.90
Steel bars, cents per lb.	1.85
Ties, white oak, Chicago, 6 in. x 8 in. x 8 ft.	$1.40

Hardware—Pittsburgh

Wire nails, base per keg	$2.30
Sheet iron (24 gage), cents per lb.	2.70
Sheet iron, galvanized (24 gage), cents per lb.	3.35
Galvanized barbed wire, cents per lb.	2.95
Galvanized wire, ordinary, cents per lb.	2.90

Waste—New York

Waste, wool, cents per lb.	14.00
Waste, cotton (100 lb. bale), cents per lb.:	
White	11.00
Colored	10.00

Paints, Putty and Glass—New York

Linseed oil (5 bbl. lots), cents per lb.	14.6
White lead in oil (100 lb. keg), cents per lb.	14.25
Turpentine (bbl. lots), per gal.	0.61
Putty, 100 lb. tins, cents per lb.	5.725

Wire—New York

Copper wire, cents per lb.	19.875
Rubber-covered wire, No. 14, per 1,000 ft.	$6.15
Weatherproof wire base, cents per lb.	18.50

Paving Materials

Paving stone, granite, 5 in., f.o.b.:	
New York—Grade 1, per thousand	$150.00
Wood block paving 3½, 16 lb. treatment, N. Y., per sq.yd., f.o.b.	2.70
Paving brick 3½x8½x4, N. Y., per 1,000 in carload lots, f.o.b.	50.00
Paving brick 3x8½x4, N. Y., per 1,000 in carload lots, f.o.b.	45.00
Crushed stone, ¾-in., carload lots, N. Y., per cu.yd., delivered	3.40
Cement, Chicago, in carload lots, without bags, f.o.b.	1.95
Gravel, ¾-in., cu.yd., delivered New York	3.40
Sand, cu.yd., delivered New York	2.15

Old Metals—New York and Chicago

Heavy copper, cents per lb.	15.12
Light copper, cents per lb.	13.60
Heavy yellow brass, cents per lb.	8.12
Zinc, old scrap, cents per lb.	2.00
Lead, cents per lb. (heavy)	4.00
Steel car axles, Chicago, net ton	$16.25
Cast iron car wheels, Chicago, gross ton	14.75
Rails (short), Chicago, gross ton	18.25
Rails (relaying), Chicago, gross ton (65 lb. and heavier)	28.50
Machine turnings, Chicago, gross ton	7.75

Safety...

Put yourself in the position of a motorman who has to compromise the factor of security because of questionable brakes.

Could you meet schedules 100% and maintain an accident free record?

National Brake Company, Inc.
890 Ellicott Square Buffalo, N. Y.

Canadian Representative:
Lyman Tube & Supply Co., Ltd., Montreal, Can.
The Ellcon Co., General Sales Representatives
50 Church St., New York

PEACOCK
Staffless Brakes

Illustration showing the new Texaco Oil seals and the ease of application. Texaco Oil Seals are simply inserted in the regular dust guard slot in back of the journal box and form an effective permanent barrier against oil leakage or access of dust and water.

LAST YEAR'S LUBRICANTS ARE DECIDEDLY OUT OF DATE

TEXACO provides an entirely new system of electric railway lubrication and a new car-journal lubricant. Texaco Lovis Oil and the system, in which the use of Texaco Oil Seals is an important factor, promise to save hundreds of thousands annually for the industry.

Here are the advantages:—1. A substantial saving in power; 2. Increased car operating speeds; 3. Reduced waste consumption; 4. Lower labor costs; 5. Lower maintenance; 6. A saving in oil house costs; 7. Lower costs for lubrication.

The new Texaco System is now being put into effect on many of the leading lines of the country. Texaco Lubrication Engineers will, on request, arrange for conclusive tests on any road.

Write The Texas Company.

THE TEXAS COMPANY 17 BATTERY PLACE, NEW YORK CITY

TEXACO LUBRICANTS

OFF IN LESS THAN 3 MINUTES

TYPE "K" RIMS SAVE TIME ON TIRE CHANGES

The ease with which Goodyear Type "K" Rims are slipped on and off despite rust, dirt, or ice is a big reason for their success. They come off your tires in an instant—THREE MINUTES OR LESS is enough.

Type "K" Rims are light, trim, and cool running. Built in two sections, one split and one endless, they are powerful and yet easy to handle. Your drivers and repair men will like this light and mechanically able equipment.

"THE MAN WHO CHANGES THE TIRES LIKES GOODYEAR TYPE 'K' RIMS"

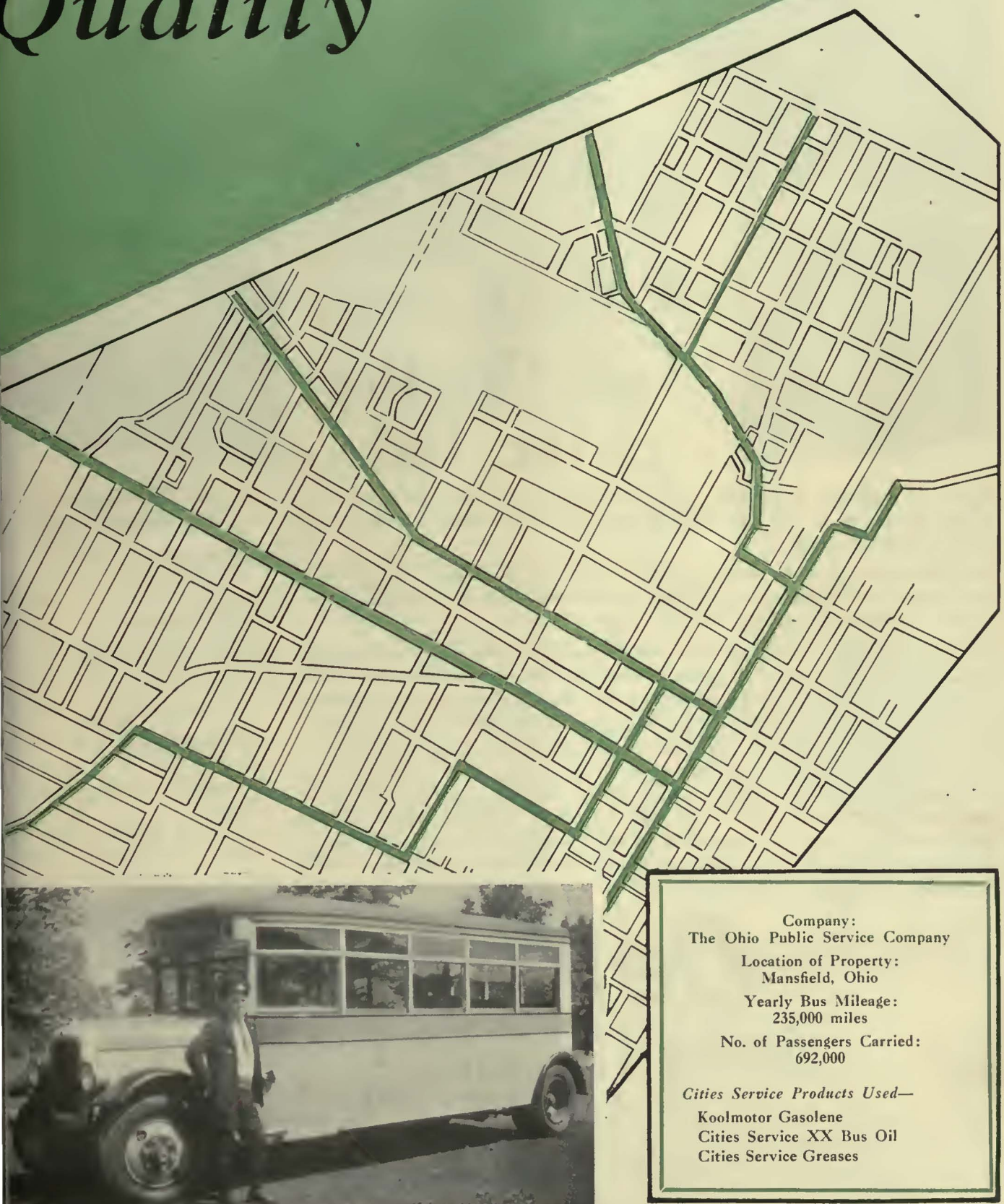
Change-overs from solid or cushion tires to pneumatics are simple matters with Type "K" Rims. You just cut down your old wheels and weld on single or dual Type "K" felloes. Then, more power, smarter appearance, and less trouble all around.

Write today to Goodyear, Akron, Ohio, or Los Angeles, California for detailed information on sensible Type "K" Rim equipment for trucks or buses.

GOODYEAR

TYPE "K" TRUCK AND BUS RIM EQUIPMENT

Buses Prove Cities Quality



Company:
The Ohio Public Service Company

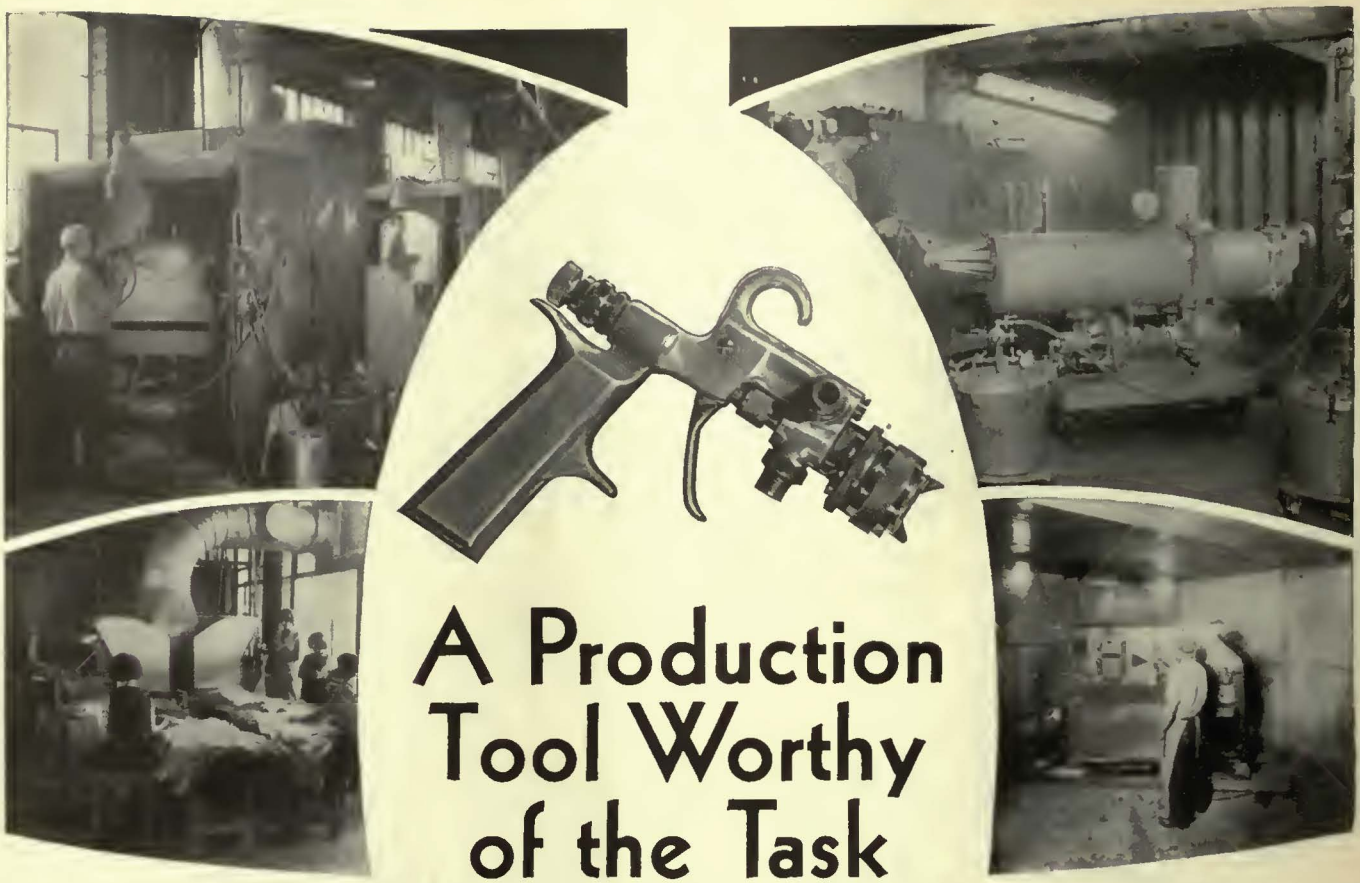
Location of Property:
Mansfield, Ohio

Yearly Bus Mileage:
235,000 miles

No. of Passengers Carried:
692,000

Cities Service Products Used—

Koolmotor Gasolene
Cities Service XX Bus Oil
Cities Service Greases



A Production Tool Worthy of the Task

SPRAY painting equipment used in industry today must measure fully up to the speed and efficiency of the most advanced production units in other departments.

DeVilbiss spray systems for use in railway finish maintenance operations—cars, buses, and buildings—are engineered with a complete understanding of the demands that will be made upon them.

This involves a constant study of the changing methods and improved devices which progress brings into every highly competitive operation. Users of DeVilbiss spray systems never find their finishing operations lagging behind improvements made in other directions. DeVilbiss equipment is designed with a complete understanding of all the processes employed in the plant where the DeVilbiss system is used. The constant improvement in every detail of a DeVilbiss spray outfit is reflected in a constantly lowering cost of finishing by reason of new economies in time consumed, labor and materials. You can always learn from DeVilbiss whether your finishing operation is as modern, efficient and economical as it should be. Such information costs you nothing. It may save you much.

DeVilbiss Provides Everything Needed

Spray guns of various types and sizes.

Pressure feed paint tanks and containers.

Spray booths, exhaust fans, and approved lighting fixtures.

Air compressing equipment.

Air transformers and accessories.

Air and fluid hose and connections.

Complete outfits from the smallest hand-operated units to the largest industrial installations.

DeVilbiss

Spray-PAINTING FINISHING System

THE DeVILBISS COMPANY

272 Phillips Ave., Toledo, Ohio

Sales and Service Branches

New York Philadelphia Cleveland Detroit Indianapolis Chicago St. Louis San Francisco Los Angeles Windsor, Ont.

Direct factory representatives in all other territories

ALMOST SEVEN MILLION MILES LAST YEAR

The coaches of Consolidated Coach Corporation travel the roads of Kentucky and Tennessee. They penetrate into Indiana and Ohio—they cross the state lines of the two Virginias. The coaches of the Kentucky Coach Company travel entirely on city streets. The combined mileage of these two operations totaled 6,919,491 miles in 1929—all on Goodyears.

For more than three years now, no other tires have been used except Goodyears, because these companies, like so many others, have found the long mileage, the stamina, the freedom from delays, the safe, surefooted traction of Goodyear Tires best suited to their demands of safety, maintained schedules and economy.

More people ride on Goodyear Tires than on any other kind—for the very good reason that experience has demonstrated Goodyear superiority.

Isn't this a good reason for asking a Goodyear Truck and Bus Tire Service Station Dealer about the extra benefits these famous tires could bring to your fleet?

THE GREATEST NAME IN RUBBER

GOODYEAR

ON YOUR NEXT COACHES SPECIFY GOODYEARS

61 motor coaches on 78 miles of routes, running 3,200,000 miles in 1929, carrying 45,000 passengers each day

Record of Bee Line purchases of G.C.F. coaches

8*	in	July, 1928
2*	in	September, 1928
2†	in	September, 1928
10*	in	February, 1929
2*	in	May, 1929
4**	in	July, 1929
4**	in	March 1930

*G. C. F. Model 508-9D11, 33-passenger urban coach.
†G. C. F. Model 601-2D9, 23-passenger urban coach.
**G. C. F. Model 511-3H7, 40-passenger Motorliner coach.

The Bee Line is one of Long Island's most important motor transport lines. The experience of the men who have built this business from scratch, is worth any operator's attention. Listen to Mr. H. B. Carter, President of the Bee Line:

"A year ago last August, we bought our first G.C.F coaches—five 33-passenger jobs. Since then, we've reordered several times, and at present, we have 32 G.C.F busses in operation. Twenty-two of them are 33-passenger models. Two are 23-passenger jobs which we use on cross routes. And eight are Metropolitan street-car-type models, which we keep busy all day long on our heaviest runs.

"Mileage? Well, the first five jobs have been on the road now for eighteen months and every one of them shows 120,000 miles or better. We keep detailed cost records on every coach we run, and these G.C.F coaches show an average operating cost, including overhead and everything, of about 29¢ a mile.

"We didn't choose G.C.F blindly. We've used several makes of coaches, and they have all been good. But the things G.C.F offered were quite a little better . . . more passenger comfort, and that is a very important point in any operation . . . more inside room . . . more air space . . . better appearance.

"And then A.C.F. are six cylinder jobs. That means smoother operation, and we have found that they don't cost any more to run than fours. We've had less trouble with them. They've stayed on the road better than any coaches we've ever had. Our routes run normally through level country, but for the last year or more, long stretches both on the Merrick Road and the Hempstead Turnpike have been under construction, and we've had to run constantly over extremely rough detours.

"They say that the proof of the pudding is in the eating. Well, if that is the case, all I can say is that for the last nineteen months, we haven't added any coaches except A.C.F. And they have certainly given us record service!"

The A.C.F. Metropolitan Coach and the advantages it offers you

An operating life of ten to fifteen years at a minimum. A seating capacity a third greater, and a standee capacity of 100 to 150% greater, than the usual 230" wheel base coach. Body maintenance practically eliminated. The all steel body-chassis is built as a single unit of 16-gauge steel panel-plates *riveted* to steel posts, which are integral parts of the chassis structure. A six cylinder Hall-Scott engine designed expressly for bus service and improved by seven years of constant refinement. The Metropolitan is built by the American Car and Foundry Motors Company—your guarantee of quality and satisfaction.

BRIEF SPECIFICATIONS

Wheelbase . .	230".	Tires	38"x 9". (single front, dual rear).
Capacity . . .	40 seated passengers.	Transmission . .	3 speed.
Construction . .	All steel; body-chassis built as a single unit.	Rear Axle . . .	Worm drive, full floating.
Engine	Hall-Scott, 6 cylinder 120 H.P.	Weight distribution, loaded .	⅓ on front axle; ⅔ on rear axle.
Drive Shaft . .	Only 24".		

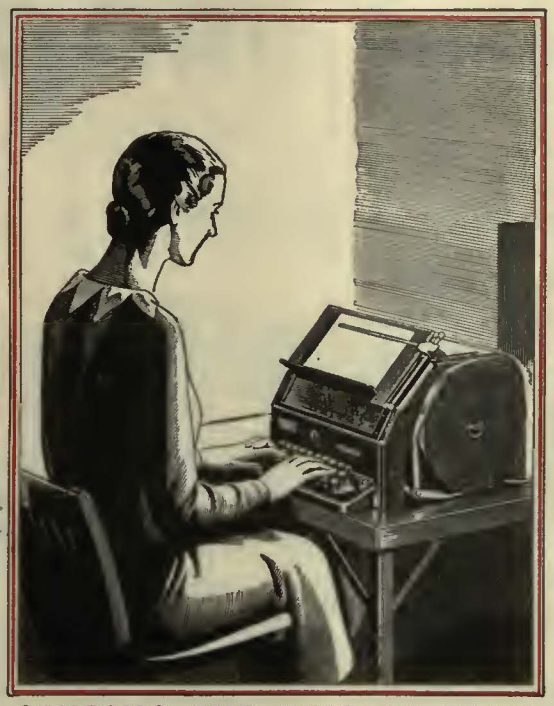
Mechanical or gas-electric drive available.

a.c.f.

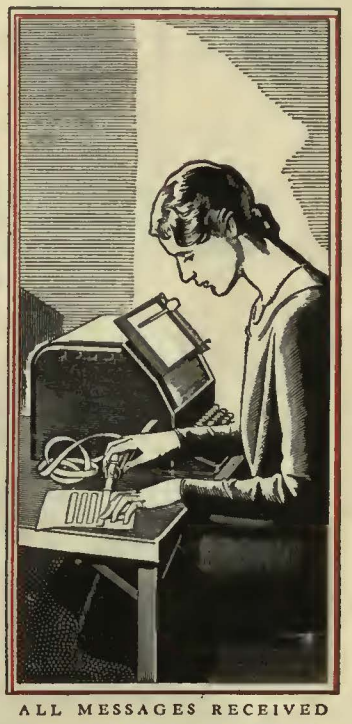
AMERICAN CAR AND FOUNDRY MOTORS COMPANY, 30 Church St., New York City

Typewritten Simultaneously in Every one of your Offices

BRANCH OFFICE EXECUTIVE RECEIVES THE MESSAGE AS IT IS TYPED IN HEADQUARTERS



SENDING THE MESSAGE FROM HEADQUARTERS TO THE FIELD



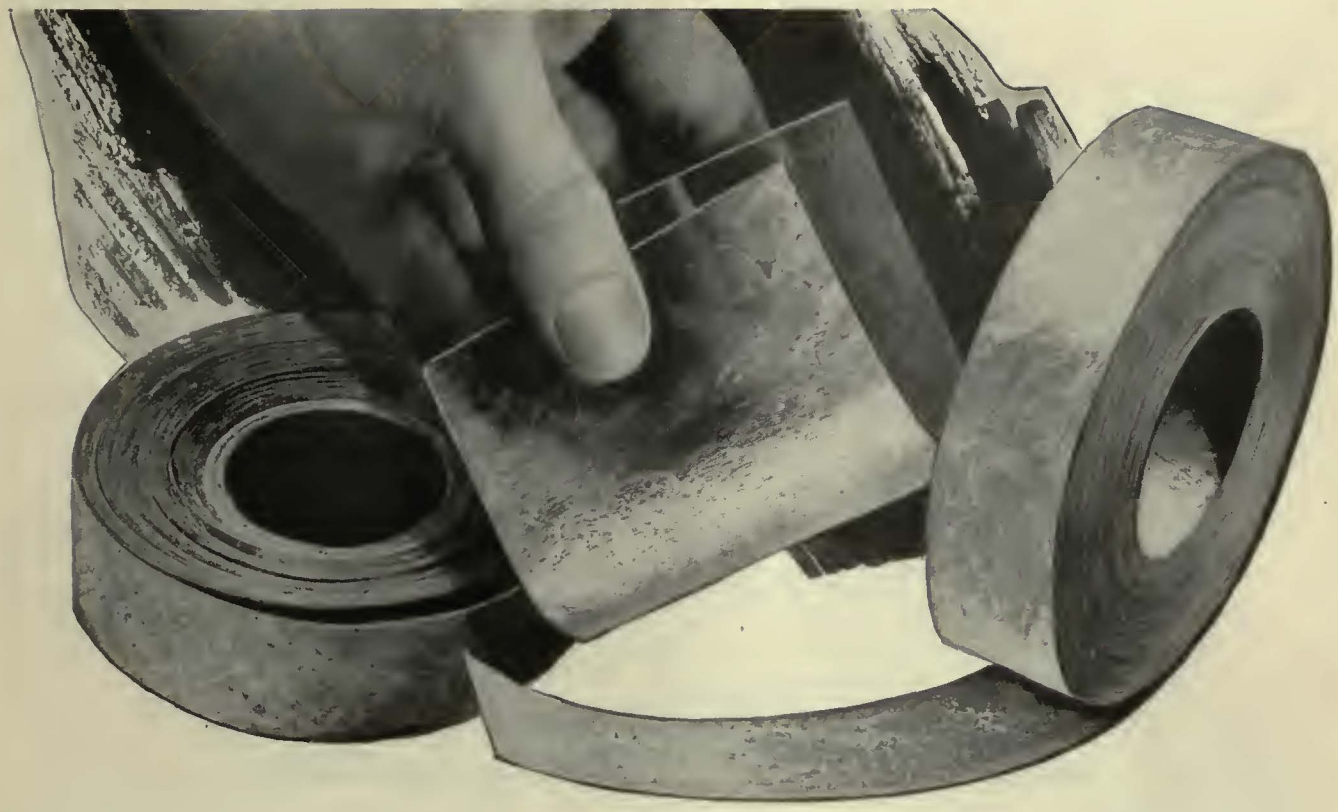
ALL MESSAGES RECEIVED MAY BE PASTED ON LETTER-HEAD SIZE PAPER FOR FILING

Telephone Typewriter Service speeds modern business by providing instantaneous typewritten communication between the different units of an organization. It weaves together headquarters, factories, branch offices and warehouses almost as closely as though they were under one roof.

A large metal company uses the service to connect its New York office with its mill in West Virginia. Orders, general information, administrative matters, specifications, cost estimates, stock on hand, shipments, etc., are reproduced instantly and accurately at either end. A tobacco company transacts much of the business between its plants in southern states by telephone typewriter. Several hundred messages are exchanged each day.

Telephone Typewriter Service is proving its worth for banks, manufacturing concerns of all kinds, public utilities, government departments, insurance companies, export firms, department stores, travel bureaus. It makes executive control easier and more complete. Facilitates immediate action on vital matters. Transmits important business information while the information is still of value. It is quick, accurate and private.

Would constant, unlimited, two-way written communications be of value to your business? Telephone Typewriter Service can be fitted to your exact requirements. Your local Bell Telephone Business Office will gladly give you complete information.



Mica in every form

for A.C. motor insulation

Protect A. C. motors and generator slot cells and coil phase sections with built-up mica! That's the way to assure lasting maintenance-free performance and the maximum of operating efficiency. Super-Micanite is practically indestructible under the heat and vibration of the severest motor and generator operation.

Flexible Super-Micanite in sheets or strips, Micanite Coil Insulation, Rope Paper and Mica, Micanite Paper, and Micanite Tape represent the built-up mica insulations ideal for A. C. machines. And the Mica Insulator Company offers in addition a complete line of Varnishes, Armco Paper, Varnished Cambric Tubing, in fact, a performance-proved electrical insulation for every need from slots to leads.

Complete information is given in Catalog 87. Write for a copy.

MICA INSULATOR COMPANY

New York: 200 Varick St. Chicago: 542 So. Dearborn St.

Works: Schenectady, N. Y. London, England

Cleveland Pittsburgh Cincinnati Birmingham Seattle
San Francisco Los Angeles Toronto Montreal

PERFECT MICANITE INSULATOR
REG. U.S. PAT. OFF.

Electrical INSULATION

PERFECT EMPIRE INSULATOR
REG. U.S. PAT. OFF

MICA INSULATION OILED CLOTH INSULATION

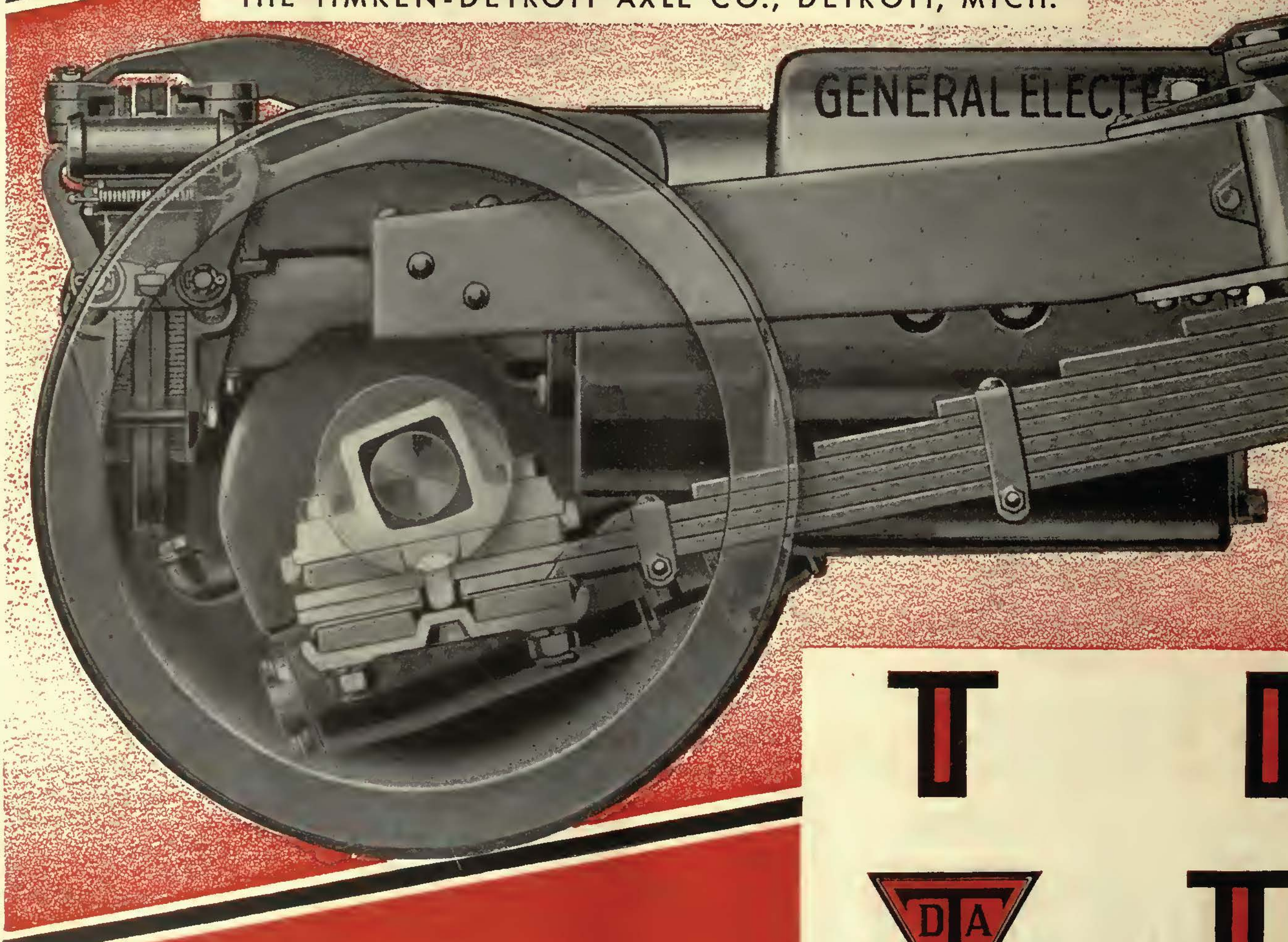
It's Velvet!

EITHER way you look at it—getting and holding more patrons for your cars, or cutting your operating costs—the result is "velvet".

Timken Worm Drive for street cars helps *both ways.*

Less noise, less weight, smooth speed—these attract and hold more riders. Power savings, lower costs of maintaining rails and equipment—these cut operating expense.

THE TIMKEN-DETROIT AXLE CO., DETROIT, MICH.



T I T

DTA CO

M K E N

worm drive

R U C K S

FOR ELECTRIC RAILWAY CARS

WACO SPUN

A PROFITABLE

Uniform Performance in Service .....
Lower Average Wheel Costs.

When

THE ULTI

The National Malleable and
Cleveland,

GOOD WILL IS IMPORTANT— DON'T RUIN IT WITH FUMES

Good will is important to any business . . . it is a priceless asset to the transportation company. If your motor coaches are releasing objectionable fumes . . . if they are gassing pedestrians and potential patrons . . . they are seriously endangering good will and your business.

The sulphur and impurities that are present in many fuels and lubricants, are a major cause of obnoxious combustion odors. Red Crown Gasoline and Polarine Motor Oil, highly refined, pure and practically free from sulphur, do not produce these stifling combustion odors.

As a motor fuel Red Crown ranks at the top, giving power, mileage, economy. Polarine is pure and rich, supplying thorough, efficient lubrication to the motor. Working together they give that perfectly balanced performance which insures dependable service and low cost operation.

A test will convince you that Red Crown and Polarine form an ideal combination for your motor coaches.

STANDARD OIL COMPANY
(INDIANA)

910 S. MICHIGAN AVE. CHICAGO, ILL.

1327

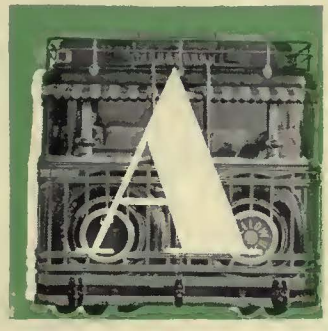
Chicago, Davenport, Decatur, Des Moines, Detroit, Duluth, Evansville, Fargo, Grand Rapids, Green Bay, Huron, Indianapolis, Joliet, Kansas City, La Crosse, Mankato, Mason City, Milwaukee, Minneapolis, Minot, Saginaw, Sioux City, Peoria, Quincy, South Bend, St. Louis, St. Joseph, Wichita

RED CROWN GASOLINE

POLARINE MOTOR OIL

Introducing the New "W" Observation

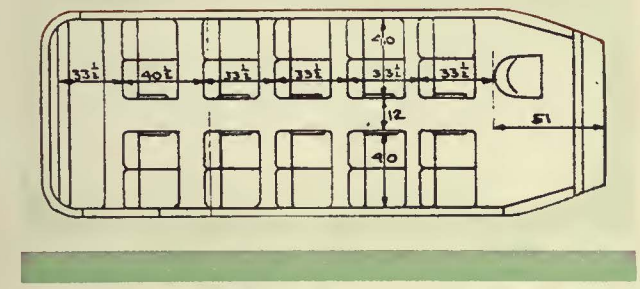
215 inch Wheelbase



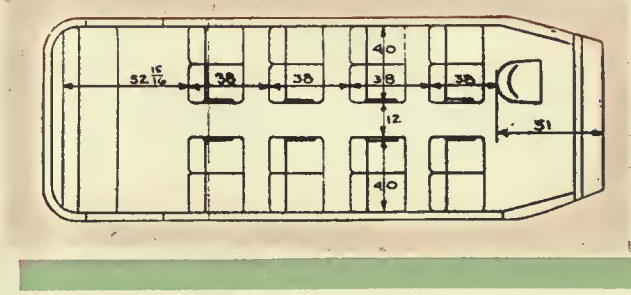
noteworthy addition to an already famous Yellow Coach family . . . . A new high headroom Parlor Observation Coach, wheelbase, 215 inches . . . body width, 96 inches . . . seats for 25 passengers with 33½ inch seat centers or optional for 21 passengers with individual reclining chairs on 38 inch seat centers. Maximum comfort. A roominess far beyond any previous coach design . . . yet the cost per passenger capacity due to standard design and construction, is unbelievably low.

It is powered with an engine whose capacity and flexibility has stood the test of time. Its quietness, freedom from vibration and quick, smooth acceleration make the maximum in rider appeal. Its brakes are quick and sure; ample for any emergency. Its ease of handling is comparable only to that of a passenger car.

All of the excellent chassis features which made the Type W-185 coach so popular has been continued in this 215 inch chassis, with the addition of heavier construction for increased capacity. This new Parlor Observation coach takes rank as the first small capacity coach with all of the advanced engineering features and passenger comfort found in the finest of large parlor coaches. In fact the body construction is so similar to the new 33 passenger Yellow 250 inch wheelbase parlor coach that many body parts and sections are interchangeable.



Standard Seating Plan
Comfortable parlor chairs for 25 passengers on 33½ inch seat centers.



Optional Seating Plan
Luxuriously roomy. Widely spaced reclining chairs for 21 passengers on 38 inch seat centers.

Filling an important place in capacity for inter-city service between the 21 passenger and the 29 passenger coaches, it can be confidently predicted that the "W-215" will meet with the same popular approval accorded its predecessor, the "W-185", of which over 800 were sold in a little more than a year.

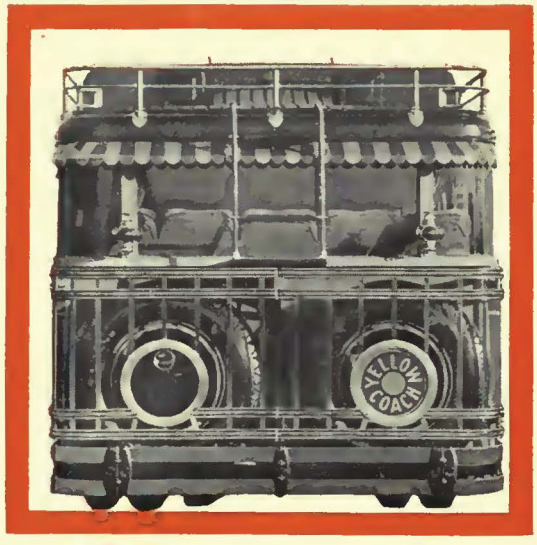
GENERAL MOTORS TRUCK CO. - - - - - - - - - - - - Pontiac, Mich.

SUBSIDIARY OF YELLOW TRUCK AND COACH CO.

It pays to Standardize

With the addition of this new model operators requiring vehicles of different capacities and types may now standardize on any combinations of Type "W" and Type "U" coaches for city service, parlor de luxe service or inter-city work. Capacities range from 16 to 25 persengers with a choice of two different engines. Bodies and a majority of chassis parts and many body parts, are interchangeable. Maintenance is greatly simplified. Capital tied up in parts inventory can be greatly reduced. Standardization means greater operating flexibility, greatly simplified maintenance and better all around economy.

Type "U" 185" w. b. 16 pass. Parlor Coach.
Type "U" 185" w. b. 21-23 pass. City Service Coach.
Type "U" 185" w. b. 21 pass. Observation Parlor Coach.
Type "W" 185" w. b. 17 pass. Parlor Coach.
Type "W" 185" w. b. 21-23 pass. City Service Coach.
Type "W" 185" w. b. 21 pass. Observation Parlor Coach.
Type "W" 215" w. b. 21-25 pass. Observation Parlor Coach.



Features

Wheelbase—215 inches.
Engine—Cadillac V Type—8 cyl.
Generator—12 volt, 600 watt.
Transmission—Four speed.
Clutch—Twin disc.
Service Brakes—Duplex hydraulic four wheel with booster.
Emergency Brake—Propeller shaft. Pull on type.
Rear Axle—Underslung worm.
Tires—36 x 8.25.
Overall length of coach—27 feet, 7½ inches.
Overall width of body—96 inches.
Head room, at front in aisle—79 $\frac{13}{16}$ inches.
Head room, at rear in aisle—73 $\frac{3}{16}$ inches.
Standard seating—25 passenger on 33½ inch seat centers.
Optional seating—21 passengers, all reclining on 38 inch seat centers.
Interior luggage racks, also outside baggage rack.
Heating—Hot water, blower type.

TYPE W OBSERVATION 215 W. B.

YELLOW COACH

On This Famous Bus Network Extending

FROM THE

GREAT LAKES

TO

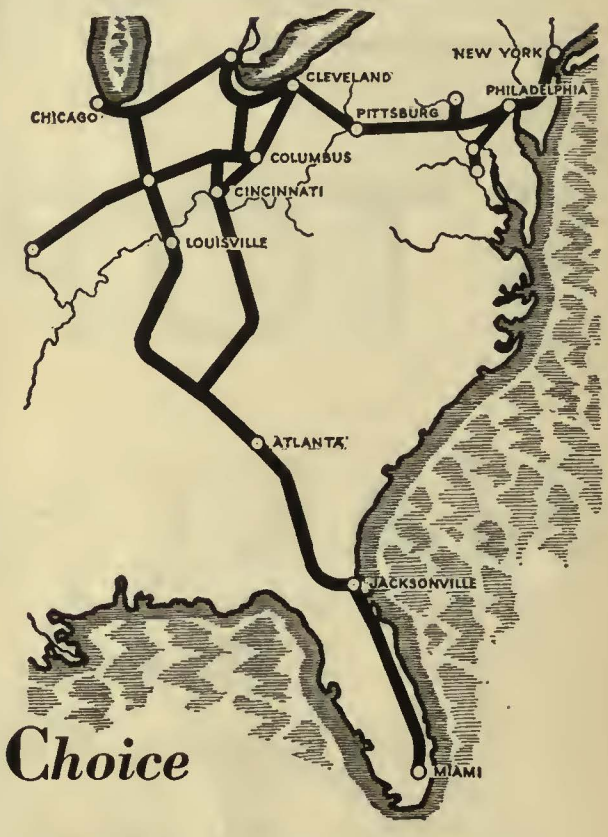
FLORIDA

THE

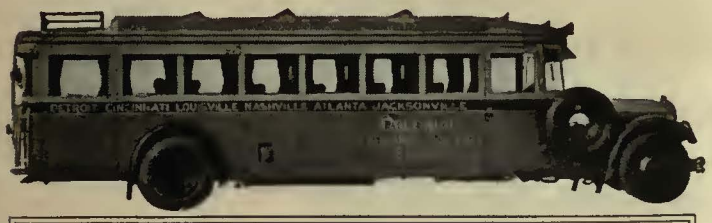
MISSISSIPPI

TO THE

ATLANTIC



Goodrich was the Natural Choice



7 Superior Specifications

Built into Every Heavy Duty Silvertown

1. Heavily insulated stretch-matched cords.
2. Additional adhesion — from greater insulation between outside plies.
3. Heavy twin beads for better rim seating.
4. Extra gum fillers between plies for longer tire life.
5. Heat-resisting, interlocking cord breakers.
6. Tread designed correctly for heavy duty service.
7. The whole tire toughened by the famous Goodrich "water cure."

C. S. WARNER, President of the Interstate Transit, Inc. (Colonial Stages), which operates a great bus network extending from the Great Lakes to Florida and from the Mississippi to the Atlantic Seaboard, makes the following statement:

"In developing this long haul, efficient bus service one of our first considerations was tires. Due to past experience in another operation, our natural choice was Goodrich, as we had to consider known tire quality and consistent performance.

"As you see from the territory covered, we strike about every conceivable kind of road and temperature condition. We are glad to tell you that Goodrich Tires have played an important part in helping us expand this operation and maintain our schedules."

The B. F. Goodrich Rubber Co., Established 1870, Akron, Ohio. Pacific Goodrich Rubber Co., Los Angeles, Calif. In Canada: Canadian Goodrich Co., Kitchener, Ont.

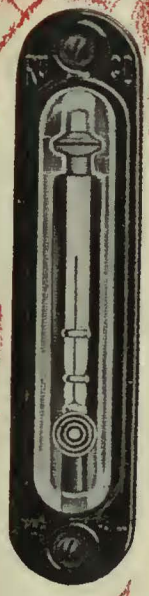
Goodrich HEAVY DUTY Silvertowns

• SPECIFY GOODRICH ON YOUR NEW BUSES •

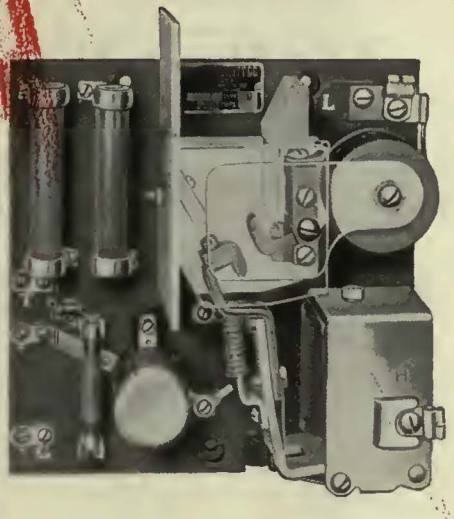
Ample Heat

Car Comfort with Utility Heaters Regulators Ventilators

with the Utility Cross Seat Heater fitted with Cromalox Strips delivers 100 per cent output for the electric energy input. Listed as standard by the Underwriters' Laboratories.



properly controlled



and efficiently regulated

with the Utility Thermometer Control that keeps air in the car at uniform temperature for which it is set and the Utility Regulator which has been tested for 100,000 contacts and did not show damage to contacts or loss of accuracy in regulation.

means passenger comfort and profitable operation

Besides heat, clean, fresh air is a definite requirement for passenger comfort. Utility system of ventilation scientifically provides fresh, dustless air and ample circulation without wasting heating current.

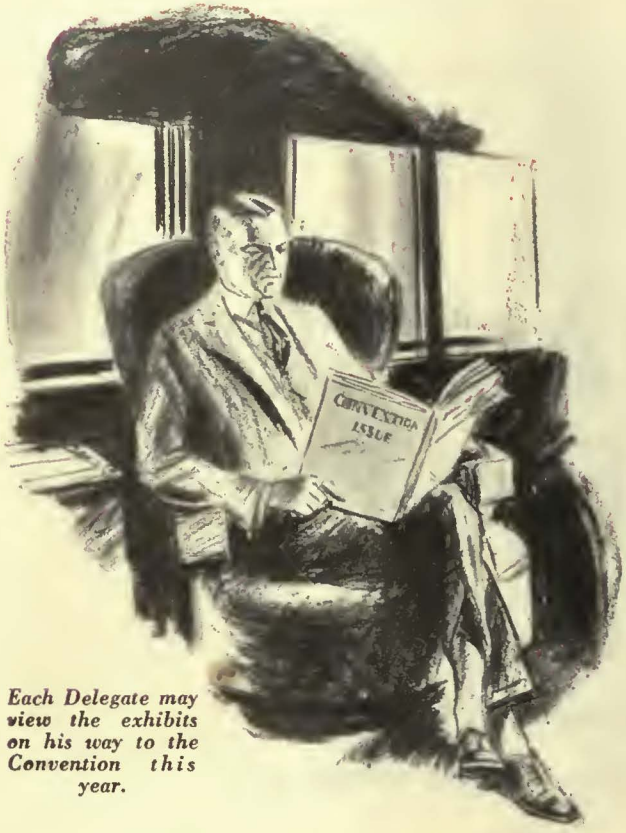
Let us figure on your heating and ventilating equipment, either for new cars or for modernizing your existing facilities.

Car Comfort with Utility Heaters Regulators Ventilators

RAILWAY UTILITY COMPANY

2241 TO 2247 INDIANA AVE. CHICAGO, ILLINOIS

TO THE COAST
. . . *for the Convention*



Each Delegate may view the exhibits on his way to the Convention this year.

THIS year the A.E.R.A. Convention will be in San Francisco but the *Exhibits* will be in the Special June 14th Convention and Exhibit Number of *Electric Railway Journal.*

There will be no exhibits at the Convention. The latest improvements in machinery, parts and equipment, must be exhibited . . . pictured and described . . . in the advertising pages of *Electric Railway Journal's* Convention and Convention Report Numbers.

The editorial pages will tell of the trend and developments in equipment that are contributing, toward greater comfort, safety, speed . . . better appearance, operation and maintenance. The advertising pages will show what each manufacturer has to contribute toward these ends.

The Convention Number *will carry articles on:*

Improving quality of transportation by improving equipment. Electric railway properties in California. Trends in engineering designs: *Passenger comfort. Reducing noise. Less weight with equal strength. Increased speed. Lowering operating costs by improving car design. Lower initial and maintenance costs of tracks. Trackless Trolleys. Improved Design of Trucks. Advance in Substation Design-building, equipment, automatic control. Overhead and Line Equipment. Trend in Bus Design. Shop Equipment. Safety. Freight Equipment.*

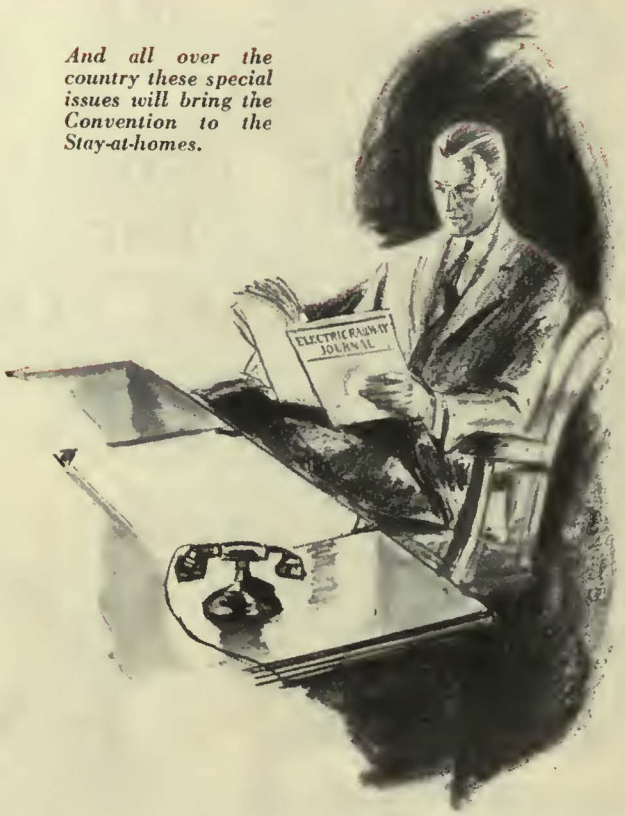
A. E. R. A. CONVENTION
San Francisco
JUNE 23-26

TO THE JOURNAL
. . . *for the Exhibits*

FOR the thousands who have to stay at home (unfortunately everybody can't go to San Francisco!) the Convention Exhibit and Convention Report Numbers of *Electric Railway Journal* will represent the exhibits, meetings, new developments, new business relationships, all the interest and enthusiasm that go to make up these annual meetings.

The fact that there will be no Convention Exhibits this year places a larger responsibility on *Electric Railway Journal*, but we feel certain of the whole-hearted support of manufacturers in our effort to place before the whole industry as complete a picture as possible of this year's Convention.

Remember! More than a million dollars a day is budgeted to be spent this year. Advertising should bring better results than ever before!



And all over the country these special issues will bring the Convention to the Stay-at-homes.

The Convention Report Number will carry the only full report of the entire convention . . . . meetings, discussions, resolutions, social doings, outstanding happenings, personals, etc., etc. It will be chock full of interest to those who attend as well as to those who stay at home, and will be retained permanently by many readers.

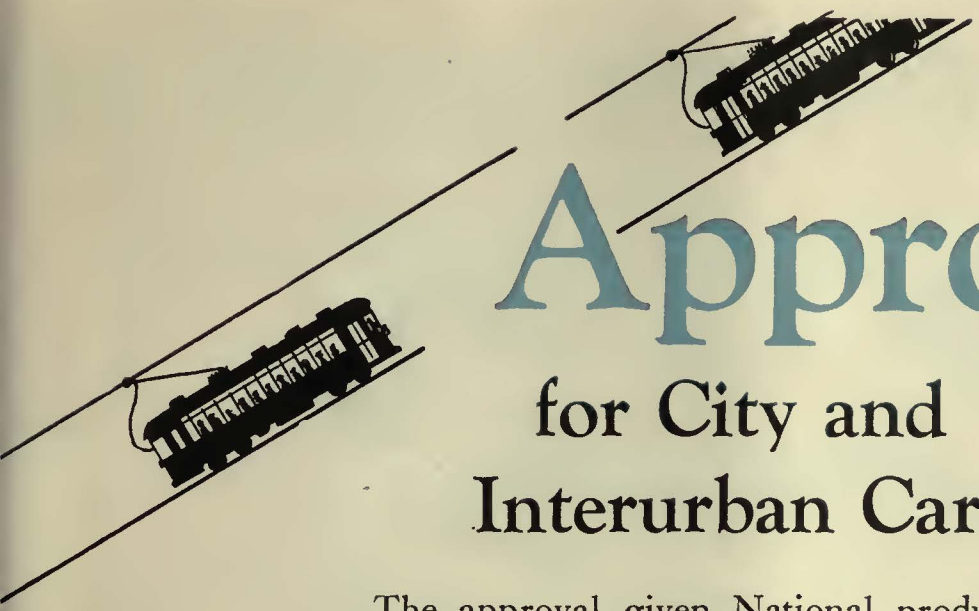
Electric Railway Journal

CONVENTION and EXHIBIT NUMBER

(FORMS CLOSE JUNE 4)

CONVENTION---REPORT NUMBER

(FORMS CLOSE JUNE 24)



Approved

for City and Interurban Cars

The approval given National products has come from far and wide and recognition of National quality and economy is growing continually.

It is only natural that National products are so well received and so extensively used. Back of their manufacture is a story of research, development, and cooperation with the traction industry that determined the success of these products.

National products are highly economical from the standpoint of first and last cost. You can safely standardize on them in keeping with your modernization program.

Our specialists will be glad to confer with you and help you solve those problems.

NATIONAL BEARING METALS CORPORATION

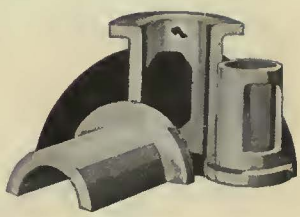
More-Jones Division

ST. LOUIS, MO.

New York, N. Y. Jersey City, N. J. Pittsburgh, Pa. Meadville, Pa.
Portsmouth, Va. St. Paul, Minn.

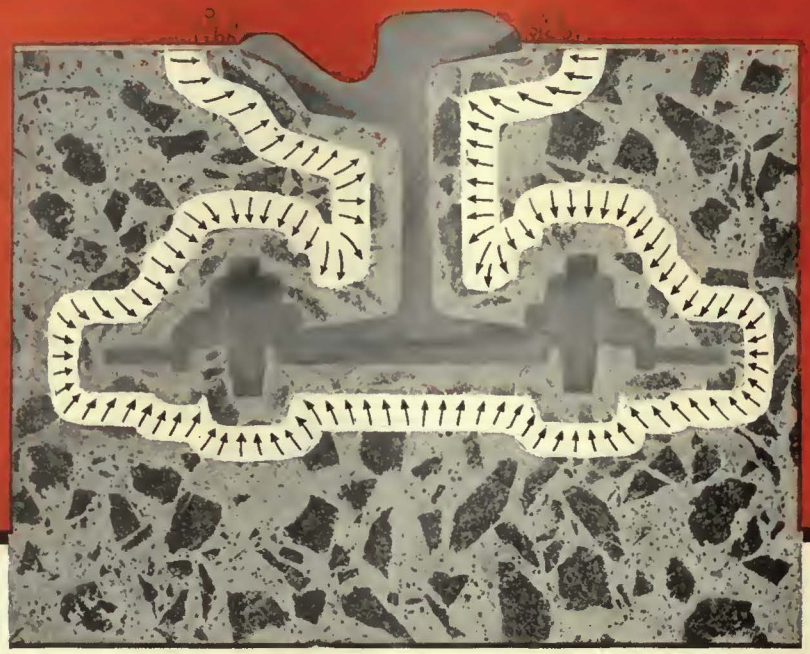
Trolley Wheels and Harps

Armature Babbitt Metal



"Tiger" Bronze Axle and Armature Bearings

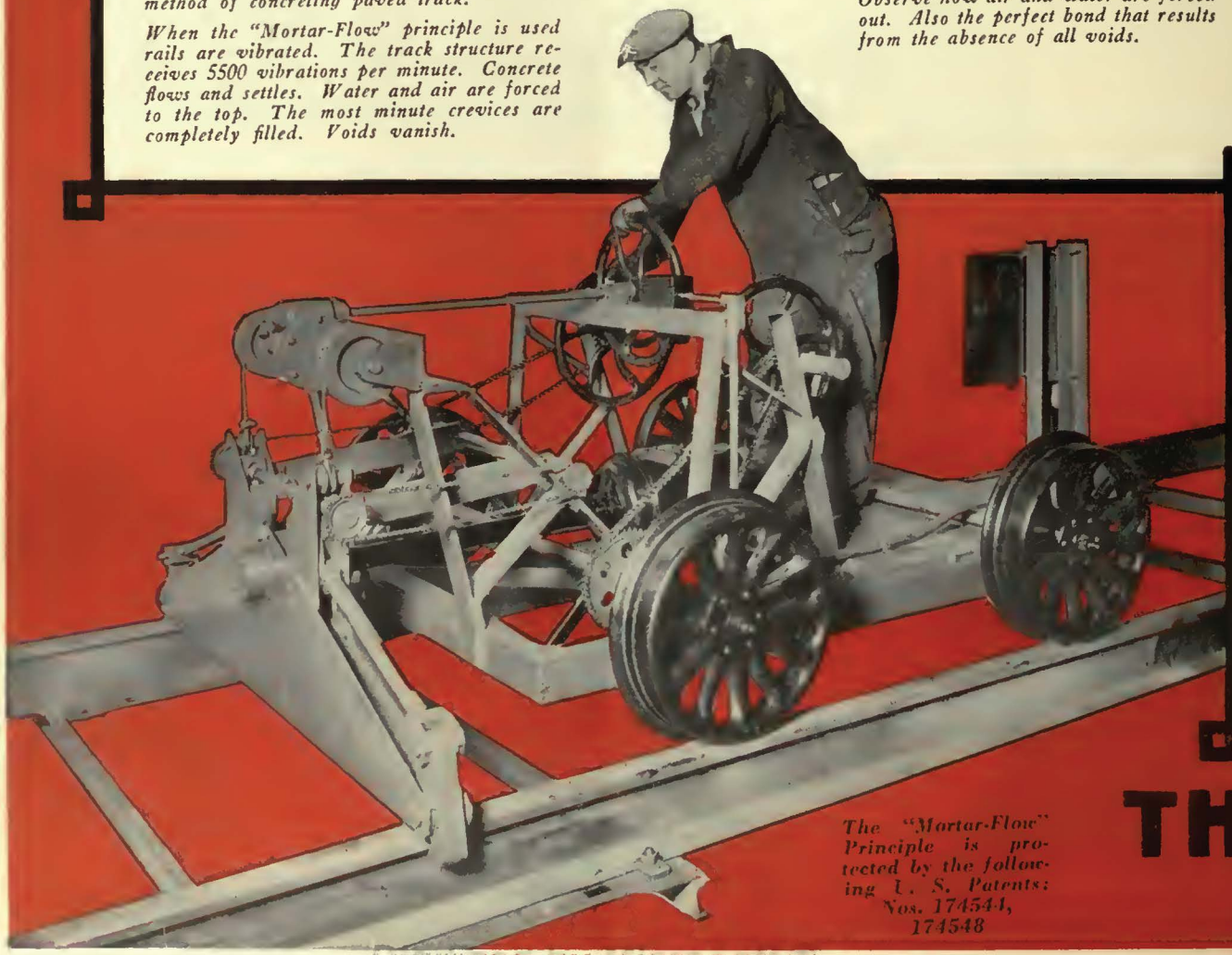
QUERIES BY ELECTRIC RAILWAY MEN



ABOVE: *Unretouched photo of rail and tie plate showing "Mortar-Flow." Observe how air and water are forced out. Also the perfect bond that results from the absence of all voids.*

BELOW: *This is the machine*—THE "MORTAR-FLOW" PULSATOR—*that has revolutionized the method of concreting paved track.*

When the "Mortar-Flow" principle is used rails are vibrated. The track structure receives 5500 vibrations per minute. Concrete flows and settles. Water and air are forced to the top. The most minute crevices are completely filled. Voids vanish.



The "Mortar-Flow" Principle is protected by the following U. S. Patents: Nos. 174544, 174548

THE

DETROIT DOES IT!

In the automobile center of the World, the Department of Street Railways, City of Detroit, maintains and operates a street railway track system *second to none* . . . . . .

Woodward Avenue, the show street of Detroit, looking Northward toward Grand Boulevard.

City of Detroit

DEPARTMENT OF STREET RAILWAYS

ADMINISTRATION BUILDING
ST. JEAN AND SHOEMAKER

GEO. A. SMITH, General Manager
WM. B. MAYO, Consulting Engr.

COMMISSIONERS
JOHN J. BARLUM, Pres.
JOHN J. GORMAN
FRANK COUZENS
R. O. LATHROP, Sec'y

March 8th 1930

Mr. John B. Tinnon
General Sales Manager
Metal and Thermit Company
New York City, New York

My dear Mr. Tinnon,

Agreeable to your request, I am enclosing several photographs showing the Thermit welding process as it was applied in our track construction work on Grand River Avenue. I am enclosing, also, other photographs which you may feel free to use in anyway that you desire.

We feel that we have accomplished a great deal in our track construction work by concentrating our forces on major rspair jobs, and during the past three years we have been able to completely rehabilitate seventy miles of track, thereby bringing our entire track structures to a point where they are in a high state of efficiency. At the time the lines were purchased from the privately owned company in 1922, the City's transportation system comprised 374 miles of track, while the system today operates over 433 track miles, or an increase of 59 miles.

The Department of Street Railways now operates 1633 street cars, and 531 motor coaches, serving an area of 145 square miles, and transporting approximately one and one-half million passengers daily.

Yours very truly,

GEO. A. SMITH
General Manager

25,000 THERMIT JOINTS help to give smooth, fast transportation in Detroit . . . . . .

Street railway transportation is a *growing* industry in Detroit. Track mileage has *grown* from 374 to 433 in the past seven years. An addition of 59 miles of track is certainly an indication of healthy growth. And much of the existing track has been rebuilt and modernized.

Thermit-welded joints are standard practice in Detroit on both new track and reconstruction. The accompanying chart indicates the way the use of Thermit has grown in Detroit as each succeeding year shows the superior quality and lowered maintenance cost of Thermit-welded track.

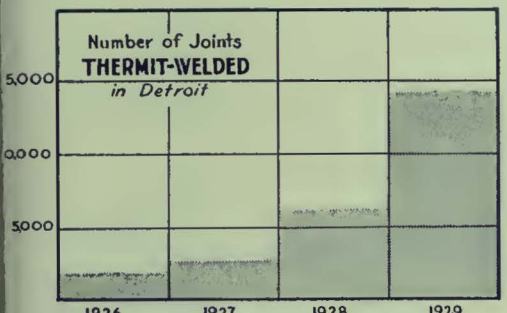
Job on Grand River Avenue, Detroit, completed with standard steel tie and Thermit welded joint construction.

THERMIT

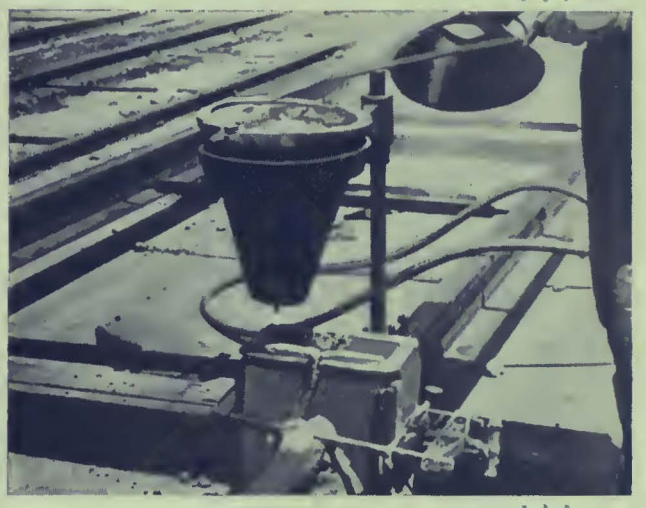
More of Detroit's fine cars are shown here. In spite of countless automobiles, Detroit's street cars carry more and more passengers each year.

Another view of Woodward Avenue, downtown section of the City of Detroit.

Thermit-welding Tee rail—workmen putting the moulds in place.



Starting with 1714 Thermit-welded joints in 1926, the Dept. of Street Railways has increased its use of Thermit every year. The total in four years is 25,009 Thermit joints. Of this total only 55 or 2/10 of 1% have failed, but there have been no failures on new rail.



Thermit-welding Tee rail—showing crucible in place, with charge.

Standard steel tie track construction costs in Detroit

Cost per mile double track	Material	$74,000.00
	Labor	46,000.00
	Total	$120,000.00

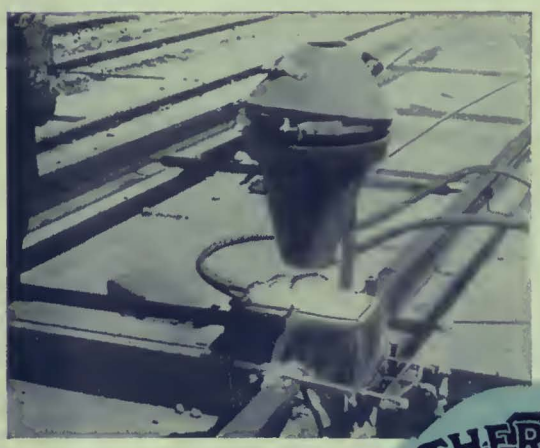
Rail and ties laid, lined, and surfaced—1,200 lin. ft. D. T. per eight (8) hours.

Thermit joints applied and ground—75 per eight (8) hours (21 men, 3 preheaters).

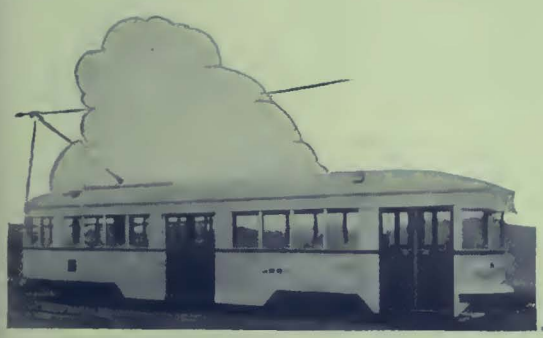
Concrete base, 8½″ deep, cost $7.00 per cu. yd. 1,200 lin. ft. D. T. per eight (8) hours.

Compressed concrete paving 5″ deep, $1.20 per sq. yd. 1,200 ft. D. T. per eight (8) hours.

Minimum labor rate $.60 per hour.



Thermit-welding Tee rail—after reaction has taken place, but before removing moulds.



Detroit boasts fine rolling stock. Modern cars, well maintained, operating on smooth-surfaced, Thermit-welded rails, give swift and quiet transportation

THERMIT

Reconstruction work in Jefferson Ave., Detroit. 2200 feet of new track laid and Thermit-welded beside the old without stopping cars.

Five miles of track rebuilt at $13,350 below the engineer's estimate . . . . . .

TWO and one-half miles of double track on Jefferson Avenue, Detroit had to be rebuilt under heavy traffic. The estimate was $200,000. The job was started May 16, and completed July 2 . . . . . one and one-half months. The estimated cost was $200,000. The actual cost $186,652.39, a saving of $13,350.

On this job the report of Mr. P. A. Kerwin, Supt. of Ways and Structures, to the General Manager, reveals the unique time- and labor-saving methods used in replacing track. This method, it will be noted, was made possible by Thermit-welding the joints.

"The performance of this entire work," says the report, "within the estimated cost including those features not anticipated, as well as the dispatch with which the job was done, was made possible by the methods adopted, which I do not believe have ever been used elsewhere. The main feature was the setting up of a single track alongside the old tracks, which were kept in operation; which new section was completely tie-rodded, Thermit-welded, and ground while in this position. During the night, in the period of forty minutes service (between 1.00 and 3.00 A. M.) the old rail was cut out with acetylene torches and the new track slid into place. At the start of the job we put into place 1500 foot sections of single track; at the close of the job we were putting in 2200 foot sections . . . . "

The Metal & Thermit Corporation's engineers are experienced and practical track men. They may be able to show you ways and means of saving money. Consultation and estimates gladly furnished without obligation.

Jefferson Ave. job after new track had been slid into place over night.

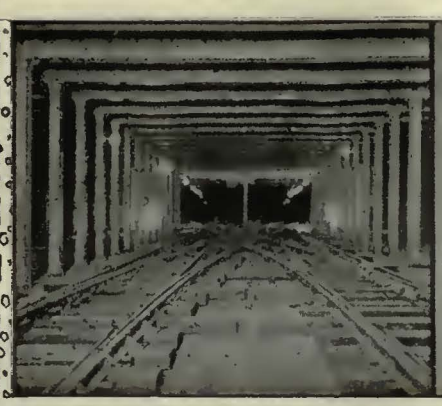
Same job, showing method of concreting using two mixers simultaneously on opposite sides.

THERMIT

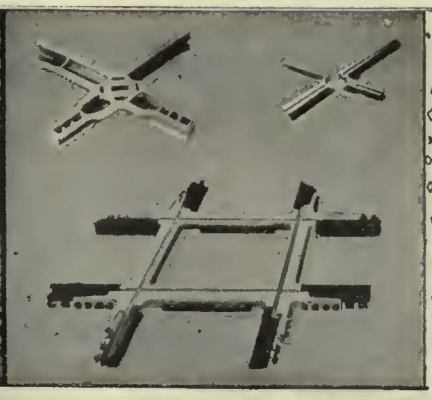
METAL & THERMIT CORPORATION

120 BROADWAY, NEW YORK, N.Y.

PITTSBURGH CHICAGO BOSTON SOUTH SAN FRANCISCO TORONTO



Subway Layout



New Wharton Scientifically Designed Crossing

Surface Layout

The New Wharton Switch

Maintenance Costs are Lower with WHARTON Special Trackwork

BECAUSE dependable, soundly engineered special trackwork reacts so favorably on earnings, leading railway companies specify Wharton Trackwork . . . of TISCO Manganese Steel.

Whether your trackwork requirements are for complicated layouts, for subway or surface lines, steam crossings, slotted work, or for only a single piece, Wharton Special Trackwork will enable you to keep each item of maintenance at a minimum.

Send for complete details relative to Wharton trackwork specialties...or consult with Wharton engineers on any special trackwork problem.

William Wharton Jr. & Co., Inc.

EASTON, PENNSYLVANIA

SALES OFFICES: Philadelphia, Pittsburgh, Boston, Chicago, San Francisco, Houston, Scranton, Montreal, New York, Los Angeles

GUARD RAIL CLAMPS

INSULATED AND NON-INSULATED GAUGE RODS

WHARTON-O'BRIEN INSULATED AND ADJUSTABLE PULL AND LOCK RODS

Quality Products

Roebling

Electrical Wires and Cables give assurance of satisfactory power and lighting service from producer to consumer. Experienced workmen; carefully controlled processes of manufacture from copper bar to finished product; forty-five years of research development and production have made Roebling Electrical Products a standard of quality and reliability.

Large stocks of finished material are carried in our warehouses throughout the United States in order to provide "demand" service to our customers. We list a few of our products:

- Arc Welding Electrodes
- Gas Welding Wire
- Electric Arc Welding Machine and Trailing Cable
- Electrode Holder Cable
- Power Cables for Overhead and Underground Transmission
- Magnet Wires

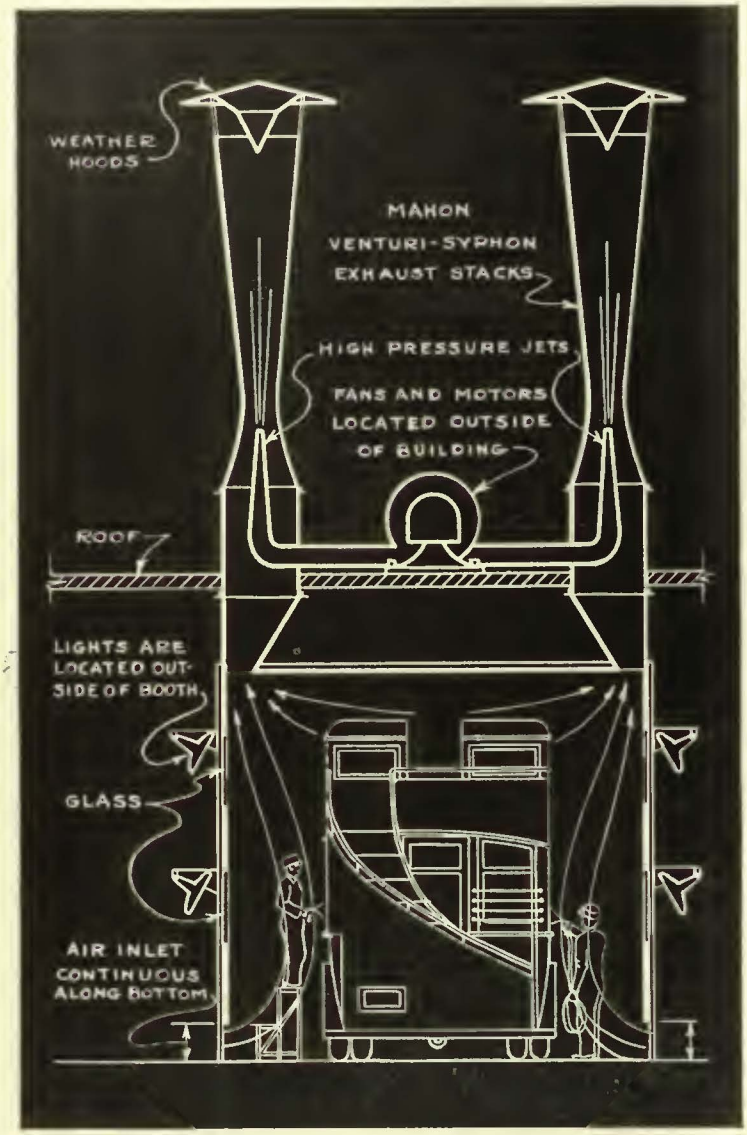
ROEBLING

ELECTRICAL WIRES & CABLES

John A. Roebling's Sons Company Trenton, New Jersey

Cut Refinishing Costs Over 50%

With this Modern Spray Painting Equipment



THE cross section drawing above shows clearly the working efficiency of the Mahon principle in Spray Booths of special design for street railway and motor bus work. Mahon Venturi-Syphon Exhaust Stacks are capable of exhausting 600% more air, through the stack, than actually passes through the fan. Such economy in operation should receive due consideration in the selection of equipment of this type. At the right is a Mahon Spray Booth installation at the Niles Center Shops of the Chicago Rapid Transit Co.

Reduction in labor cost . . . reduction in out-of-service time . . . reduction in reserve rolling stock . . . smoother, more durable finish . . . these are the advantages of Duco or other lacquer finishes when you are equipped with proper facilities for rapid application. ¶ Spray Booths are not a standardized commodity . . . they must be designed to meet the requirements of the object to be painted, and the existing conditions in the individual paint shop. The layout of your paint shop and the design of your Spray Booths demands the services of Mahon Specialists. On the ability of these Spray Booth Specialists depends the fire safety of the installation, the degree of efficiency, and the cost of operation. ¶ Mahon engineers are available to you, and will gladly lay out the most efficient, most economical Spray Booth installation obtainable for your particular requirements. Mahon Spray Booths are now in operation throughout the United States and Canada, France, South Africa, Australia, Brazil, Java and the Argentine. You are invited to arrange a consultation with Mahon engineers at your convenience.

THE R. C. MAHON COMPANY

DETROIT, MICHIGAN

Manufacturers of Spray Booth and Exhaust Systems for every purpose.

MAHON

SPRAY BOOTHS & EXHAUST STACKS

DESIGNED FOR FIRE SAFETY

PROTECT YOUR CROSSINGS AGAINST SPRING TRAFFIC

The coming of fine weather will release a rush of vehicular traffic. And it will become necessary for the electric railways which traverse heavily traveled districts to provide some means of protecting the thousands of motorists who will be on the roads. Better protection for locations on thickly traveled or thickly populated districts could hardly be found than automatic signals.

"Union" HC-5 Highway Crossing Signals provide a surer protection than that afforded by watchmen or the manually operated crossing gate. "Union" Highway Crossing Signals are working every minute of the twenty-four hours and they relieve the crossing of the consequences which are likely to occur if a watchman fails. And their distinctive indications shout in a language all can understand: "A car is coming."

1881 Union Switch & Signal Co. 1930

SWISSVALE, PA.

27 Out Of 34

Placed Repeat Orders

Thirteen years ago we gave, gratis, 34 Tool Steel pinions to 34 different electric railway companies who had not before used them.

We recently checked up. Out of the 34 companies 27 have placed repeat orders. The 27 companies have purchased a total of 628 gears and 2,057 pinions.

Thus is shown the fact that 79% of the companies who accepted the trial pinion have ordered more. Not once but several times.

Surely such a recommendation proves Tool Steel Gears and pinions "best by test."

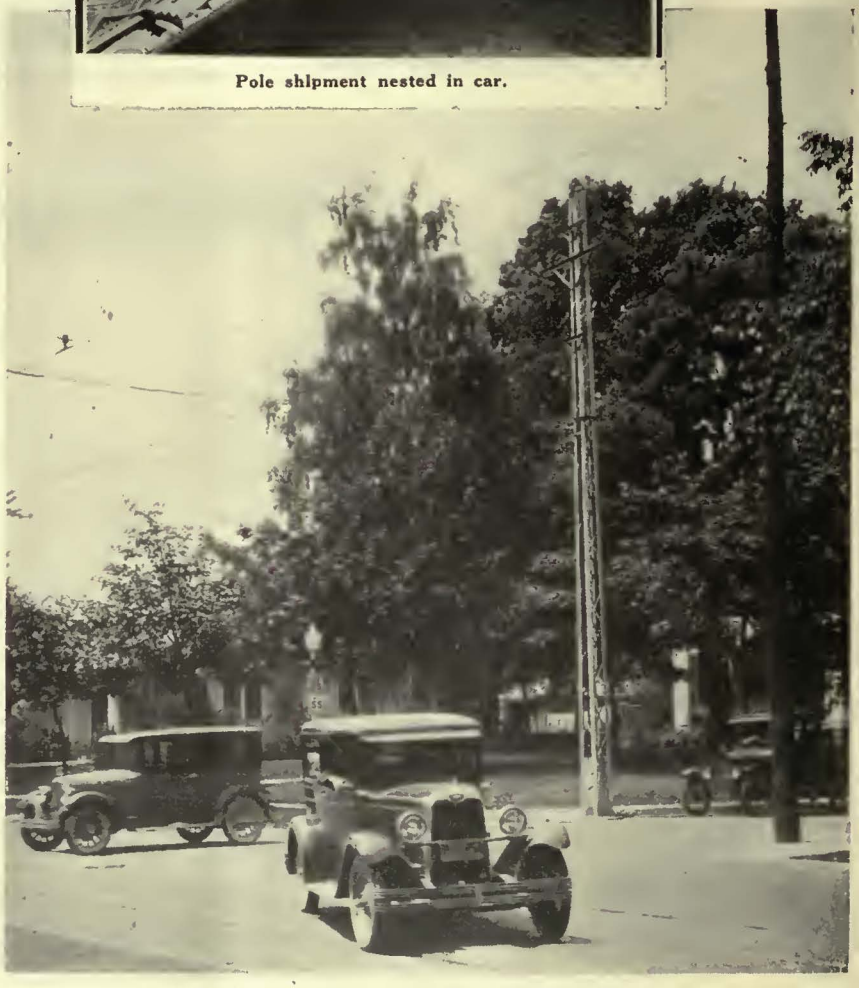
"Tool Steel" Gears Reduce Maintenance

The Tool Steel Gear & Pinion Co.
Elmwood Place, Cincinnati, Ohio

Walter Bates Steel

EXPANDED SQUARETRUS
Trolley Poles

Pole shipment nested in car.



Combination power and trolley pole, Troy, Ohio

Four of the expanded angles shown above make one pole, including all lattice members.

Equally strong in all directions. Smooth surfaces, no bolt heads protruding.

Pole No. 10935—35′ 0″ overall weighs 414 pounds. Safe working load 1430 pounds.

Price, $20.65.

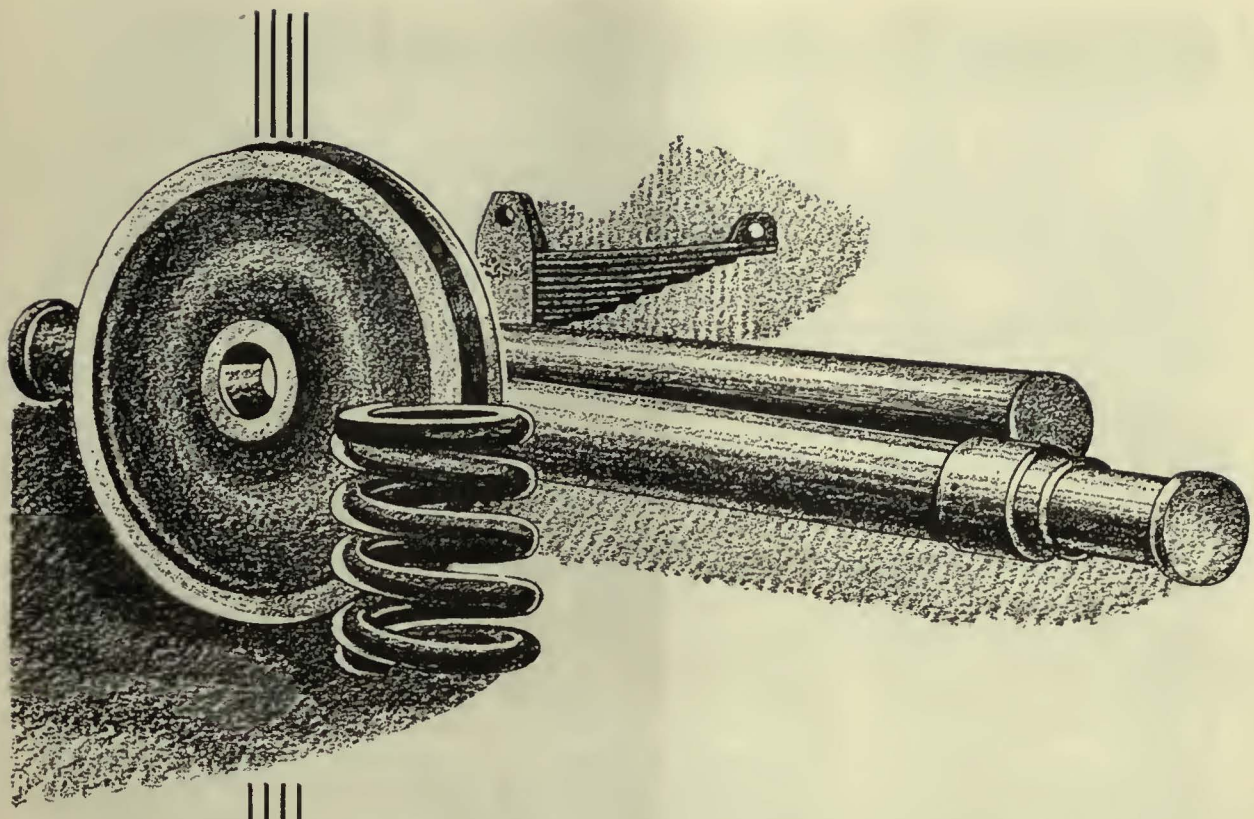
Complete line of accessories.

STEEL
WALTER BATES
FLOOR GRATING
SUBSTATIONS
TOWERS
POLES

WALTER BATES STEEL CORPORATION

GARY INDIANA

Let us hear from you—you will promptly hear from us.



Bigger motors are needed for the fast starts which speed up city service. They put heavier strains on axles and armature shafts.

Reduce maintenance costs by specifying "Standard" Steel Armature Shafts and Axles for all equipment.

STANDARD STEEL WORKS COMPANY

PHILADELPHIA, PA. **WORKS: BURNHAM, PA.**

Products: Steel Axles Steel Springs Armature Shafts Rolled Steel Wheels

SALES OFFICES:

New York Chicago St. Louis Richmond Portland San Francisco

The figures above show a few of the many industries and the machinery manufacturers that use SKF anti-friction bearings.

IN EVERY INDUSTRY —*PREFERRED*

LOOK at the illustration of this advertisement again . . . nine representative industries . . . and in each SKF stands supreme. Forty-eight American railroads use SKF Bearings. Sixty-five airplane or aircraft equipment manufacturers use them. And in all the others, the manufacturers who build the machinery upon which these industries depend select SKF.

Why? Certainly not merely because SKF is the "Highest Priced Bearing in the World." Certainly not merely because it IS high-priced.

. . . But because the bearing-wise engineer insists upon getting the performance—the dependability—the real *economy* of "The Highest Priced Bearing in the World."

Nothing Is Apt to Cost So Much As the Bearing That Cost So Little

SKF INDUSTRIES, INCORPORATED 2147

40 East 34th Street, New York, N. Y.

SKF

THE HIGHEST PRICED BEARING IN THE WORLD

Illustration: The SIXTH STREET BRIDGE over Allegheny River at Pittsburgh, Pa., selected by a national jury appointed by AMERICAN INSTITUTE OF STEEL CONSTRUCTION as the most beautiful bridge completed in 1928.

The STRUCTURAL STEEL in the superstructure of this bridge was produced by Carnegie Steel Company, and FABRICATED and ERECTED by

AMERICAN BRIDGE COMPANY

Subsidiary of United States Steel Corporation

General Offices: 71 Broadway, New York, N. Y.

Contracting offices in New York, Boston, Philadelphia, Baltimore, Pittsburgh, Cincinnati, Cleveland, Detroit, Chicago, St. Louis, Minneapolis, Duluth, Salt Lake City and Denver.

Manufacturers of Steel Structures of all classes particularly

BRIDGES and BUILDINGS

Pacific Coast Distributors:
U. S. Steel Products Co., Pacific Coast Department
San Francisco, Calif. Portland, Oregon
Los Angeles, Calif. Seattle, Wash.
Honolulu, T. H.

Export Distributors:
United States Steel Products Company
30 Church Street, New York, N. Y.

"Our railway traffic is heavy —our upkeep costs are light"

A view of The Tampa Electric Company's trackage on Seventh Avenue, Tampa, Florida. Note the excellent condition of the flangeways and the smooth expanse of brick pavement adjacent to the tracks.

"Tampa is notably a city of brick paving," said Mr. F. E. Fletcher, General Railway Superintendent of The Tampa Electric Company. "And, as every traction engineer knows, the installation of street railway tracks in connection with brick paving presents some interesting problems.

"We use a special asphaltic cushion under the head of the 80-pound low-T-rail. This forms the flangeway, keeps the track area smooth, and eliminates the need of buying and applying special-shaped nose brick. Our traffic is heavy—unusually heavy—yet our maintenance costs are surprisingly low."

The "cushion," to which Mr. Fletcher refers, is a durable, asphaltic compound reenforced with asphalt-saturated fibre and preformed under pressure. *Carey Elastite System of Track Insulation*—used and recommended by street railway officials in almost two hundred cities, large and small. Investigate this modern traction improvement!

Carey Elastite

SYSTEM OF TRACK INSULATION

THE PHILIP CAREY COMPANY, Lockland, CINCINNATI, OHIO

Erected 28 years ago and still going strong

This feeder cable, erected 28 years ago by the Columbus, Delaware and Marion Electric Company, is a striking example of the reliability of aluminum cable.

Withstanding elements, for 28 years, this aluminum feeder has never been down—except once—and then a pole fell on it. The conductor is all-aluminum cable 397,500 cir. mils. The line potential is 600 volts.

28 years ago this aluminum feeder cable was the most economical line to buy and erect. Today, a similar line constructed of aluminum would still cost far less than any competitive material.

Is it any wonder that Public Utility Companies are using more and more aluminum feeder cable? Let us send you full particulars both about all-aluminum cables and A.C.S.R.—Aluminum Cable, Steel Reinforced. ALUMINUM COMPANY *of* AMERICA; 2463 Oliver Building, PITTSBURGH, PENNSYLVANIA.

ALCOA ALUMINUM

ALL-ALUMINUM CABLE FOR FEEDER LINES

Alcoa Aluminum Bus Bars save 25 cents on every dollar in installations such as this

Where maximum efficiency in service from bus bars must be obtained, Alcoa Aluminum Bus Bars are the obvious choice for several reasons.

In the matter of first cost, Alcoa Aluminum Bus Bars are cheaper because, for the same current carrying capacity, their weight is only 48% that of other metals commonly used for this work.

In the matter of the erection of the bars, Alcoa Aluminum Bus Bars also bring substantial savings. In the first place their light weight permits the design and erection of lighter supporting structures. Then too, the work of bending and assembling is speeded up—the bars are worked with surprising ease and labor costs are materially reduced.

Another unique advantage of Alcoa Aluminum Bus Bars is that they have a much lower operating temperature than bus bars made of competing metal.

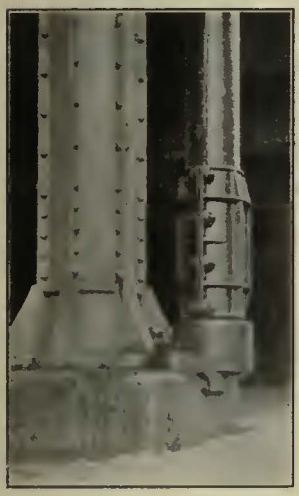
Tables of weights, carrying capacities and other technical data are contained in the booklet, "Aluminum Bus Bars". May we send you a copy? ALUMINUM COMPANY *of* AMERICA; 2463 Oliver Building, PITTSBURGH, PENNSYLVANIA.

BUS BARS MADE OF

ALCOA ALUMINUM

Simplifying Tubular Pole Maintenance

"C" Clamp Supporting Pole Corroded at Base



"C" Clamp Holding Pole to Pole Step with Short Length of Pipe

"A" Clamp Installation

M.I.F. Accessories for Tubular Poles provide the desirable combination of simplicity, durability, economy in first cost installed, high salvage value, etc., for the following phases of maintenance operations:

Ground-Line Corrosion—*C-Clamps* are used for those cases where there is no factory sleeve, or where that sleeve may be readily cut off. This Clamp has uniform internal diameter throughout to fit each of the standard sizes of pipe used.

A-Clamps are used where there is nominal reduction of 1" in external diameter of pipe, from sleeve to pole. This Clamp has two internal diameters, the upper being smaller.

Upper Joint Corrosion—*A-Clamps* are used for reinforcement where the upper section is nominally 1" smaller in external diameter and the lower section is un-swaged.

B-Clamps are used where the reduction is less, the lower section being swaged, and averaging about $\frac{5}{8}$". This Clamp also has two internal diameters, the upper being smaller.

Corrosion in Pole Steps, or under Upper Collars—*C-Clamps* are used on bridges, etc., at corroded section—in some cases with short length of pipe of same diameter clamped in, replacing the corroded section.

Pole Top Extensions—*C-Clamps* in smaller sizes for extensions with pipe of same diameter, in street widening operations requiring raising of span wires, feeders, etc., at poles; also for supplementary circuits such as street lighting, traffic lights, etc.

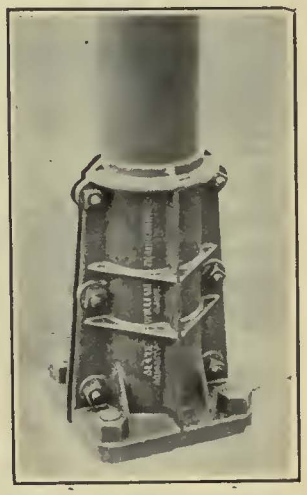
A-Clamps similarly used with pipe 1" smaller.

Temporary Construction—Build up poles of any required height from poles on hand, lengths of pipe and *C-Clamps* or *A-Clamps*. All material salvaged following grade changes, street widening, etc. Clamps may be used either top or bottom of pole.

Anchorage—*Williams Pole Mounts* will anchor poles on bridges, retaining walls or rock—for permanent construction also.

Send for Sales Bulletin No. 3, featuring Accessories for Tubular Iron Poles.

"B" Clamp Reinforcing Corroded Swaged Joint

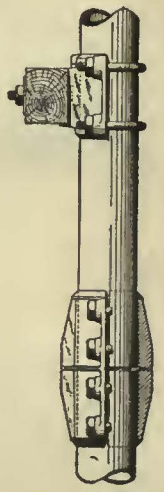


Typical Pole Mount Installation on Concrete

Other M. I. F. Pole Hardware Specialties of interest to the Street Railways are

Insulated Suspension Hangers with split insulators for signal conductors, traffic light cables, etc.
Span Hangers with knob insulators for two conductors spaced 8" apart, for service parallel or perpendicular to span wire.
Guy Hooks and Eye Nuts. Send for new Guying Specifications.
Crossarm Gains for attaching wood arms to tubular or wood poles.
Williams Pole Mounts for economical salvaging of wood poles, or for special new construction—such as on rock, bridges, retaining walls, etc.

Send for full data and samples of items in which you are interested.



"C" Clamp Extension and Gain Assembly

MALLEABLE IRON FITTINGS COMPANY

Pole Hardware Department

Factory and New England Sales Office: Branford, Conn.

Middle Atlantic States Sales Office:
30 Church St., New York, N. Y.

General Sales Agents elsewhere in U. S.

LINE MATERIAL COMPANY, South Milwaukee, Wis.

Canadian Manufacturing Distributor: Line & Cable Accessories, Limited, Toronto

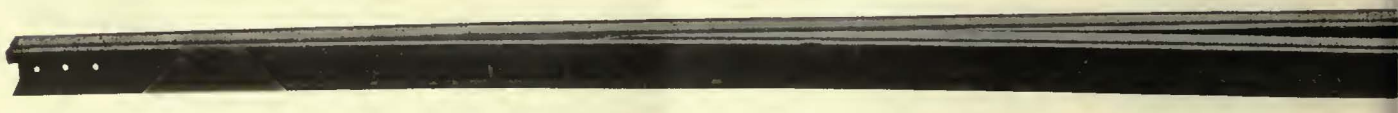
Reduce maintenance

weldable,

The illustrations below and at the left show the installation of a Bethlehem Silico-Manganese Three-way Turnout. This special work was assembled in Bethlehem's Frog and Switch Plant before shipment, as is all Bethlehem Special Work, making installation easy and assuring correct track alignment and perfect-fitting sections.

The wear-resisting Silico-Manganese frogs and mates used in this turnout will stand up under the impact of heavy traffic and have the added advantage of being easily repaired and built up on the job by any of the standard methods of welding.

Below are shown a Bethlehem Silico-Manganese Mate and a Frog, similar to those used in the turnout illustrated above. Bethlehem Silico-Manganese Mates and Frogs show remarkable shock- and wear-resisting qualities due to the Silico-Manganese steel of which they are made. The mates and frogs are of one-piece construction and can be easily welded to connecting track by any of the standard methods.



BETH

Silico-Man

with this *wear-resisting* trackwork

INSTALLATIONS of Bethlehem Trackwork at heavy-traffic intersections have demonstrated the ability of Silico-Manganese steel to stand up under continuous pounding.

The wear-resisting properties of Silico-Manganese steel are well established. It is accepted as the standard for high-grade tools, such as punches, chisels, shear blades, etc., as well as for highest-grade automobile springs and other parts subject to shock and wear. Silico-Manganese steel of tool-steel quality, possessing great tensile strength, is used in the manufacture of this new trackwork.

The weldability of Bethlehem Silico-Manganese Trackwork has brought many new advantages. It is readily welded by any of the standard methods, such as electric-arc, oxy-acetylene and Thermit welding.

Bethlehem Silico-Manganese Trackwork can be installed at all heavy-duty locations with confidence that it will stand up—not only under today's traffic, but under the still greater traffic volume of tomorrow.

BETHLEHEM STEEL COMPANY

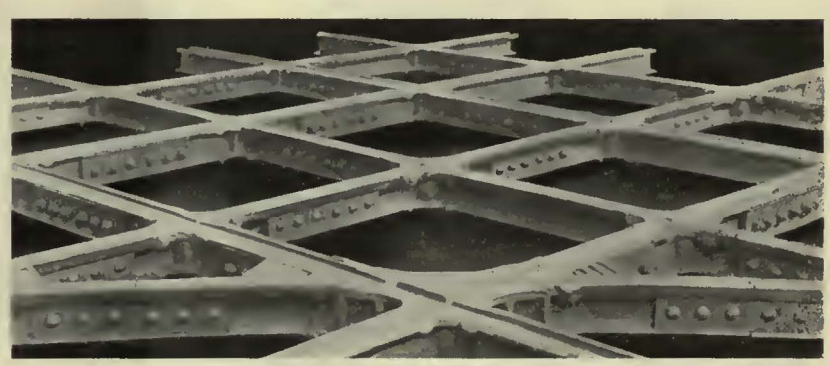
General Offices: Bethlehem, Pa.

District Offices: New York, Boston, Philadelphia, Baltimore, Washington, Atlanta, Pittsburgh, Buffalo, Cleveland, Cincinnati, Detroit, Chicago, St. Louis

Pacific Coast Distributor: Pacific Coast Steel Corporation, San Francisco, Los Angeles, Portland, Seattle, Honolulu.

Export Distributor: Bethlehem Steel Export Corporation, 25 Broadway, New York City

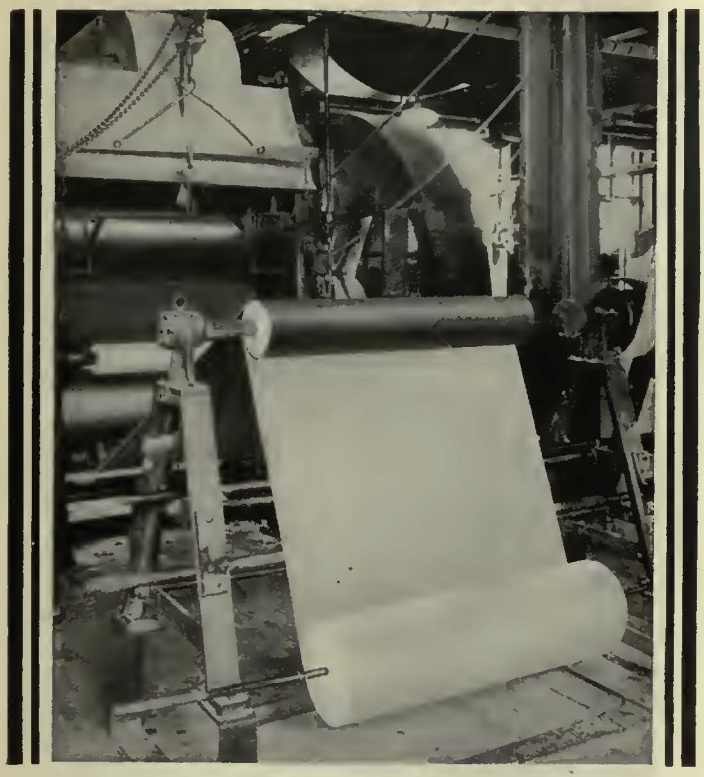
Bethlehem Silico-Manganese Crossing and Turnout installed at a busy traffic intersection in a large eastern city.



Bethlehem Silico-Manganese crossing assembled in Bethlehem's Frog and Switch Plant before shipment. Every crossing is assembled in well-lighted shops by careful workmen, assuring easy assembly and installation in the field.

LEHEM

ganese Trackwork-Design 1999



In the OKONITE factory, Dundee tape is frictioned in this heavy callender which forces the adhesive into and through the mesh of the fabric. The wide roll of frictioned material is then slit into suitable widths, rerolled and packed.

DUNDEE "A" FRICTION TAPE DOES NOT SEPARATE

IN addition to the ready adhesiveness of Dundee "A" friction tape, it has a definite homogeneousness that is rarely found in the lower price tapes.

The original process for making friction tape involved rubbing (frictioning) the adhesive compound into and through the mesh of cotton fabric by means of heavy callender rolls. From this process the product originally took its name.

But the high speed production of cheap tapes precludes the use of these frictioning rolls. In their place is substituted a spreading machine which merely surfaces both sides of the fabric with the sticky compound. The fault of this process is that the adhesive is not thoroughly worked into the fabric and may separate from it when the tape is unwound, leaving spots which are not sufficiently covered with the adhesive. Obviously, such a surfaced tape has not the permanent adhesive qualities of a friction tape made by the frictioning process.

Dundee "A" friction tape is a true friction tape made by the frictioning process, and the adhesive will not separate from the fabric under any condition.

OKONITE PRODUCTS

Okonite Insulated Wires and Cables

Varnished Cambric Cables

Okonite Insulating Tape

Monson & Dundee Friction Tapes

Okocord

Okoloom

OKONITE-CALLENDER PRODUCTS

Impregnated Paper Cables

Super-tension Cables

Splicing Materials

THE OKONITE COMPANY

Founded 1878

THE OKONITE-CALLENDER CABLE COMPANY, INC.

Factories: Passaic, N. J. Paterson, N. J.

SALES OFFICES:

NEW YORK CHICAGO PITTSBURGH ST. LOUIS BOSTON ATLANTA
BIRMINGHAM SAN FRANCISCO LOS ANGELES SEATTLE DALLAS

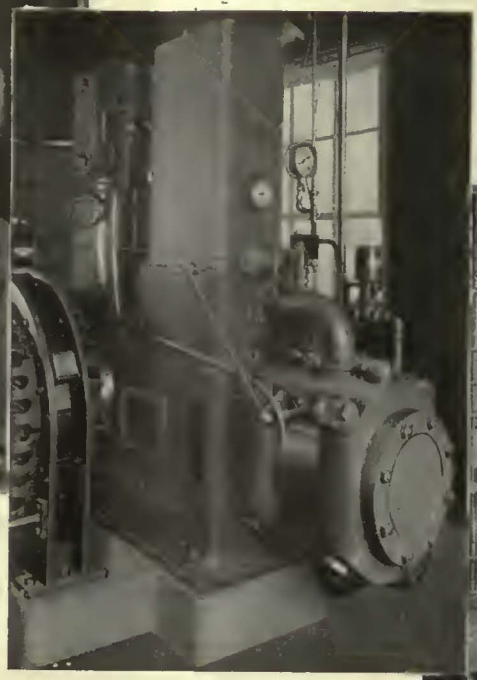
Novelty Electric Co., Philadelphia, Pa.
F. D. Lawrence Electric Co., Cincinnati, O.

Canadian Representatives:
Engineering Materials, Limited, Montreal

Cuban Representatives:
Victor G. Mendoza Co., Havana

OKONITE QUALITY CANNOT BE WRITTEN INTO A SPECIFICATION

Drilling holes through 2-in. planks at the rate of two a minute.



Sullivan Balanced Angle Compressor, direct connected, at work for one of the largest city railways in the world.

Two men with paint sprays paint a car in one hour.

where Air Power backs service to 650,000 car riders daily

FIFTEEN ways to speed up car and bus repairs, and reduce track maintenance costs, with air power—are illustrated by one of the largest city railways in the world.

Before air paint guns were used in the shops, two men with brushes used to paint a car in eight hours. Now they do it with paint sprays in one hour.

Air drills bore 26 holes through 2-in. platforms in 15 minutes; and 66 holes an hour for the platforms of steel cars.

Compressed air grinders, riveters, rivet cutters, and numerous air hoists are also at work.

Air tests brake valves, and pneumatic doors; and works in gas furnaces and soldering torches. Sandblasting and cleaning apparatus are other possibilities.

One of the Sullivan compressors is a single stage unit installed 21 years ago. The other is a modern Sullivan Balanced Angle Compressor.

The flexibility and convenience of air not only cut labor costs for the railway—but they may reduce the investment in rolling stock.

Even a small compressor, such as the Sullivan belted 68-ft. machine will earn a substantial profit. Sullivan Compressors are available to 5100 feet capacity, for all drives.

For track maintenance, Sullivan Portable Compressors, Rock Drills, Concrete Breakers, Clay Spaders, and Portable Hoists are available to suit all conditions.

Send for these Booklets 83-R, 83-W, and "Speed Up With Air."

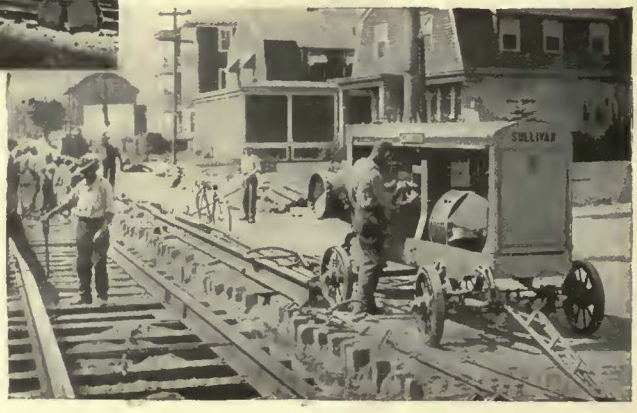
Setting a pole with a sullivan Portable Air Hoist 345-lb. models will lift a ton on single line, or pull a 50-ton car on level track.

SULLIVAN TRADE MARK

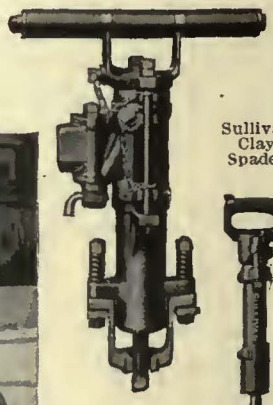
Sullivan Machinery Company

809 Wrigley Bldg., Chicago

Offices in all principal cities of the world



Sullivan electric protable compressor, speeds up track work for United Electric Railways Co. Sullivan Portables are available in 66, 110, 120, 160, 175, 220, 240, 310 ft. sizes; all mountings.

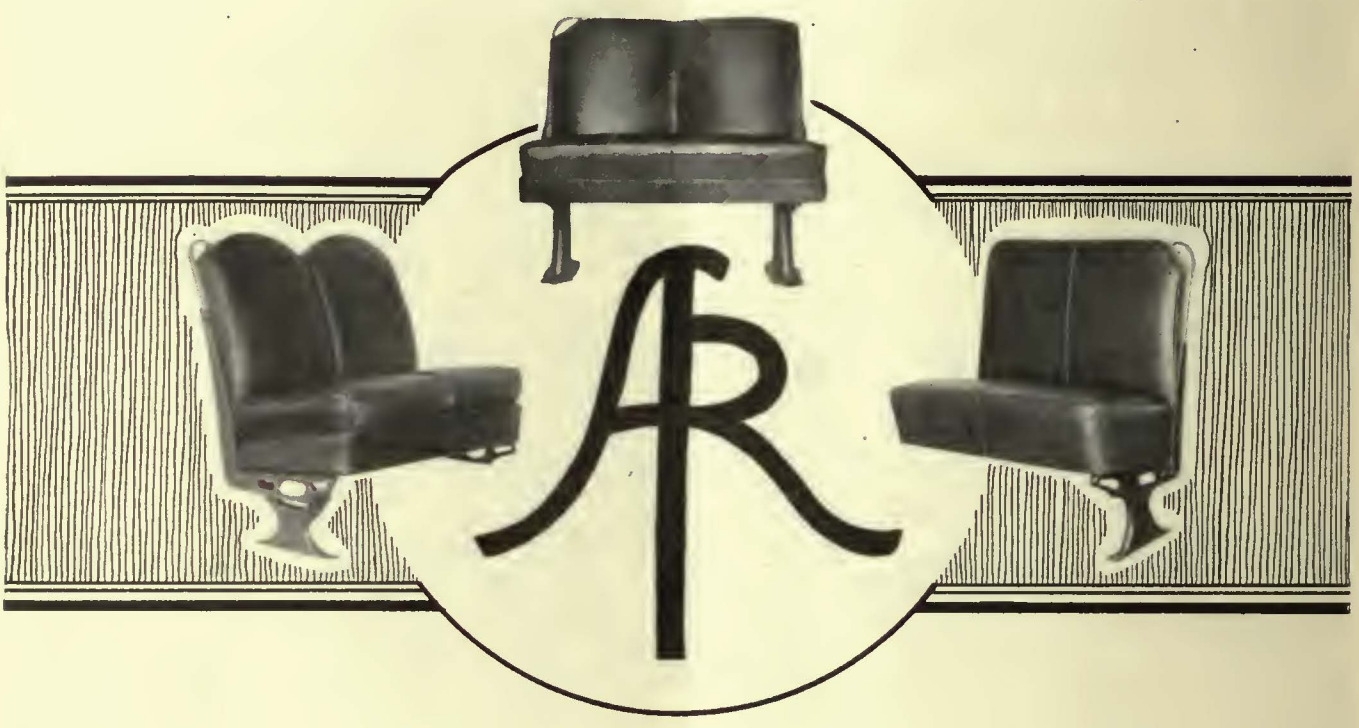


Sullivan 39-lb. Rock Drill

Sullivan Clay Spader

Sullivan Concrete Breaker

"NOTHING SUCCEEDS LIKE SUCCESS"



That is an old saying that well applies to Art Rattan Seats for use in street cars. The success of Art Rattan Seats is proved by their steadily increasing use in the bus field. Now manufacturers of street cars find that Art Rattan Seats add definite sales value to *their* products.

Sturdy frames, smart tailoring, luxurious upholstery, greater comfort result from long seat building experience and a knowledge of what the car builder requires to meet car riders demands.

ART RATTAN WORKS, INC.

Builders of DeLuxe Bus Seats

CLEVELAND • • • • • • • • • • OHIO

Where Safety and Appearance Dominate

IN the heart of a busy city, where safety must be maintained at its maximum, there is nothing so important in the selection of electric line poles as the certainty of their strength and endurance. Another important factor, of course, is their appearance.

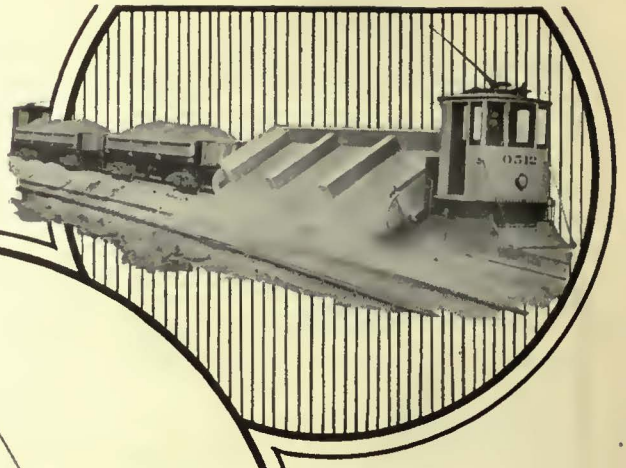
Both of these requirements are embodied in the tubular steel pole and reach their maximum effectiveness in NATIONAL Poles, because of their great strength and reliability under severe conditions of service and their clean cut, neat appearance which adds to rather than detracts from the built-up surroundings.

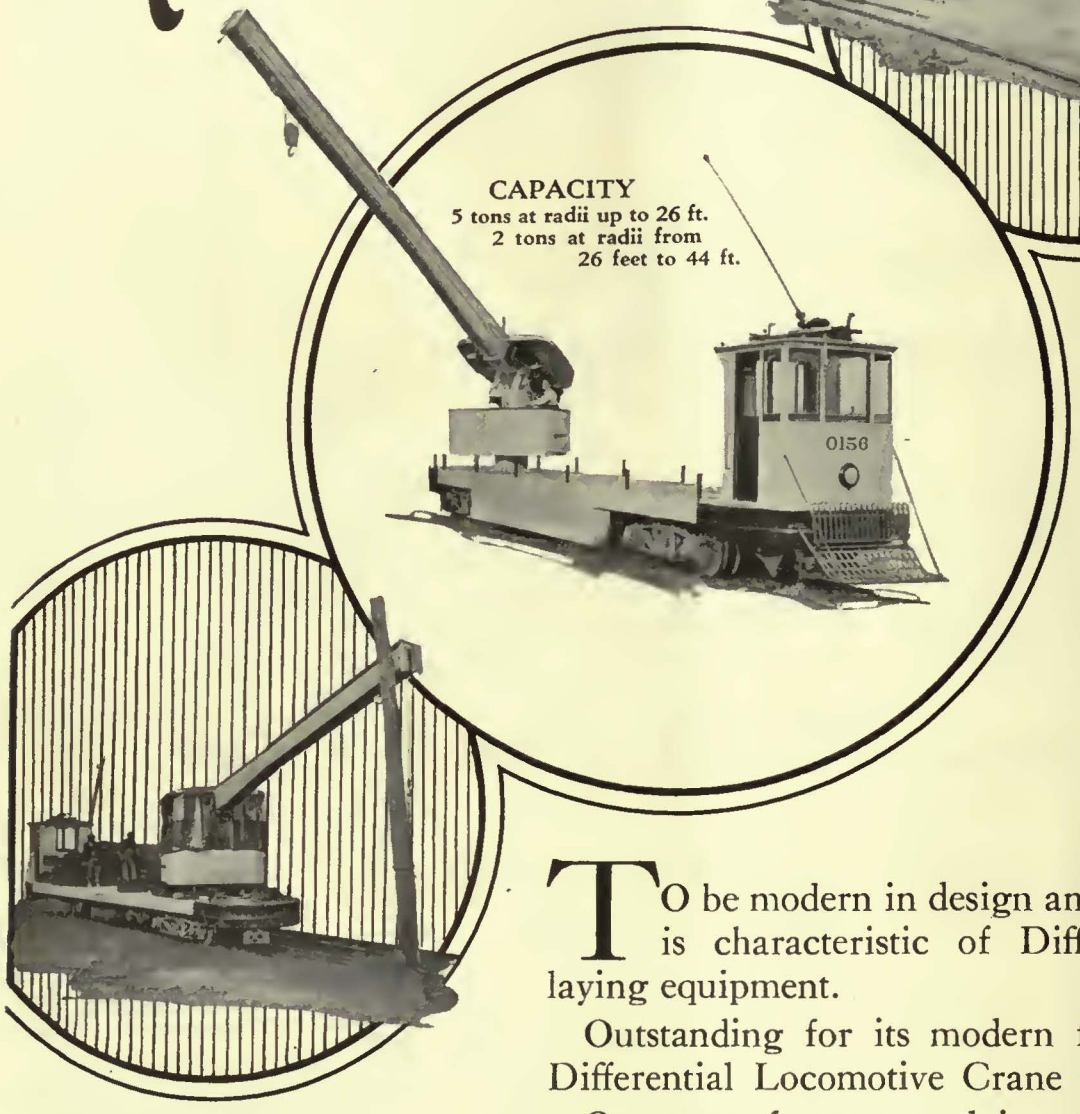
Wherever the factors of safety and appearance dominate, it will pay you to specify NATIONAL Poles. Made by the largest manufacturer of Tubular Products in the world, with facilities for meeting a wide range of specifications in pole construction. Ask for Bulletin No. 14—Tubular Steel Poles.

For additional protection against atmospheric corrosion use NATIONAL Copper-Steel Line Poles. Steel containing a small percentage of copper makes it more resistant to corrosion caused by alternate wet and dry conditions. The fact that tubular poles are constantly exposed to such conditions, makes the use of copper-steel particularly desirable for this purpose. Ask for Bulletin No. 11—Copper-Steel Pipe.

NATIONAL TUBE COMPANY · Pittsburgh, Pa.
Subsidiary of United States Steel Corporation

Modern





To be modern in design and construction is characteristic of Differential track laying equipment.

Outstanding for its modern features is the Differential Locomotive Crane Car.

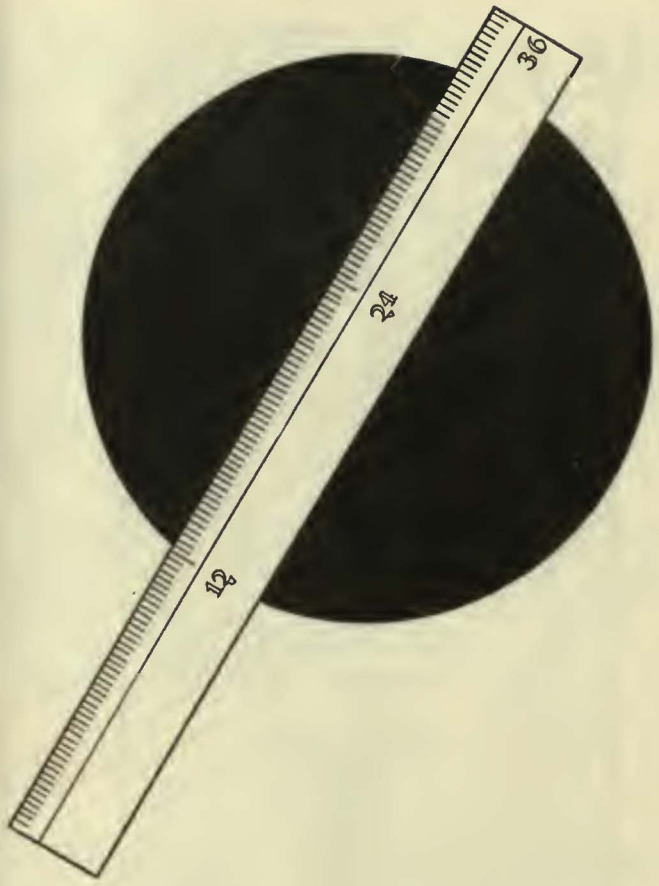
One man, from a revolving turret, controls the crane for any loading or unloading operation, for handling rails and bridge timbers, pole setting or special track work.

The Differential Crane is fast, conforms to Electric Railway clearances, does not impede traffic on adjacent tracks.

Equally modern are Differential Dump Cars, Differential 3-Way Dump Trucks and Clark Concrete Breakers.

Comparative cost records of representative Electric Railways prove that Differential modern equipment substantially reduces track laying costs.

THE DIFFERENTIAL STEEL CAR COMPANY
FINDLAY, OHIO



Put your stopping ability to the yardstick test » »

On the assumption that every motor transport operator is vitally interested in making the quickest possible stops in the shortest number of feet, the Automotive Air Brake is recommended as the one method of control which offers these advantages with incomparably smooth, effortless operation and perfect safety.

Put your present stopping ability to the yardstick test . . . Compare the result with the flexibility of modern, Automotive Air Brakes and you have the answer to the wide-spread acceptance power brakes enjoy today.

In making these comparisons, specialists in the art of power brake control are always ready to assist you. These men are technically trained to render invaluable consulting service to the fleet operator and may be had by addressing the BENDIX-WESTINGHOUSE AUTOMOTIVE AIR BRAKE COMPANY at Pittsburgh, Penna.

6276-A

BENDIX-WESTINGHOUSE
Automotive
AIR BRAKES

Here is the Logical POLE for City Streets

Union Metal Fluted Steel Poles installed on Market Street, Youngstown, O.

NO one considered pole appearance a few years ago. Poles were an engineering problem only. Now, the public is protesting vigorously against the unsightly curb-line forest of many of our cities.

A score of leading utilities have effectively silenced this agitation by installing Union Metal Fluted Steel Poles. Union Metal Poles were designed particularly for city streets. Instead of separate poles for each utility, one set carries all street electrical equipment. And the poles, themselves, are attractive. The perfect taper, the fluting, and the decorative base and cap remove the pole from the merely utilitarian classification. Property owners never object to this type of equipment. And so Union Metal Poles build good will, permanently and effectively.

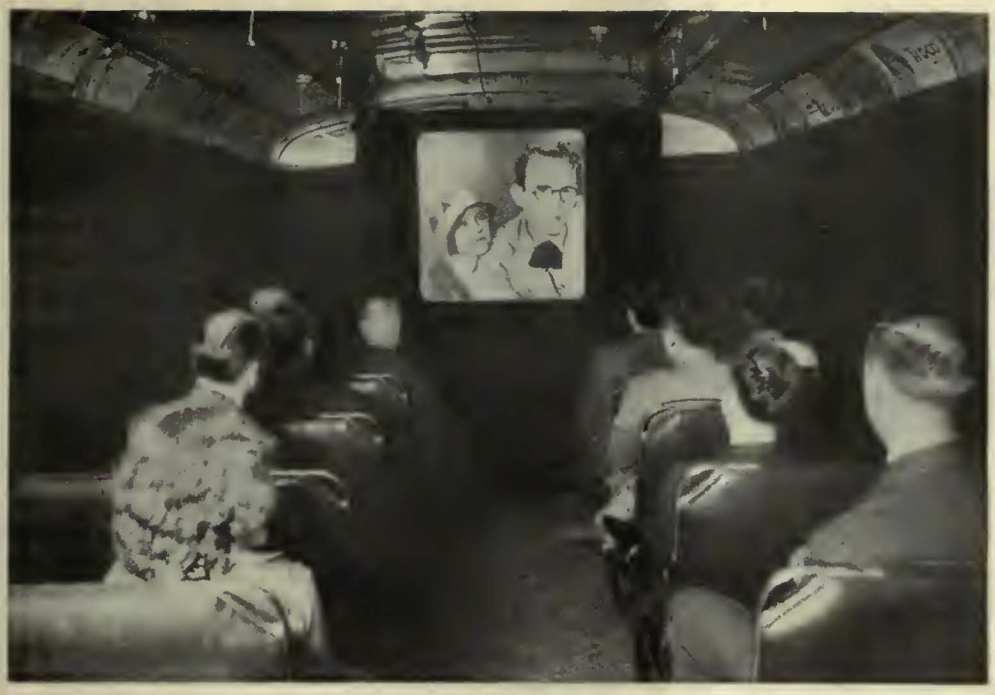
We would like to tell you about some of the many interesting installations and applications of Union Metal Poles. Write the nearest representative for complete information.

THE UNION METAL MANUFACTURING COMPANY
GENERAL OFFICES AND FACTORY ✦ CANTON, OHIO
SALES OFFICES: New York, Chicago, Philadelphia, Cleveland, Boston, Los Angeles, San Francisco, Seattle, Dallas, Atlanta

DISTRIBUTORS
Graybar Electric Company, Inc. General Electric Supply Corp.
Offices in all principal cities

Distributed by Graybar

UNION METAL DISTRIBUTION POLES



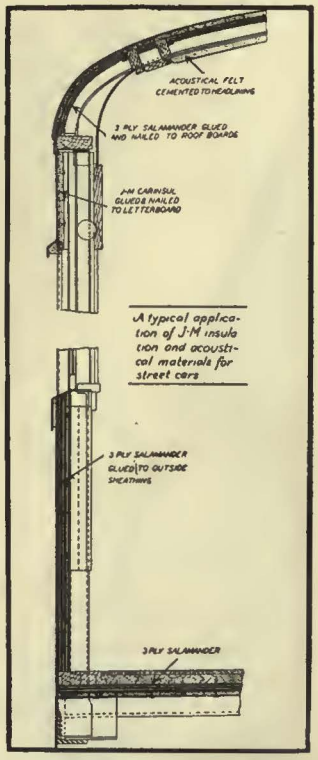
The Market Street Railways with the cooperation of the Publix Theatres and the use of J-M Insulation showed for the first time in moving picture history a talking picture in a street railway car. A schedule was so figured that the car would leave at a certain street at the beginning of the picture and make a complete circuit of the city of San Francisco, without stopping, arriving at the point of departure just as the picture ended.

"TALKIE"—a success on street car ...with Johns-Manville insulation

BY successfully presenting a talkie in one of their cars as it traveled through the noisy streets of San Francisco, the Market Street Railways demonstrated to the public in a dramatic way the new quiet that has been put into more than 100 of their old cars by the use of Johns-Manville Acoustikos Felt—a form of body insulation.

In all types of railway equipment, the reduction of noise is becoming increasingly important. To solve this problem is comparatively simple. There are several forms of J-M Insulation that will effectively keep out external car noises. For many years J-M Insulation has acted as a sound deadener on railroad passenger cars throughout the country. It is easily adapted to re-built street cars as well as new cars. The diagram at the right shows the simplicity of its application.

On one high speed electric railway system, nine hundred cars have been J-M Insulated to provide ear comfort for passengers. Recently another three hundred electric cars were so equipped. Wherever street railways have installed J-M Insulation passenger traffic has been increased. It is a worth-while investment in riding comfort that is rapidly becoming a necessity. Let us tell you more about this sound-absorbing idea made possible by J-M Insulation. The coupon will bring you complete information.



A typical application of J-M insulation and acoustical materials for street cars

In order to show the picture the seats in the smoker were removed to allow room for the projecting apparatus. The J-M Acoustikos Felt—a form of body insulation used to keep out the street and car noises—was installed under the direction of Mr. W. F. Delaney, Superintendent of Equipment of the Market Street Railways.

More Osgood Bradley Cars... Hyatt equipped

Street railway and interurban cars, with Hyatt Quiet Roller Bearing journals, are smoother running and easier riding . . . both contributing factors to punctual service, public good will, and, therefore, increased patronage.

Sturdy Hyatt bearings reduce friction and wear, cut power consumption and eliminate the costly maintenance of brass bearing journals.

Hyatt equipped cars waste no time or power when starting, and gather speed faster. The jerking, common with friction bearing journals, is eliminated.

One of the latest Hyatt Roller Bearing equipped cars built by the Osgood Bradley Car Carporatian, Warcester, Mass., for the Altoona & Lagan Valley Electric Railway Co.

The outstanding economies of Hyatt operation have won the endorsement of many American properties. Hyatt engineering counsel, for new cars or changeover on existing equipment, is available at your call.

HYATT ROLLER BEARING COMPANY
Newark Detroit Chicago Pittsburgh Oakland

HYATT
ROLLER BEARINGS
PRODUCT OF GENERAL MOTORS

ENGINEERS *and* CONSULTANTS

SEARCHLIGHT SECTION

EMPLOYMENT and BUSINESS OPPORTUNITIES—USED and SURPLUS NEW EQUIPMENT

UNDISPLAYED—RATE PER WORD:

Positions Wanted, 5 cents a word, minimum $1.00 an insertion, payable in advance.

Positions Vacant and all other classifications, excepting Equipment, 10 cents a word, minimum charge $2.00.

Proposals, 40 cents a line an insertion.

INFORMATION:

Box Numbers in care of our New York, Chicago or San Francisco offices count 10 words additional in undisplayed ads.

Discount of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED—RATE PER INCH:

1 inch $6.00
2 to 3 inches..... 5.75 an inch
4 to 7 inches..... 5.50 an inch

Other spaces and contract rates on request.

An advertising inch is measured vertically on one column, 3 columns—30 inches—to a page.

R.J.

New "SEARCHLIGHT" Advertisements

must be received by 5 P.M. the 20th of the month to appear in the issue out the following month.

Address copy to the Searchlight Department
Electric Railway Journal
Tenth Ave. at 36th St., New York City

POSITION VACANT

ENGINEERING draftsman having street railway track experience. Capable of making surveys and designs. P-207, Electric Railway Journal, 520 No. Michigan Ave., Chicago, Ill.

POSITIONS WANTED

SUPERINTENDENT maintenance or operation; 18 years experience street railway work. Now employed, desires change. Any location. Best references. PW-201, Electric Railway Journal, Tenth Ave. at 36th St., New York.

SUPERINTENDENT transportation, broad experience, successful record dealing with labor, public, public officials, increasing revenue, decreasing operating costs. Excellent references. PW-205, Electric Railway Journal, Guardian Bldg., Cleveland, Ohio.

WANTED, position as carhouse foreman, broad experience, best of reference. Will go anywhere. PW-206, Electric Railway Journal, Tenth Ave. at 36th Street, New York.

YOUNG man, four years with public relations and advertising department of large property, wishes change. Technical graduate, capable of establishing and managing department. Can go anywhere, on right offer, in thirty days. PW-204, Electric Railway Journal, 520 No. Michigan Ave., Chicago, Ill.

AGENTS WANTED

Agents Wanted

For a portable high efficiency electric welder for street railway circuits. Portability such that one man can easily handle the machine on the street. Machine is provided with pneumatic tires and springs so that it can be towed for long distances at high speed. Current consumption from five hundred volt trolley is twelve amperes for two hundred amperes in the arc circuit. Normal welding capacity two hundred amperes; maximum capacity three hundred amperes. Write to the Economy Electric Products Co., 2400 Woodland Ave. Cleveland, O.

FREE BULLETIN

MONARCH Machinery Company, 300 No. Third Street, Philadelphia, Pa.—24-page bulletin of "Monarch" used and rebuilt presses, threading machines, boring mills, drilling machines, grinders, lathes, etc. Illustrated and priced. Copy free on request.

Wanted to Purchase

Electric Railways in Their Entirety

HIGHEST PRICES PAID

DISMANTLING DONE BY US

The Allite Corporation
636-638 Broadway, New York, N. Y.

THE PERRY, BUXTON, DOANE CO.

New and Relaying Rails

All Weights and Sections

We specialize in buying and dismantling entire Railroads, Street Railways, and all other industrial properties which have ceased operation. We furnish expert appraisals of all such properties.

May We Serve You?

THE PERRY, BUXTON, DOANE CO.
Rail Department, Philadelphia, Pa. General Department, Boston, Mass.
Pacific Sales Office—Falling Building, Portland, Oregon

4000 Tons 85-Lb. ASCE Rail

with angle bars in stock ready for immediate shipment. Attractive prices quoted.

M. K. FRANK
15 Park Row, New York, N. Y.

Double Truck Cars

3—Modern light weight, for sale direct to a street railway, also

Double Truck Snow Plow

All in first class condition.

Interstate Street Railway Company
Attleboro, Massachusetts

Searchlight can help you—

HUNDREDS of miscellaneous business problems pertaining to Civil Engineering and Construction can be quickly and easily solved through the use of the Searchlight section of this publication.

When you want additional employees, want to buy or sell used or surplus equipment, seek additional capital or have other miscellaneous business wants—advertise them in the Searchlight Section for quick, profitable results!

Think "SEARCHLIGHT" *first*

FOR SALE

The Last Word in Modern Cars!

6—Light Weight Double Truck Passenger Cars

two to four years old—weight 30,000 lbs.—excellent condition—ready for immediate shipment.

Railway Motors.
Sweepers and Snow Plows.
Controllers. Compressors.

Reasonably priced.
Let us have your requirements.

Railways Purchased in Entirety

When business judgment dictates the wisdom of abandoning part or all of your electric railway equipment—don't let it rust away in idleness waiting for the chance piecemeal buyer to gradually unburden you, at big losses.

Do the one practical thing. Sell it as a unit to SALZBERG—complete with power plant, track, feeder and trolley wire system and rolling stock.

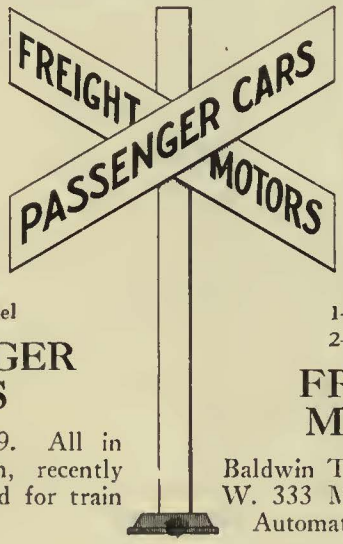
You will get FAIR dealing and the highest prices that are based solely on present day market values. Save money, time and trouble. We will do our own dismantling.

No obligation for our proposition.

H. E. SALZBERG COMPANY, INC.

225 Broadway — Estd. 1898 — New York City, N. Y.

For Sale



Priced Right

12—All Steel

PASSENGER CARS

Seating Capacity 59. All in first class condition, recently painted and equipped for train operation.

1—All Steel
2—Semi-Steel

FREIGHT MOTORS

Baldwin Truck H. L. Control W. 333 Motors, Straight and Automatic Air.

Prices upon Application

The Joseph Schonthal Company

COLUMBUS, OHIO

HIGHEST PRICES PAID FOR ELECTRIC RAILWAYS FOR—

DISMANTLING

M. K. FRANK
15 Park Row
New York, N. Y.

FOR SALE

1000 K. W. and 500 K. W. Westinghouse modern type Synch. Motor Generator Sets

D.C. Volts 575/600 A.C. Volt, 3 ph., 60 cy., 2200 comp'd. w'd. Interpole Generators 80% P. F. Motors with Direct Conn. exciters. Speed 1000 Kw., 900 r.p.m., 500 Kw., 1200 r.p.m., complete A.C. and D.C. control switchboards.

Condition Strictly First Class
For Particulars Apply

JOHN D. CRAWBUCK CO.
Empire Bldg., Pittsburgh, Pa.

MAKE YOUR SELECTION

FROM 173 BIRNEY CARS

(60 May Be Sold)

Built by J. G. Brill Co.; Brill 79 E-1 Trucks; Full Safety Devices.
Either Westinghouse No. 508 or Gen. Elec. No. 264 Motors.
Complete with all appurtenances.

Now in Operation *Splendid Condition* *Low Price*

MORE THAN 20 YEARS AT YOUR SERVICE

For Complete Information Write:

W. M. McKEE CO.
601 Commonwealth Bldg., PHILADELPHIA, PA.

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HASKELITE

HASKELITE arch roof on car built by the Cincinnati Car Co., for the United Traction Co., Albany, N. Y.

HASKELITE ROOFS

cut operating costs

SINCE the energy consumed in electric operation varies almost directly with the weight, any saving in dead weight represents a direct saving in operating costs.

An efficient and popular means of saving considerable weight in car roofs, side panels, and floors, is the use of HASKELITE—the blood-albumin glued plywood—and its metal-faced companion, PLYMETL. The car illustrated above is a typical recent example of lightweight construction. The Cincinnati Car Company, builders, shows HASKELITE for the roof. Complete construction details are given in the description published in this magazine recently.

Roof panels of HASKELITE can be furnished molded to any desired curvature, to simplify roof construction. The material itself is lightweight, strong, stiff, and is unequalled for water resistance.

Engineering data on both products and their applications to street car and bus construction gladly furnished.

PLYMETL 48-in. x 144-in. is a stock size.

TRAVEL BY AIR HASKELITE USE AIRMAIL

PLYWOOD HASKELITE PLYMETL

HASKELITE MANUFACTURING CORPORATION
120 South LaSalle Street, Chicago, Illinois
There is a Representative in your Territory.
Name on application.

PLYMETL

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