

# ELECTRIC RAILWAY JOURNAL

Hill Publishing Company, Inc.

APRIL 21, 1928

Twenty Cents per C

HOUSTON PUBLIC LIBRARY,  
HOUSTON, TEXAS.

## 1000 MILES OF PAVED TRACK —how much money will be saved?

**T**HIS year about one thousand miles of paved track will be laid. Modern production methods will be used. Old fashioned methods will be used. Every mile laid with wooden ties and yesterday's methods will cost more to lay, more to maintain, and be a poorer job, than can be done with modern methods and Steel Twin Ties.

Mass production methods plus Steel Twin Ties make the laying of paved track a fast, efficient operation. The result is a piece of track that lasts for the life of the rail, affords a smooth roadbed for cars—and costs less!

Write today for delivered prices for *your* 1928 track program.



Just Out!

The Second  
Edition of the  
Paved Track  
Notebook.  
Write for  
your copy.

THE INTERNATIONAL STEEL TIE CO.

Cleveland, Ohio

# STEEL TWIN TIE TRACK

## THE BASE OF MODERNIZATION

One of the  
Greatest  
Advances  
in  
Electric  
Traction  
Progress



The new W-N Drive is destined to effect tremendous improvements in electric railway operations. It has been developed by Westinghouse and Nuttall engineers to give to traction companies all the advantages of light, compact, high-speed, high-efficiency motors—less initial investment, reduced maintenance cost, smoother starting, quick acceleration and quiet operating.

Some of the features of the W-N Drive are high ratio of speed reduction, heat-treated hardened helical gears, Timken roller bearings and oil-tight steel gear case.

The advantages of this remarkable drive are so pronounced, you should give it most careful consideration. May we send you complete details?

**R.D. NUTTALL COMPANY**  
PITTSBURGH  PENNSYLVANIA

Canadian Agents:

Lyman Tube & Supply Co., Montreal, Toronto and Vancouver

All Nuttall Products are sold through the Westinghouse Electric & Mfg. Co., district offices. Refer your inquiries to the nearest Westinghouse Office.



# Nuttall

MORRIS BUCK  
Managing Editor  
JOHN A. MILLER, Jr.  
Associate Editor  
CLARENCE W. SQUIER  
Associate Editor  
G. W. JAMES, Jr.  
Assistant Editor

# ELECTRIC RAILWAY JOURNAL

HENRY W. BLAKE  
Senior Editor  
GEORGE J. MACMURRAY  
News Editor  
PAUL WOOTON  
Washington Correspondent  
ALEX McCALLUM  
Editorial Representative  
London, England

CHARLES GORDON, Editor

Vol. 71  
No. 16

April 21, 1928

Pages  
645-684

## CONTENTS

### Energy from Dynamic Braking Cuts Heating Costs .....648

By A. W. BAUMGARTEN

Heating a car by the use of regenerated energy along with that wasted in acceleration proves successful in Blackhall car. The details of this installation are given in this issue, as is also the story of how manual control superimposed on automatic lends flexibility without interference with regular air braking. Savings of 60 per cent of the cost of heat appear practicable.

### Truck Overhauling Systematized in Brooklyn . .653

By CLARENCE W. SQUIER

Dismantling and assembling are done on separate tracks. Between and perpendicular to these two tracks are eight bays used for inspection and repair work. All of the operations incidental to overhauling are progressive and are so laid out as to require a minimum amount of time to secure the best results at lowest cost.

\* \* \*

### Editorials .....645

- Not Enough Comparison of Maintenance Costs.*
- Regenerative Heating Shows Attractive Savings.*
- Putting Truck Overhaul on a Production Basis.*
- Bus Maintenance Calls for New Standards.*
- Another Setback for Suburban Transit.*
- Track Cost Is Important Element in Considering Car Replacements.*
- Lightning Arresters Require Regular Inspections.*

### Educational Opportunities in Los Angeles .....651

### Sand Car with Six Hopper Outlets .....651

### Lightning Arrester Testing Set .....652

By JEFF RUCK

### Oil House for Denver Tramway .....658

By H. L. MINISTER

### Block for Running in Bus Engines .....659

By F. J. FOOTE

### J. A. McCartney Wins Maintenance Prize for March .....660

### Maintenance Data Sheet .....661

### Adventures of Old Man Trouble .....667

### New Equipment Available .....668

### Dick Prescott Attends a Meeting .....668

### Association Activities .....669

### News of the Industry .....670

## The "Last Word" in Power Distribution

IN THESE days of rapid development of all classes of electric railway equipment, "last word" is a strong term to use in presenting any single installation. As used here, therefore, it does not by any means imply that the final chapter has been written on power distribution development.

Nevertheless, the Cincinnati Street Railway is just completing the most comprehensive automatic distribution system with full supervisory control that has yet been installed on a city property. This project is of interest not only because of its magnitude but also because of several difficult operating problems that were encountered.

Harley L. Swift, superintendent of substations in Cincinnati, presents a complete article on this major development in next week's JOURNAL. Don't miss it!

### McGRAW-HILL PUBLISHING COMPANY, INC.

Tenth Avenue at 36th Street, New York, N. Y.  
New York District Office, 285 Madison Ave.

Cable Address: "Mechinist, N. Y."

JAMES H. MCGRAW, President  
JAMES H. MCGRAW, Jr., V.-P. and Treas.  
MALCOLM MUIR, Vice-President  
EDWARD J. MEHRREN, Vice-President  
MASON BRITTON, Vice-President  
EDGAR KOBAE, Vice-President  
C. H. THOMPSON, Secretary

WASHINGTON:  
National Press Building

CHICAGO:  
7 S. Dearborn Street

PHILADELPHIA:  
1800 Arch St.

CLEVELAND:  
Guardian Building

ST. LOUIS:  
Bell Telephone Building

SAN FRANCISCO:  
883 Mission Street

LONDON:  
8 Bouverie Street, London, E. C. 4

Member Associated Business Papers, Inc.

Member Audit Bureau of Circulations

The annual subscription rate is \$4 in the United States, Canada, Mexico, Alaska, Hawaii, Philippines, Porto Rico, Canal Zone, Honduras, Cuba, Nicaragua, Peru, Colombia, Bolivia, Dominican Republic, Panama, El Salvador, Argentina, Brazil, Spain, Uruguay, Costa Rica, Ecuador, Guatemala, Chile and Paraguay. Extra foreign postage to other countries \$3 (total \$7 or 29 shillings). Subscriptions may be sent to the New York office or to the London office. Single copies, postage prepaid to any part of the world, 20 cents.

Change of Address—When change of address is ordered the new and the old address must be given, notice to be received at least ten days before the change takes place. Copyright, 1928, by McGraw-Hill Publishing Company, Inc.

Published weekly. Entered as second-class matter, June 23, 1908, at the Post Office at New York, N. Y., under the Act of March 3, 1879. Printed in U. S. A.



Publishers of  
*Engineering News-Record*  
*American Machinist*  
*Power*  
*Chemical and Metallurgical Engineering*  
*Ucol Ago*  
*Engineering and Mining Journal*  
*Ingenieria Internacional*  
*Bus Transportation*  
*Electric Railway Journal*  
*Electrical World*  
*Electrical Merchandising*  
*Radio Retailing*  
*Construction Methods*  
*Electrical West*  
(Published in San Francisco)  
*American Machinist—European Edition*  
(Published in London)



# Protection for Insulation

**I**N electric railway motor service, insulation must have dependable protection. Westinghouse Varnish No. 335 does more than save the surface—it protects and *insulates*.

Developed especially for the extremely severe service to which railway motors are subjected, Varnish No. 335 has an exceptional vitality that assures protection against the destructive effects of vibration, excessive moisture, and heat. The tough, protective film produced by No. 335 Varnish is a vital factor in prolonging the service-life of railway motors operating under any conditions.

The fact that Westinghouse varnish is used on Westinghouse motors is positive proof of its reliable service.

*Using Westinghouse Insulating Materials  
Is Like Owning a Million Dollar Laboratory*



## Westinghouse Insulating Materials

Treated Fabric Tapes  
 Untreated Tapes  
 Cord and Thread  
 Sleeving  
 Treated Papers  
 Treated Fabrics  
 Untreated Papers  
 Untreated Fabrics  
 Micarta Sheets  
 Micarta Tubes  
 Micarta Formed Shapes  
 Mica Sheets  
 Mica Tubes  
 Varnishes  
 Paints  
 Japans  
 Enamels  
 Insulating Compounds  
 Insulating Glue  
 Transformer Oil  
 Switch Oil

Westinghouse Electric & Manufacturing Company  
 East Pittsburgh Pennsylvania

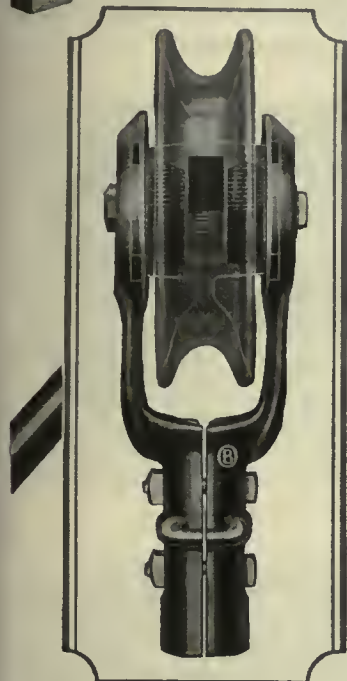
Sales Offices in All Principal Cities of  
 the United States and Foreign Countries



# Westinghouse

# MAINTENANCE SAVINGS DOLLARS AND SENSE!

It is the many possible small saving, easily made, that help most to swell the "net". Let O-B Wheels and Harps contribute their share.



## The O-B Trolley Wheel and Harp Make a Big Cut in Maintenance

A BIG portion of ordinary trolley wheel expense is maintenance—frequent oiling and periodical replacement of contact washers and springs.

Such maintenance is *all* eliminated with the O-B Trolley Wheel and Harp (Feist Patents). There is no oiling to pay for during the life of the wheel—for the permanent automatic lubrication of the graphite plugs makes this unnecessary.

Better conductivity is provided by the large, rigid axle, which, with its closely fitted bearing, minimizes overhead wear and prevents chattering.

O-B Wheels and Harps actually show a *definite saving* in purchases for replacement of \$100 per million car miles and *cut maintenance costs* at least 36%. They will generally more than double the mileage of ordinary wheels.

A trial of O-B Wheels & Harps on your lines is a mighty good "Dollars and Sense" idea. Furnished in 5-in. and 6-in. sizes with either "U" or "V" groove.

Ohio Brass Company, Mansfield, Ohio  
Canadian Ohio Brass Co., Limited  
Niagara Falls, Canada  
822 C

# Ohio Brass Co.



NEW YORK CHICAGO  
PHILADELPHIA

PITTSBURGH ATLANTA  
ST. LOUIS SAN FRANCISCO

CLEVELAND  
LOS ANGELES

PORCELAIN INSULATORS  
LINE MATERIALS  
RAIL BONDS  
CAR EQUIPMENT  
MINING MATERIALS  
VALVES

---

BETTER RAIL, BETTER TRANSPORTATION

---

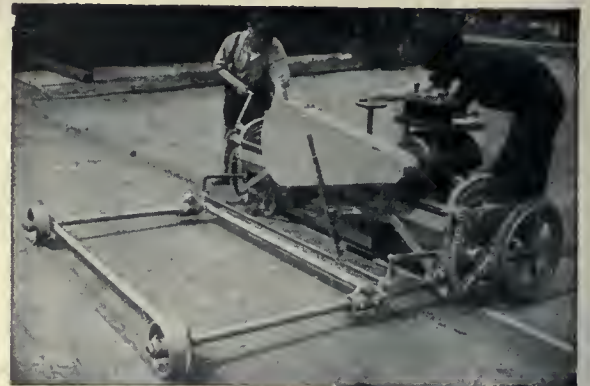
# Soft seats don't cushion bumpy track.

A good car running over good rail has less jounce and bounce than an automobile.

The keynote is "good rail."  
The key to good rail is rail grinding.



Eureka Radial Rail Grinder



Vulcan Rail Grinder



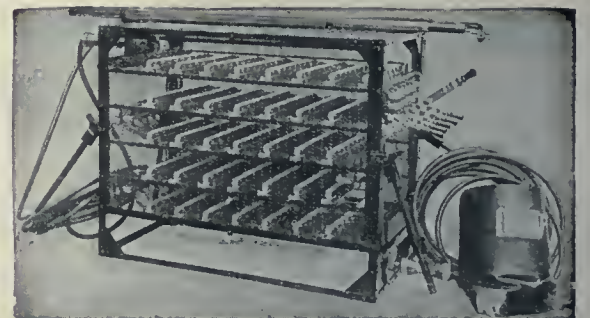
Reciprocating Track Grinder

## Railway Trackwork Co.

3132-48 East Thompson Street, Philadelphia

AGENTS:

Chester F. Gallor, 30 Church St., New York.  
Chas. N. Wood Co., Boston  
Electrical Engineering & Mfg. Co., Pittsburgh  
H. F. McDermott, 208 S. LaSalle St., Chicago  
P. W. Wood Railway Supply Co., New Orleans, La.  
Equipment & Engineering Co., London  
Frazar & Co., Japan



"Ajax" Electric Arc Welder

⊕ 2337

---

BETTER RAIL, BETTER TRANSPORTATION

---



AN INSPECTION TOUR  
OF THE WELL-EQUIPPED  
CAR

*An attractive asset for modern cars—*

# SAFETY DOME TYPE LIGHTING FIXTURES

Attract increased patronage and keep your present patrons sold on your service by providing lighting fixtures that enable your passengers to read "en route."

The use of dome type fixtures in modern cars reflects the present trend toward improving the comfort and appearance of electric cars so that they may equal the de luxe service offered in many cases by competing vehicles.

Safety Dome Type Fixtures are designed to provide bright, steady, well-diffused light—with a lesser number of units. Their beautiful Druid glass bowls produce a soft pleasing effect.

We will be glad to send you full particulars of Keystone Lighting Fixtures and of other Keystone Equipment found on the modern well-equipped car.

Send for ESSCO Catalog No. 7.

Home office and plant at 17th & Cambria St., PHILADELPHIA; District office at 111 N. Canal St., CHICAGO; 50 Church St., NEW YORK; Bessemer Bldg., Pittsburgh; 88 Broad St., Boston; General Motora Bldg., Detroit; 316 N. Washington Ave., Scranton; Canadian Agents, Lyman Tube & Supply Company, Ltd., Montreal, Toronto, Vancouver.



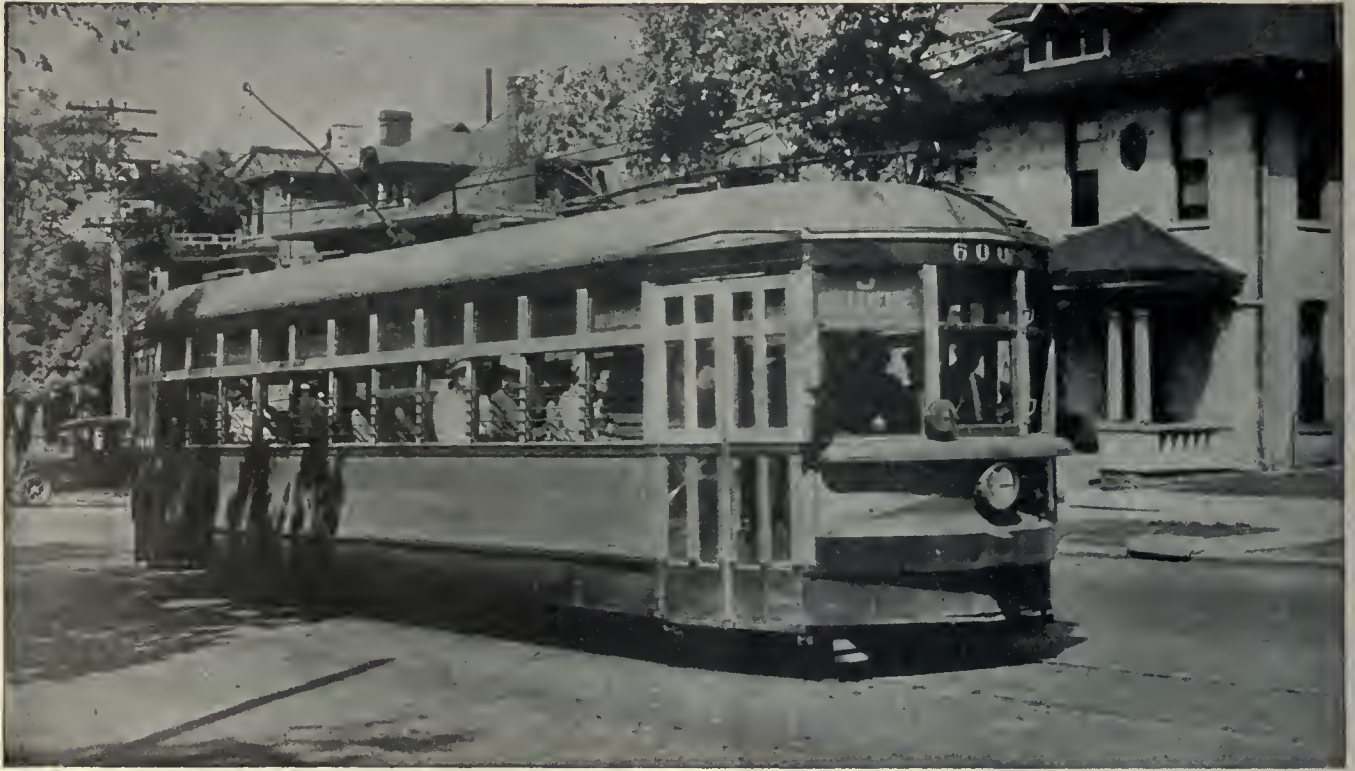
Safety Dome Type Lighting  
Fixtures

These fixtures, made in various styles, represent the very latest and most approved designs. They are made to withstand extreme vibration, provide efficient lighting and greatly add to the attractiveness of cars. Due to the lesser number of units required important savings are realized.

# ELECTRIC SERVICE SUPPLIES Co.

MANUFACTURER OF RAILWAY, POWER AND INDUSTRIAL ELECTRICAL MATERIAL





## Speeding Transportation Safely

When transportation conditions impel shorter headway between cars to reduce waiting time of patrons . . . quicker brake applications to reduce time consumed in making stops . . . rapid interchange of passengers to cut down standing time . . . prompt release of brakes to permit quick get-away . . . THEN the Safety Car Control Equipment will help speed up the service while maintaining the basic element of safety.

This is the modern equipment for modern cars.

The illustration shows one of the ten modern light weight cars now being used by the Nashville Railway and Light Company. Each car bears the name of a distinguished Tennessean. All of these cars are themselves rendering distinguished service because they by nature have the common name of SAFETY CAR.



# SAFETY CAR DEVICES CO.

OF ST. LOUIS, MO.

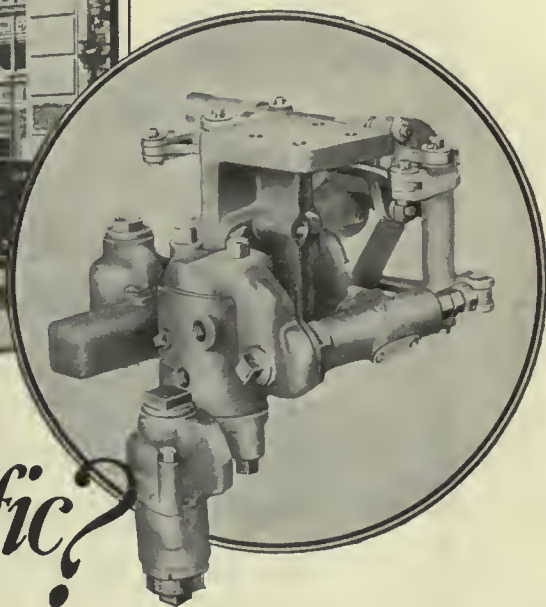
*Postal and Telegraphic Address:*  
**WILMERDING, PA.**

CHICAGO SAN FRANCISCO NEW YORK WASHINGTON PITTSBURGH





The Westinghouse Variable Load Brake is an attachment for use with straight air or semi-automatic equipments by means of which the brake cylinder pressure is automatically adjusted as the car weight changes, to provide the same retarding effect throughout range of passenger load.



*Can your cars lead the traffic?*

WHEN thoroughfares are congested . . . when other vehicles are contending for the right of way . . . when traffic demands are greatest . . . are your cars as mobile as other conveyances that use the streets . . . can they lead the traffic rather than lag behind?

They can if equipped with the Westinghouse Variable Load Brake. This modern brake for modern cars is as effective on loaded cars as on empty cars and assures uniformly short stops under all conditions. It furnishes adequate control to enable cars to hold their place in the traffic stream.



Confer with our representative regarding the desirability of Westinghouse Variable Load Brakes for your new cars.

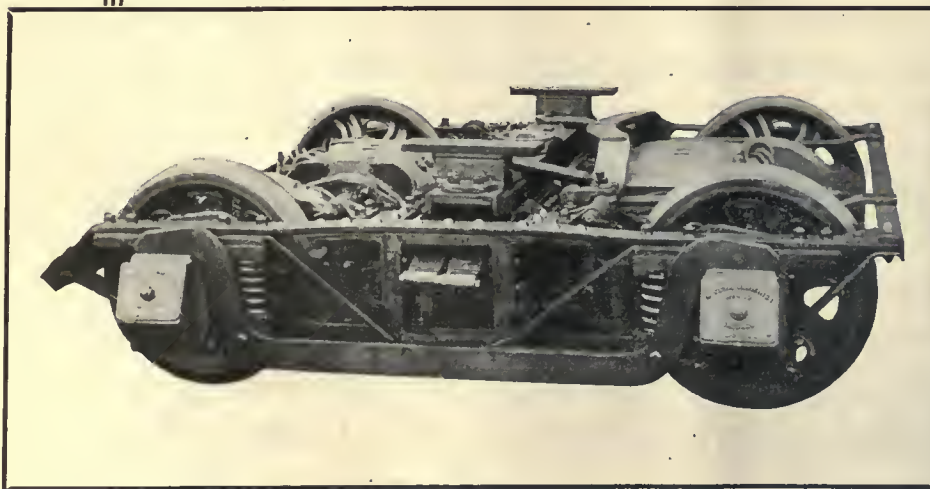
WESTINGHOUSE TRACTION BRAKE CO.  
General Office and Works, WILMERDING, PA.

# WESTINGHOUSE TRACTION BRAKES

# Riding Comfort *must be* *"built in"* Modern Cars

CAR modernization is not a matter of dressing up old designs with spring cushioned seats and De Luxe interiors. Appearances alone, will not decrease operating expense nor increase revenue. Riding comfort for instance, the most essential factor in public attraction, must be built in from the ground up.

Cummings No. 62 trucks have contributed largely to the riding comfort of our cars.



Cummings No. 62 low body Truck for city and interurban service.

---

---

**CUMMINGS CAR AND COACH CO.**

*Successors to McQuire-Cummings Mfg. Co.*

**111 W. Monroe St., Chicago, Ill.**

---

---

*Look out!*

AKRON

759

Twin Coach

**Twin Coach**  
BY F.R. FAGEOL KENT, OHIO

T20-450

*Motors in front will be obsolete*

# Edward Dana



The motor bus can be a very useful vehicle as an auxiliary to mass transportation systems and the development of the Twin Coach at this time is in my opinion most fortunate.

Patrons now appreciate the extent to which motor buses can be made effective, but are dissatisfied with the riding qualities, uncomfortable entrance and exit facilities and capacity of the conventional types thus far rendering the service.

The Twin Coach combines capacity, reliability, flexibility and a street-car appeal which I feel will have a marked influence upon the extent of bus operation and the welcome accorded buses by patrons from now on.

*Note:  
This opinion has since  
been backed by an order  
for ten Gas. Electric Twins!*

*Edward Dana*

General Manager

BOSTON ELEVATED RAILWAY CO.

# Compares TWINS vs OTHER TYPES



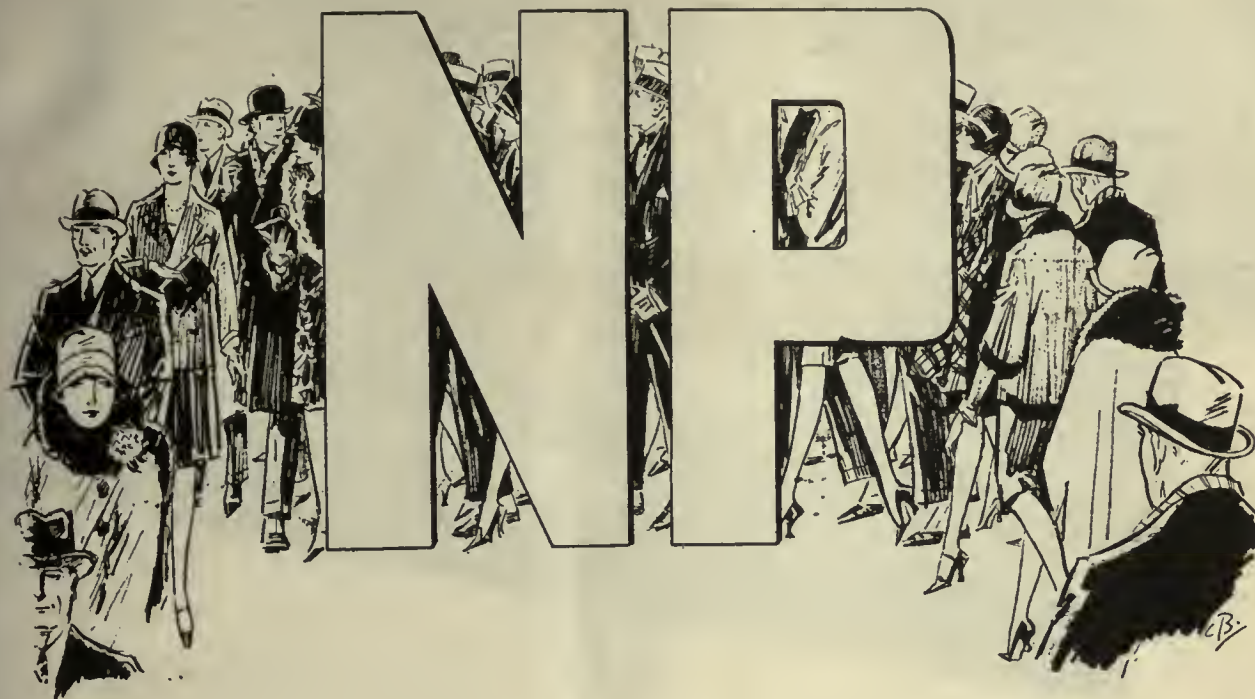
Eighteen money-making Twins are at work for the Northern Ohio Power and Light Company at Akron, Ohio—Twelve are serving the workmen at the great tire plants—Six are winning increased daily patronage on inter-city runs between Cleveland, Akron and Canton.



# Two Millions Invested IN TWIN COACHES In 9 Months



*The*  
**MOST SIGNIFICANT**  
**VEHICLE in all 1928 TRANSPORTATION**



**FOLLOW THE CROWD**  
the widespread adoption  
of NP Treadles must mean that  
many operators find in treadle  
operation a method of quicker  
interchange of passengers—  
circulating load—greater economy  
and a mechanism that  
appeals to car riders



**NATIONAL PNEUMATIC COMPANY**

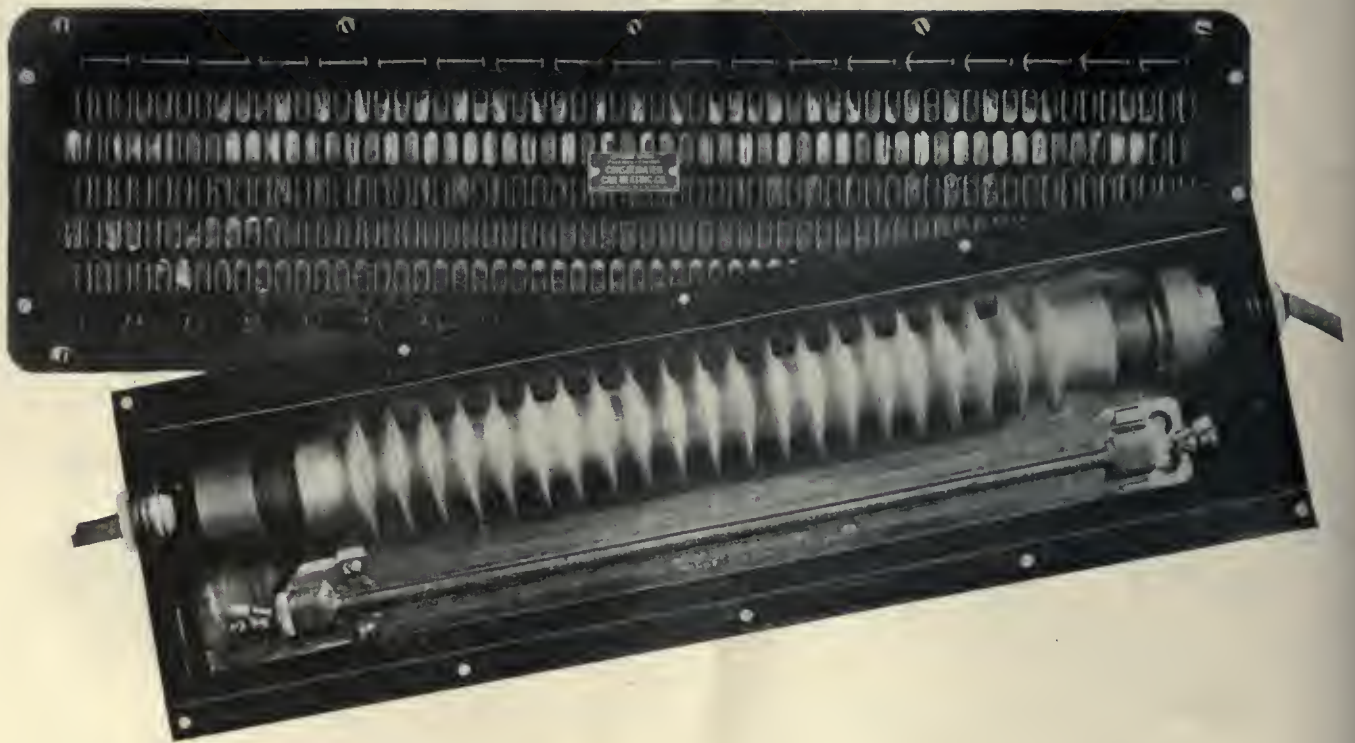
*Executive Office: Graybar Building, New York*

*General Works, Rahway, New Jersey*

CHICAGO  
518 McCormick Building

MANUFACTURED IN TORONTO, CANADA, BY  
Railway & Power Engineering Corp., Ltd.

PHILADELPHIA  
1010 Colonial Trust Building



## Use the Waste Energy of Control Resistance in Consolidated Motor Resistor Heaters

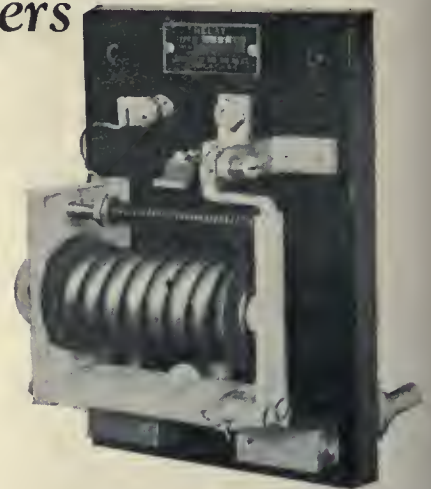
The Consolidated Resistor Heater utilizes the heat now wasted in the grids. These heaters have the same resistance values as the grids under the car which are used in the summer. Consolidated heaters contain a motor resistor and also a standard heating element as a compact unit. The regular heaters are cut off whenever the resistor heaters are operating, unless they should be cut off by the thermostat. These heaters with peak load relay, illustrated at the right not only utilize the energy formerly wasted in the motor resistors, but they cut the heater load off the peak when cars are accelerating.

The twenty-five articulated trains and the fifty motor cars now under construction for the Cleveland Railway are being equipped with the new Consolidated Motor Resistor and Sheath Wire Heaters.

For cars now equipped with electric heaters, the Consolidated Resistor Heater can be furnished as a separate unit.

It will pay you to investigate this latest Consolidated contribution to car heating.

Consolidated Motor Resistor Heaters can be used for regenerative braking resistors as well as for the accelerating resistors.



The Peak Load Relay

This is in the resistor heater circuit—When the motor resistor heaters are in operation—or when the car is being operated with the resistance in the motor circuit—the peak load relay is energized and short circuits the magnetic switch controlling the regular heaters, thus cutting them out. If the temperature of the car is below that at which the thermostat would cut the heaters out, they will come into service again automatically as soon as car motors cease to run on resistance.

# CONSOLIDATED CAR-HEATING CO.

NEW YORK

ALBANY, N. Y.

CHICAGO





## When, in your opinion, is the maximum reached?

Cincinnati **BALANCED** Lightweight cars are operating proof that the maximum of both **SPEED** and **SAFETY** has been advanced. They prove, too, that the combined maximums bear heavily on the problem of increased net earnings.

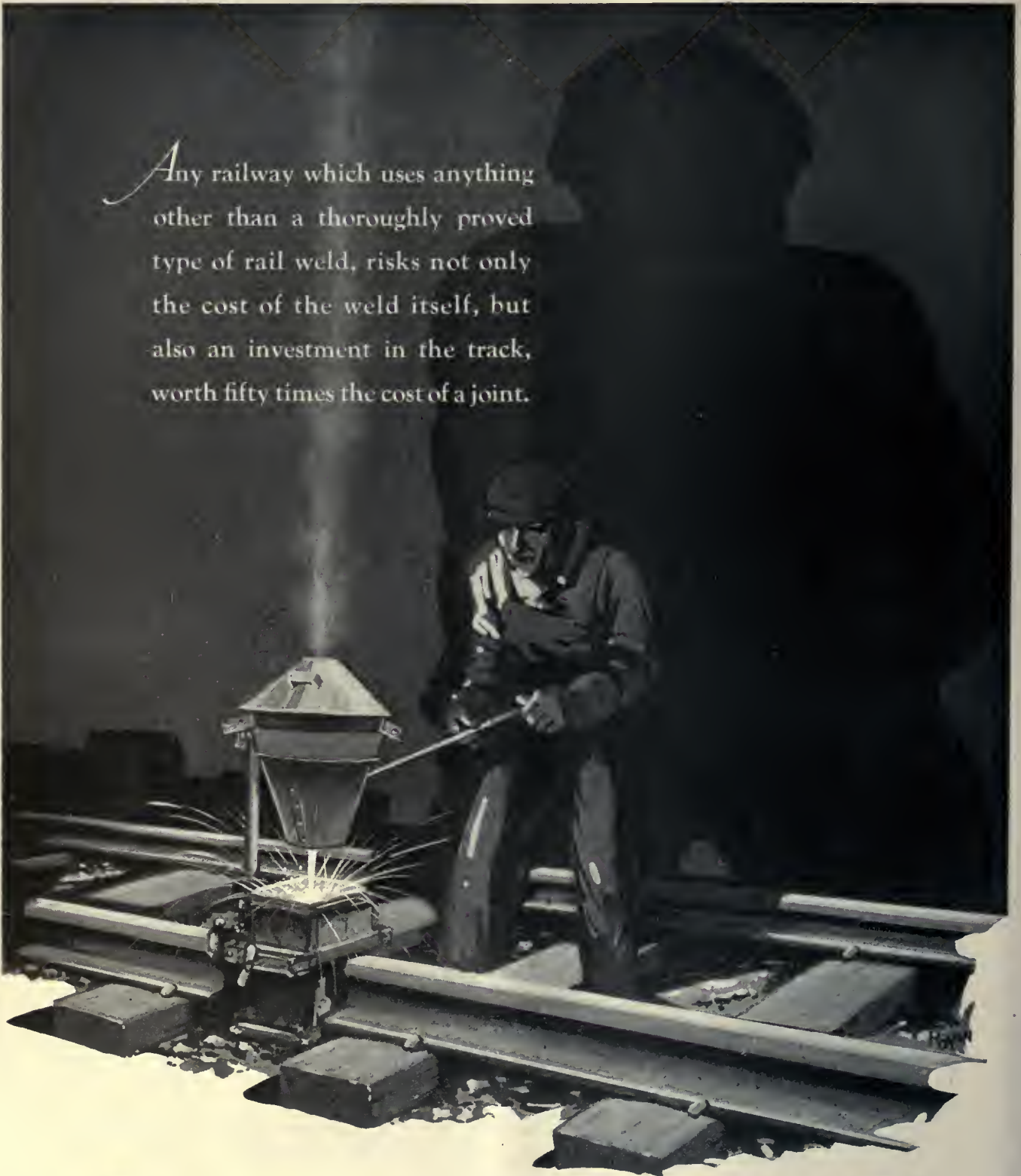
You can bring your own opinion on "SPEED WITH SAFETY" up to the minute—gain an intimate knowledge of the most recent accomplishment in profit building operation through an analysis of Cincinnati **BALANCED** Lightweight Car design, construction and operating records. We welcome the opportunity to present this data.

And—is it not sound advice to check opinions against most recent developments? Opinions often become decisions.

Cincinnati Car Company, Cincinnati, Ohio

**CINCINNATI**  
**BALANCED**  
**LIGHTWEIGHT** **CARS**

Any railway which uses anything other than a thoroughly proved type of rail weld, risks not only the cost of the weld itself, but also an investment in the track, worth fifty times the cost of a joint.



The Thermit Insert Weld which has been used in electric railway work since 1912, is basically the same today as then. The only changes have been in a simplification of the process and a reduction in the amount of material used, with corresponding decreases in the cost of installation.



**METAL & THERMIT CORPORATION**  
 120 BROADWAY, NEW YORK, N.Y.

PITTSBURGH

CHICAGO

BOSTON

SOUTH SAN FRANCISCO

TORONTO

# TO REDUCE MAINTENANCE Install Economy Meters

## For Electric Railways

The ECONOMY Watthour Meter has cut the consumption of energy in two hundred cities all the way from 10 to 20%. This reduction in power consumption is due to better operation of the cars. Better operation of cars means decreased maintenance. In addition the car inspection dials set the interval for inspection in a thoroughly scientific manner. Regular systematic inspection also means reduced maintenance.



Economy Electric Railway Meter

## For Automotive Transportation

The ECONOMY Gasoline Vehicle Meter furnishes the bus field with an accurate method of determining energy consumption. Energy for automotive equipment is measured in miles per gallon. By means of the records obtained from this meter the condition of the equipment and the operation thereof can be carefully watched. Better operation means reduced maintenance.



Economy Gasoline Vehicle Meters  
4½ x 4½ x 6½ inches high

## Economy Electric Devices Company

37 W. VAN BUREN ST., CHICAGO

*Distributors or Agents for*  
Haskelite and Plymetl

Sangamo Economy Meters  
Peter Smith Heaters

Woods Fare Boxes  
Economy Gasoline Vehicle Meters



Street cars equipped with Hyatt Roller Bearing Journal boxes are quieter running and easier riding . . . contributing factors to public good will and increased patronage.

Also, from an economical standpoint Hyatt Roller Bearings further justify their use . . . by

making possible quicker acceleration, substantial power savings, and reduced oiling and maintenance expense.

These operating advantages and economies are worth investigating. Our engineering counsel is at your disposal.

HYATT ROLLER BEARING COMPANY  
 Newark Chicago Detroit Pittsburgh Oakland

**HYATT**  
**ROLLER BEARINGS**  
 PRODUCT OF GENERAL MOTORS

U. S. Royal Cord Motor-coach Tires have been chosen as standard equipment for the fleet of buses operated by the Midland Trail Bus Line of Olney, Ill.



# U.S. Motorcoach Tires

ROYAL CORD

—for low-cost mileage

Records of tire mileage on individual buses and on fleets comprising as many as 300 motor-coaches, all point to this same conclusion: U. S. Royal Cord Motorcoach Tires give the lowest possible cost per tire mile!

United States  Rubber Company  
Trade Mark

Mileage records of the Midland Trail Bus Line prove conclusively the low cost per mile of its equipment of U. S. Royal Cord Motorcoach Tires.



UNITED STATES TIRES ARE GOOD TIRES

# A substation on friendly terms with its neighbors



A substation in a residential district must be in keeping with its surroundings—and it must be quiet—to remain on friendly terms with its neighbors. G-E rectifier substations *are* quiet and may be architecturally beautiful. For these reasons, a rectifier substation can be placed in localities where substations are ordinarily prohibited.

For such a substation building, it is not necessary to build heavy foundations, nor is special sound-proof construction or ventilating equipment needed.

*A 1,500-kilowatt G-E mercury-arc rectifier in the Vollmer Road substation, of the Public Service Company of Northern Illinois, which supplies power to the Illinois Central Railroad*



# GENERAL ELECTRIC

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y., SALES OFFICES IN PRINCIPAL CITIES

# Electric Railway Journal

McGraw-Hill Publishing Co., Inc.  
JAMES H. MCGRAW, President

Consolidation of  
Street Railway Journal and  
Electric Railway Review

CHARLES GORDON  
Editor

Volume 71

New York, Saturday, April 21, 1928

Number 16

## Not Enough Comparison of Maintenance Costs

COMPARISONS of maintenance costs on various properties give an opportunity to determine whether one's own practices are in line with those in use elsewhere, and whether possibilities have been overlooked for doing the work better or at lower cost. Of course such comparisons, to be of maximum value, must be considered along with those of service reliability. Any maintenance executive can cut down his costs for a time by deferring necessary work and sacrificing reliability. But when the records are studied over any extended period the shortcomings of such practices are bound to make themselves evident.

Maintenance costs are not interchanged among electric railway properties as generally as they should be. Maintenance men have not given the matter the attention it deserves, for a number of reasons. While the standard classification of accounts is almost always used the details are not always comparable. The physical conditions of properties vary widely and have a direct bearing on maintenance costs. Then all too often there is a lack of appreciation of the value of studying the other fellow's figures and methods. Even some of those who interchange data have not obtained the maximum benefit because of failure to analyze the figures and to effect needed changes in their maintenance methods that are obvious to an impartial observer.

The cost per unit is not in itself a conclusive measure of excellence. Either high or low figures, considered abstractly, mean little in themselves. Variations in accounting as between depreciation or renewal reserves and operating maintenance accounts cause some difficulty in making comparisons. Other causes of variations in costs are the age, type and state of repair of the cars; the supervision and shop facilities, and the operating characteristics of each company. For instance, the total cost of equipment maintenance for the properties in the Electric Railway Association of Equipment Men, Southern Properties ranges from \$13.67 to \$30.46 per 1,000 car-miles, while cost of labor for cleaning and inspection ranges from \$6.59 to \$17.38 per 1,000 car-miles.

On the other hand, costs that are out of line must not be waved aside with the general and time worn excuse of "local conditions." High figures should be considered the signal to look for expensive practices or those that are failing to give satisfactory results. Sometimes high maintenance figures are in no way a measure of the efficiency of the maintenance departments themselves but are traceable to operating practices and management policies that need correction. In that event the man responsible for maintenance may not be in a position to correct the difficulty directly, but he holds the

key to opening up general questions of policy that affect directly his own performance. For these reasons he should seek rather than avoid the interchange of maintenance figures with other properties even though his own figures may seem to be high.

## Regenerative Heating Shows Attractive Savings

RECOVERY of the energy that is wasted in the car resistors during acceleration with series-parallel control, and the energy which is stored in momentum and is absorbed in the brake shoes when the car stops, presents an opportunity for economy that has attracted many engineers. Regeneration of the kinetic energy of motion into electrical energy and its return to the distribution system is entirely possible, and it has been adopted with advantage on several of the heavy railroad electrifications. But for street cars and light interurbans recovery of this energy is not so simple. The series motor, which is universally used in this class of service, is not readily adaptable to serve as a generator for feeding back energy to the line.

A substitute proposition which has been tried with some success at various times is the use of regenerated electrical energy for heating the cars. While in temperate climates this opportunity is available during the winter months only, the expenditure for heating is a very considerable portion of the energy used throughout the year, sometimes running as high as 8 to 10 per cent of the total. The regeneration of energy serves an additional purpose in that it directly relieves the brake shoes of a portion of the work they are ordinarily called on to do. This makes possible either a higher braking rate or less wear on the shoes and wheels, so that even in the summer when the heat is not needed the use of dynamic braking, with the motors acting as generators, is advantageous.

Various difficulties are involved in the dynamic braking system. The rate of braking must be controlled, and since the voltage of the motors falls off rapidly as the speed is reduced, the resistance in the circuit must be changed continually as the car comes to rest. According to an article by A. W. Baumgarten, appearing in this issue, these problems have been successfully met in the installation which has been made in the experimental car of the Chicago & Joliet Railway. Both manual and automatic control are used through remote-controlled contactors, making the system flexible. Duplicate sets of resistors are installed, so that the heat can be used inside the car or discharged to the atmosphere beneath it. The heat released during acceleration is also utilized along with that produced during braking. With both together and without any external source the car was heated to a temperature of 60 deg. during winter weather. For a

short period in the early morning, prior to going out on the run, additional heat from the line was used, but this was turned off while the car was in service.

As a measure of the value of this method, Mr. Baumgarten estimated that the cost of heating a car with standard electric heaters is \$501 per season, while with the regenerative system it is \$200—a saving of \$301, after making allowance for all charges on the extra equipment. This will be augmented by savings in the electrical distribution system, bringing the total up to some \$400, according to the author. Such a saving is well worth making, if the motors are of sufficient capacity to stand the additional service, and if it does not involve any great complication in apparatus or impose added duties upon the operator.

### Putting Truck Overhaul on a Production Basis

**P**LACING car truck overhauling on a production basis is advantageous, particularly for the larger electric railways. With them, the quantity of this work makes it necessary to prepare definite schedules for overhauling, which must be adhered to closely. One of the greatest problems is that of cutting down non-productive hours. The work may be classified into dismantling, repairing or replacing worn parts, assembling and testing. When several men work on the same truck, one will interfere with another. This results in waiting and unproductive time. If replacement parts are not at hand the workman must wait for the material or leave his place to get it.

Unless there is the necessary labor-saving equipment production will slow up at the end of the working period, due to physical fatigue of the men. Material handling equipment is needed, as most of the parts are heavy and hard to place with the accuracy needed to insure good performance. The various operations must follow progressively and without delay, else one man may interfere with others who are to follow him. Order and system are essential, and the work should be laid out so that the various operations become standardized. Each man can then become an expert in his particular duties, and the work will be done better and quicker due to greater familiarity and skill.

An outstanding example of constructive planning and systematizing of truck overhaul is found in the new Coney Island Shops for the Brooklyn-Manhattan Transit Lines, an article on which appears in this issue. One is impressed particularly with the number of one-man jobs into which the work is divided. One man removes the heavy parts with the aid of an overhead crane. Another does the cleaning in a room provided with chemical and rinsing tanks. A third man cuts off rivet heads holding parts to be replaced, and so on. There is no crowding of workmen or materials. Only a single job is done on a truck frame at one time and there are enough trucks ready to be worked on so that a man can proceed from one to the next without waiting. Free stores adjacent to the work are kept stocked with all parts needed. Balanced production makes it easy to order material far enough in advance to assure its being on hand when needed. Proper routing of work and the group arrangement cuts down rehandling and lost time.

An important factor in the success of this method is the design of the shop building, which was planned with quantity production in view. All tools and equipment needed are available and there is close supervision.

Attention is given to constructive planning and scheduling. With such provisions the force necessary to carry on the work is surprisingly small. The reduction in labor costs and in the elimination of lost time will pay a handsome return on the necessary investment in spare trucks and parts.

### Bus Maintenance Calls for New Standards

**D**EVELOPMENT of bus mechanisms has been along entirely different lines than those through which the street car has progressed. Going back to the early days, the horse car was about the simplest vehicle that could be devised for its purpose. Its working parts were few and rugged. Nearly all of them could be built by a blacksmith and repaired by him. Naturally the transition to electric drive at a period when the electric motor was still in its infancy resulted in the retention of a good deal of the same philosophy, and much of it remains in the present-day cars and in the mechanics who repair them. Parts are sturdy and rugged, but many of them lack refinement in detail. Clearances are large and a considerable variation is permissible in fitting. There is much hand work and many parts are not entirely interchangeable. This is particularly true after the car has been through the repair shop several times.

Contrast this with the development of the bus, which is a product of the automotive school. Based on quantity manufacture, the parts are turned out by automatic or semi-automatic machinery. They are correct to size within a few thousandths of an inch, whereas in railway practice allowable variations may be measured in sixty-fourths. The general use of anti-friction bearings, high grade alloy steels and finely finished surfaces in bus parts, introduces new standards of workmanship and tolerances.

When it comes to repair work similar differences are noticeable. Many bus engine parts, for instance, are not reconditioned but are replaced with new ones, while railway parts are restored to their original condition as nearly as possible and returned to service. Naturally this wide departure in practice calls for workmanship of a radically different character. The bus maintenance man does more assembling and less repair work than his railway brother. But he must work within closer limitations, and must be, generally, a mechanic of an entirely different type.

### Another Setback for Suburban Transit

**I**MPROVEMENT of transportation facilities for commuters from New Jersey, Westchester and Long Island to New York City has received another setback in Governor Smith's veto of the Mastick bill. This bill would have given official sanction of the state of New York to the studies of suburban transit now being made by the Port of New York Authority. Approval by the state of New Jersey already had been given. Despite a certain amount of objection on the part of New York City authorities, the State Legislature had passed the Mastick bill. The Governor, however, refused his signature, and there the matter rests.

Something must be done, and done quickly. No one denies that. The volume of suburban traffic into and out of New York City outgrew the transportation facilities years ago. The growth of traffic continues, but the expansion of facilities proceeds at a snail's pace. It is equally plain that a bi-state body is required to solve this problem. The flow of passengers from New Jersey



to New York City is greater than that from all the other suburbs put together. Attempts made several years ago by the North Jersey Transit Commission to solve the problem showed that one state cannot do it alone. Therefore the Port Authority, an existing agency of interstate character, was called upon for aid. The members of that body were willing enough to tackle the job, and New Jersey was willing to let them do it, but New York has balked. What the next move will be is problematical.

Opinions differ as to whether the Port Authority is the agency best qualified to handle the suburban transit problem. The Governor intimates that it has enough to do with bridges, railroad freight movement and port planning. On the other hand, much of the passenger traffic moves over the same rails as the freight. The railroad officials with whom the Port Authority has been dealing for several years are the ones who are responsible for passenger movement. The Port Authority is already familiar with many details of the suburban transit problem. Moreover, since the Port Authority is the only bi-state agency of its kind now in existence in the Metropolitan district, it would seem better to give it the job rather than to await the creation of an entirely new agency. By disapproving of this expansion of its activities, the Governor of New York has dealt a serious blow to hopes of early improvement in suburban transit facilities.

### Track Cost Is Important Element in Considering Car Replacements

**I**N MOST discussions of the advantages of new electric railway equipment, consideration has been directed primarily to the probable reduction in car operating costs and the effect upon railway patronage and public relations. These are, of course, outstanding considerations. But in addition there is a definite relation between car design and the very important factor of track costs. Far too little attention seems to have been given to the possibility for making substantial reductions in track investment and maintenance costs through the use of lighter electric railway rolling stock, reductions in unsprung weight and general improvements which may result from the use of more effective springs designed to reduce the shocks and impacts transmitted from the moving car to the track structure.

Consideration of track costs, as we know them today, opens a broad field for speculation as to the economies possible by improved design of electric cars. Special work, in particular, accounts for heavy expenditures in both construction and maintenance. Anything which will reduce the impact of heavy cars pounding over crossings, switches and frogs is bound to result in substantial economies.

One great obstacle to an evaluation of the effect of car design upon track costs lies in the difficulty of measuring this relationship. Only after years of painstaking observation and experiment can even an approximation be obtained of the economies to be expected. Even then it would be hard to translate the effects of car weight and spring design into terms of track dollars. Not only does track in paved streets carry the cars for which it is intended, but it frequently carries heavy vehicular traffic as well. Any move toward lighter rails and foundations that might be made possible by improved cars would necessarily have to be made slowly and cautiously, since in large measure satisfactory track construction is

developed through the empirical process of experience. It is at best, therefore, a slow proceeding. There is no question, however, but that the effect on track costs is an important factor that must be taken into consideration in judging the results to be expected from new cars.

### Lightning Arresters Require Regular Inspections

**W**ITH the arrival of the summer months come frequent electrical storms and the attendant danger to electric railway equipment. While all power equipment and nearly all cars have some form of lightning protection, it must be maintained properly if it is to serve its purpose at the critical moment. It is particularly important, therefore, that protective apparatus not only be inspected prior to the season of thunderstorms, but also that a regular inspection schedule be adopted and rigidly followed. It is necessary, too, that a type of arrester adequate to the service in which it is used be installed and the proper method of testing be employed.

Some knowledge of what happens in the electrical circuit when static electricity makes itself evident is necessary to an intelligent program of lightning arrester maintenance. Accumulated static electricity in the clouds either strikes the system directly or releases bound charges, the second being the more frequent occurrence. Another source of danger is the internal disturbance. The discharge of energy from inductive circuits of motors at the time of switching often punctures the insulation. Few railway men appreciate that the arresters are protecting their equipment from such charges as well as from lightning.

The type of arrester to be selected depends on the severity of discharges from which protection is needed. The electrolytic or aluminum cell arrester is the most effective, although the spark-gap porcelain-enclosed type is favored in sections of the country where lightning storms are not severe, because of its lower first cost and simple maintenance. Whatever type of arrester is used on a car, it should be protected from rain and wheel wash. It is most essential that it provide a direct path from trolley to ground. If electrolytic arresters are kept in service all winter they should be installed inside the car to prevent freezing.

Every arrester requires regular inspection and maintenance, especially during the summer. Spark-gap arresters should be examined after every electrical storm and any damaged units replaced. Carborundum blocks of the multipath type need periodical inspecting, and gap settings for the higher-voltage carborundum arresters, which use a small gap in series with the block, need checking.

With the electrolytic arrester a regular routine of inspection should be adopted and adhered to rigidly. A small current flow is needed to maintain a film on the cell plates. On this account the cells must be charged frequently and kept in balance, particularly if of the three-cell type. The arresters themselves need testing at least once a month during the summer. For this purpose a testing set such as that devised in New Orleans and described in this issue is of value. It is good practice to take the arresters apart for storage in the winter, wash the plates and the jar and throw away the used electrolyte and oil.

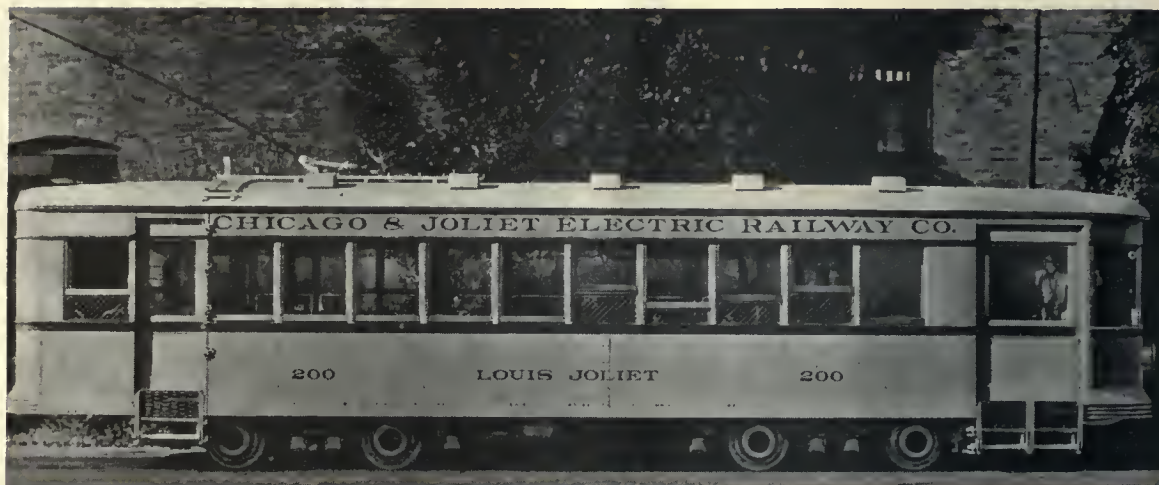
Lightning arresters are very necessary pieces of equipment, but improper installation and lack of maintenance can nullify the protective value of any type.

# Energy from Dynamic Braking Cuts Heating Costs

System of heating using regenerated energy along with that wasted in acceleration succeeds in Blackhall car. Manual control superimposed on automatic lends flexibility without interference with regular air braking

By *A. W. Baumgarten*

Division Engineer Chicago & Joliet Electric Railway, Joliet, Ill.



The heating tests were made on the car "Louis Joliet," which was exhibited at last year's A.E.R.A. convention

**E**LECTRIC heat in railway cars has long been considered the most desirable, but its cost has sometimes been considered prohibitive, particularly where the average winter temperature is less than 40 deg. F.

For this reason the Chicago & Joliet Electric Railway has for many years used fuel heaters in its city and interurban cars. Within the last few years a number of railway properties, such as the United Railways & Electric Company of Baltimore, the Twin City Rapid Transit Company, the Pittsburgh Railways, and others, have tried several plans of utilizing the waste energy of motor rheostats for car heating. Naturally, this afforded considerable reduction in heating costs, for the only additional cost is an investment in inclosed resistors which can be installed safely within the car. However, except in very mild climates, additional heaters using power from the trolley are needed in conjunction with motor rheostatic heating. With no additional heaters, in colder weather the operator would be tempted to run on resistance points to maintain a comfortable temperature in his car.

Some years ago the writer conceived the idea of utilizing waste energy of starting resistance losses for car heating, together with the much greater waste energy of braking. This necessitated the design of a dynamic brak-

ing system whereby the driving motors would become generators so that energy therefrom could be dissipated through the same motor rheostats. Although dynamic braking was not new the automatic control and use of this waste energy for car heating had not previously been used to any extent.

## SAME CONTACTORS USED FOR ACCELERATION AND BRAKING

This dynamic braking and heating scheme has been incorporated in the motor control of the new light-weight worm-drive car of the Chicago & Joliet Electric Railway that was exhibited at the Cleveland convention of the American Electric Railway Association last October. This car was put in regular city service in February.

Both motor acceleration and dynamic braking are controlled with standard remote contactors and a standard master controller. Only three additional contactors are needed for the dynamic braking. In braking and heating the contactors are actuated by an automatically controlled sequence drum that is interlocked with the motor controller and brake valve. This dynamic braking sequence drum automatically cuts out heater resistance as the car speed decreases. Its rate of movement is controlled by a current-limiting relay carrying the main generated current. This current-limiting relay prevents overloading of

TABLE I—DYNAMIC BRAKING TESTS ON CHICAGO & JOLIET WORM-DRIVE CAR NO. 200, NOV. 16, 1927

M.P.H.	Time, Seconds	Maximum Volts, Two Motors	Ampere per Motor Average	Motor Maximum	Weight of Car, Pounds	Braking, M.P.H.P.S.
22.5	11.50	...	81	120	26,100	1.96
22.0	9.80	...	82	120	26,100	2.25
12.0	5.33	...	85	140	26,100	2.25
21.4	8.98	...	96	132	26,100	2.39 *
21.0	7.77	...	104	140	26,100	2.70 *
20.0	7.57	...	93	132	26,100	2.65 *
13.0	6.82	340	78	140	26,100	1.91
12.7	5.98	340	79	140	26,100	2.12
20.8	7.90	545	100	132	26,100	2.63
21.7	8.33	545	95	132	26,100	2.60

\* Maximum relay setting.

the motors while they function as generators during braking.

The starting and braking resistance units consist of edgewound resistors entirely inclosed in aluminum cases. These are placed under the car seats in box-type aluminum seat pedestals having louvers on all sides to allow free circulation of air. The seat pedestals prevent the passengers from placing their feet on these heaters, some of which reach quite high temperatures. A second set of open-type resistor units is placed under the car body for summer use when heat in the car is not desired. The change from inside to outside resistors is made by a six-pole, double-throw switch under the car. The aluminum cases of the heater resistors are grounded through a relay so that should any part of the resistor circuit open or become grounded the control circuit will be opened.

The motor equipment on this car consists of four 300-volt motors, with pairs connected permanently in series. This simplifies the dynamic braking control, for the load of the four machines, when acting as generators, can be divided equally by interchanging fields of the paired motors.

The dynamic braking action is governed by the standard safety-car control air valve in which there is an extra port between the release and air application positions of the valve. A circuit-closing air valve is connected to this port, so that when the car operator moves the brake valve to the proper position this air valve closes the dynamic braking control circuits. The remainder of the braking operation functions automatically. Any desired rate of braking can be obtained by changing the setting of the current-limiting relay.

Dynamic braking does not in any way interfere with air braking and, if desired, air braking may be used at the same time as the dynamic braking. Also, the car operator can at any time cut off the dynamic braking and reduce car heating by throwing a snap switch placed alongside the master controller. A manual control, obtained through a foot switch, is superimposed on the automatic control of the brake so that the car operator can stop the movement of the sequence drum and use as much or as little braking as desired. This manual control enables the operator to coast down steep grades using the dynamic brake without bringing the car to a stop.

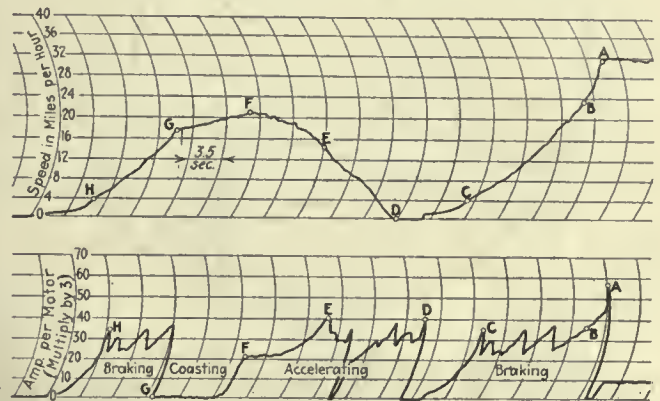
TABLE II—DYNAMIC AND AIR BRAKING COMBINED, WORM-DRIVE CAR NO. 200, ON NOV. 18, 1927

M.P.H.	Time, Seconds	Amperes per Motor—Average · Maximum		Weight of Car, Pounds	Braking, M.P.H.P.S.
21.5	5.54	89.6	138	25,200	3.88
21.0	5.90	82.1	147	25,200	3.56
22.0	5.20	88.9	147	25,900	4.23
19.0	4.73	84.3	136	25,900	4.02
19.0	4.78	89.5	140	25,900	3.97
20.2	5.13	79.1	150	25,900	3.94
20.2	5.40	84.2	148	25,900	3.74
20.0	5.04	82.8	138	25,900	3.96

Previous to putting this light-weight car in regular service a long series of tests was made by engineers of the railway and the Westinghouse Electric & Manufacturing Company. The car was equipped with high-speed Esterline twin type graphic meters, recording simultaneously combinations of car speed and motor current, motor current and line voltage, and generator current and voltage. Indicating thermometers in the car and thermocouples installed in the motor windings determined the temperature. Recording watt-hour meters in the circuits recorded energy consumption and energy returned to the car in heating.

NO DELAY IN ACTION OF DYNAMIC BRAKE

Typical speed-time and current-time curves obtained during acceleration and dynamic braking are reproduced. At the right of point A on the curves the car was running at a speed of 32 m.p.h., with a current of 30 amp. per motor. Power was shut off with the brake valve in dynamic braking position. The time interval to obtain maximum dynamic braking, as indicated by the break in the motor-current curve, was only 0.65 second.



Typical speed-time and current-time curves with dynamic braking obtained in Chicago & Joliet tests. These curves, reading from right to left, show car speed and current per motor. Chart speeds in the tests were 3.5 seconds per vertical division

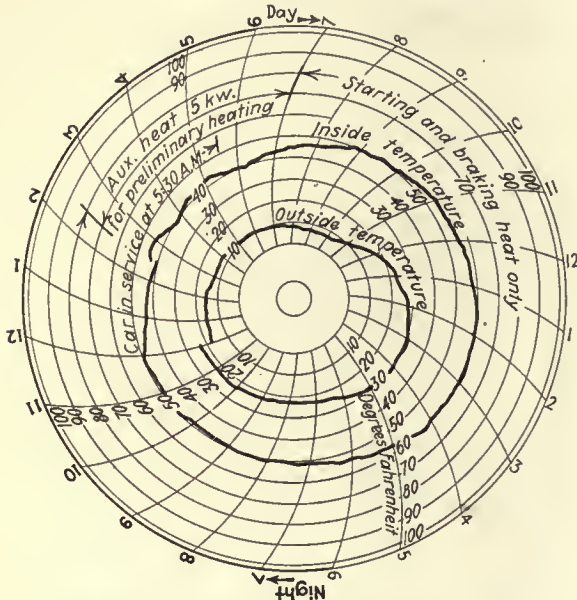
The points indicated at A, B, C, etc., on the corresponding curves are identical time points. No air braking was used except to stop the car after reaching a speed of less than 2 m.p.h. Although the speed of 32 m.p.h. at point A is abnormally high the maximum motor current in braking is only about 174 amp. The braking rate between points A and B is about 3.33 m.p.h.p.s., and between points B and C it is 2.03 m.p.h.p.s. As shown on the motor-current curve, the advance from each dynamic braking point to the next occurs at the same speed each time the car is stopped when the current relay setting remains fixed, and the rate of braking is always the same on level track.

The dynamic braking in all cases was extremely smooth, as can be noted from the speed-time curves. By setting up the current limiting relay, high braking rates were obtained without discomfort. The results of a number of tests using various speeds and relay settings are given in Table I. In a large number of tests where the average braking rate was 2.36 m.p.h.p.s., the average motor current was 87 amp., whereas the average motor current for the corresponding rate of acceleration is about 137 amp. On this basis the average braking currents are found to be about 63 per cent of those for average acceleration. The maximum voltage developed across two motors when braking from a speed of 28 m.p.h. was 545 volts, which is less than trolley voltage.

Table II shows results obtained when using dynamic and service air braking simultaneously. A maximum retardation of 4.23 m.p.h.p.s. was obtained without wheel slippage. On tests made with air braking only, such high rates of retardation were not possible, and wheel slippages occurred at rates less than those shown in Table II, even with sand on dry rails. The reason for such a difference would appear to be that air brakes cannot be adjusted equally on all wheels and, with the air braking, one or more pairs of wheels will slide at high braking rates. When using both forms of braking at high rates the air braking is only about 50 per cent of the total—not sufficient to slide the wheels—and the remaining 50

heaters of 5 kw. capacity on a 50 deg. F. thermostat control. These are turned on about two hours before the car is scheduled to leave the barn to have it warm in the morning.

A typical temperature chart taken in the car while in regular service on March 5 is shown in the accompanying illustration. The outer curve is the recorded temperature inside the car, while the inner curve gives the outdoor temperature, plotted from a similar temperature record taken on the same day. The car was put in regular service at 5:30 a.m. with an inside temperature of 40 deg. F. obtained with the auxiliary heaters, and an outside temperature of about 12 deg. A temperature of 50 deg. and more was maintained in the car, using the starting and braking heat only, with an average outside temperature of about 20 deg. In general, it has been found that the average temperature rise obtained with dynamic braking and starting rheostat losses is about 30 to 35 deg. During stormy weather and when passenger loading is heavier, higher temperature rises occur. Except in extremely cold weather, the heat obtained from braking and starting is ample to maintain a comfortable temperature in the car.



Temperature curves obtained on March 5, 1928

Car was put into service at 5:30 a.m. after preliminary warming with auxiliary heaters. Resistors used for starting and dynamic braking then supplied sufficient heat to maintain an interior temperature approximately 30 deg. F. above outside atmosphere.

per cent of dynamic braking is fully equalized between all the wheels. In fact, tests on very slippery rails showed that with dynamic braking it was not possible to slide all the wheels at once; those that did slide started to turn again in a short distance. Better rates of retardation appear possible, consequently, on bad rail with dynamic braking.

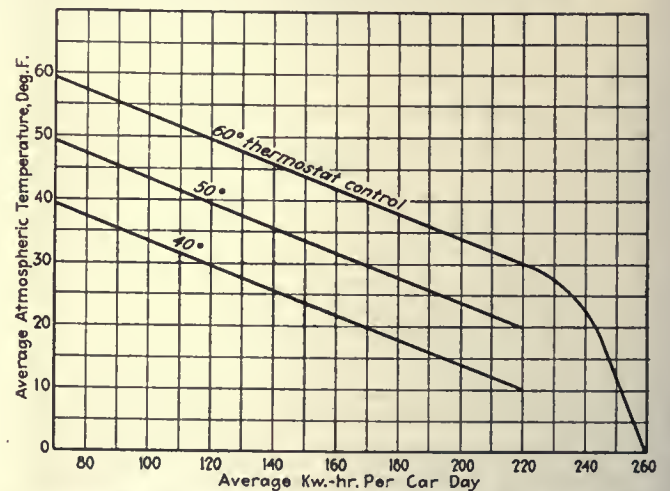
With thermocouples in the motor windings separated from the copper with only one layer of tape, tests were made on a predetermined schedule of six stops per mile. A six-hour run of a loaded car was made on a schedule of 11 m.p.h., using dynamic braking only. The same tests were repeated using air braking alone. With dynamic braking the maximum motor temperature was 83 deg. C., as compared with a maximum motor temperature of 73.5 deg. C. with air braking. These are practically hot-spot temperatures. Since the permissible temperature rise is about 100 deg. C., it is highly improbable that dangerous motor temperatures would be reached during winter as a result of dynamic braking. While not very accurately determined, due to the wide variation in voltage, the tests showed about 8 kw. was the average return of power, to which must be added the loss in the resistors from accelerating currents, or about 20 per cent of the total input.

Since putting the car in regular service last February it has not been necessary to use any heating beside that derived from the dynamic braking and the accelerating resistance losses. The car is equipped with auxiliary

SUBSTANTIAL ECONOMY IN HEATING OBTAINED

Several years ago the railway operated a few cars with electric heaters on 60 deg. thermostat control. Meters were installed in the heater circuit of two of these cars and accurate records kept of the heating energy for two seasons. Table III shows the heating energy, the motor energy per car-mile and the average heating energy per car per season for the year 1924.

The upper curves in the accompanying chart were plotted from these records. The average kilowatt-hours per car per day based on the average atmospheric temperature are shown. The cars upon which these records were taken had a total heater capacity of 13 kw., which



Energy consumption to heat city car electrically for various atmospheric temperatures and thermostat settings. The 60-deg. thermostat curve is from tests; 50 and 40 deg. curves are calculated

accounts for the sharp bend in the curve at 25 deg. atmospheric temperature. In other words, the 60 deg. thermostat would not cut off the heaters at all when the outside temperature was below 25 deg. The two lower curves indicate the calculated energy with thermostat control set to cut off at 40 deg. F. and 50 deg. F., respectively.

The comparative annual costs per car of electric heating and heating obtained from dynamic braking and

starting rheostat losses is shown in Table IV. These costs will depend on average winter temperature, which in the latitude of Joliet is about 33 deg. The estimated saving of \$300 per car per year with dynamic braking is conservative, as it includes only the energy cost. This method of braking during winter will also effect savings in brakeshoe wear and cost of collision accidents.

TABLE III—COST OF ELECTRIC HEATING ON CITY-TYPE DOUBLE-TRUCK CAR WITH 60 DEG. THERMOSTAT CONTROL

Month	Kilowatt-Hours			Total Heat*	Average Car-Miles per Day	
	Per Car-Mile	Motor	Heating per Day			
January, 1924.....	3.46	2.31	1.15	207	6,417	180
February.....	3.43	2.23	1.20	216	6,048	180
March.....	3.25	2.20	1.05	189	5,859	180
April.....	2.54	2.24	0.30	54	1,620	180
November.....	2.66	2.20	0.46	83	2,490	180
December.....	3.39	2.30	1.09	196	6,076	180
				28,510		

Average kilowatt-hours per car per day based on 150-day season.... 190 kw.-hr.

\*Total heat is kilowatt-hours per car per season.

The electric heating energy cost has been based on the average charge per kilowatt-hour. As the maximum demand for heat invariably occurs during the peak, the cost of energy used for heating is higher because of the increased peak demand. Furthermore, the capacity of railway substation equipment must be sufficient to provide for this demand. If the average heater load per car

TABLE IV—COMPARATIVE ANNUAL OPERATING COSTS PER CAR PER YEAR FOR HEATING

ELECTRIC HEATING	
Energy cost, 28,510 kw.-hr. at 1.6 cents.....	\$456
Interest and depreciation, 12 per cent.....	30
Maintenance.....	5
Cost of hauling 250 lb. at 4 cents.....	10
<b>Total cost per car per year.....</b>	<b>\$501</b>
DYNAMIC BRAKING AND HEATING	
Interest and depreciation at 12 per cent.....	\$106
Maintenance and inspection.....	25
Auxiliary heat power, 3,000 kw.-hr. at 1.6 cents.....	48
Hauling 525 lb. at 4 cents.....	21
<b>Total cost per car per year.....</b>	<b>\$200</b>
<b>Estimated saving per car per year.....</b>	<b>\$301</b>

is 12 kw. and substation equipment is valued at \$60 per kilowatt, then the total electric heater investment would be increased by \$720 per car. At 12 per cent interest and depreciation, the operating cost of electric heaters would be increased \$86 per year. The total estimated saving through dynamic heating and braking may therefore be taken at approximately \$400 per car per year.

## Educational Opportunities in Los Angeles

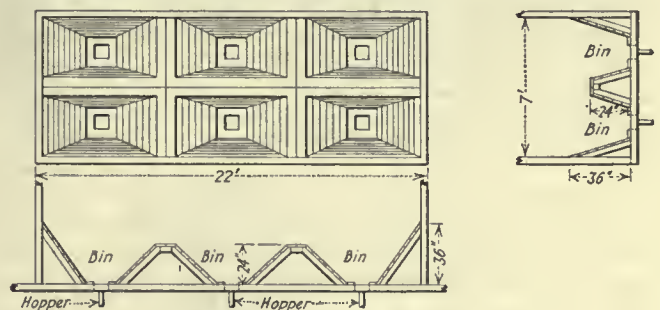
TWENTY-THREE years after the opening of the first courses in engineering at the University of Southern California, Los Angeles, Cal., a college of engineering has been created at that institution. The demand for engineering education in this section of the southwest and the need of industries in southern California for centralized and adequately-equipped engineering laboratories has led the board of trustees of the university to authorize this college. Philip S. Biegler, professor of electrical engineering at the university for the past five years, has been appointed acting dean by President Rufus B. von KleinSmid. From 1918 to 1921 he served as associate engineering editor of *Electrical World*, a McGraw-Hill paper.

This new college, which will open its doors in September, will be made up of five major divisions with separate chairmen. The divisions comprise chemical engineering; civil engineering; electrical engineering; mechanical engineering and petroleum engineering. In addition to the four-year courses leading to degrees of bachelor of science in any of the divisions of engineering, and master's degrees for graduate work, there has been established the degree of civil engineer for distinction in the practice of engineering.

## Sand Car with Six Hopper Outlets

RAIL sanding equipment has received considerable attention the past year on the New York & Queens County Railway, Woodside, N. Y. Simplification of the rail sanding methods and continuity of sand flow have been considered of such importance that a special sanding equipment was designed and constructed in the shop. A second-hand single-truck passenger car was purchased and stripped of all internal fittings. All glass was removed and the windows boarded with ½-in. x 6-in. material from the sill to the letterboard. Necessary changes were made on the end and window posts to obtain a neat appearing and weatherproof job. Suitable solid sliding windows were left in the sheathing to permit of filling the car with sand.

Six sand bins approximately 3½ ft. wide by 7 ft. long by 2 ft. high were erected from 2-in. x 4-in. timbers and the sides were tapered to afford a minimum of fric-



Bin arrangement in sand car

tion to the sand flowing by gravity to the hopper located in the bottom of each. These frames were covered with 1¼-in. spruce which was ship-lapped 1¼ in. on each end to minimize leakage. All were painted with two coats of heavy metallic red paint. The capacity of each bin is approximately 1.5 cu.yd. of dry sand.

The bins are equipped with Brill dump-it type sand hoppers and have spouts in front of and between the wheels directly over each rail. Three operating levers are installed on the front and rear platforms. Two of these levers control the sand flow in front of the leading wheels and the other controls one in the center. They are held in a latched position by a notched circle plate, thus permitting any desired degree of sand flow. The operating levers normally are held in the off position by a heavy coil spring attached to the lower extremity of the lever. This multiplicity of sanding outlets has eliminated the constant shoveling of sand into the hoppers, decreased the possibility of failure and permits the operator to see the results obtained by the sanding equipment.

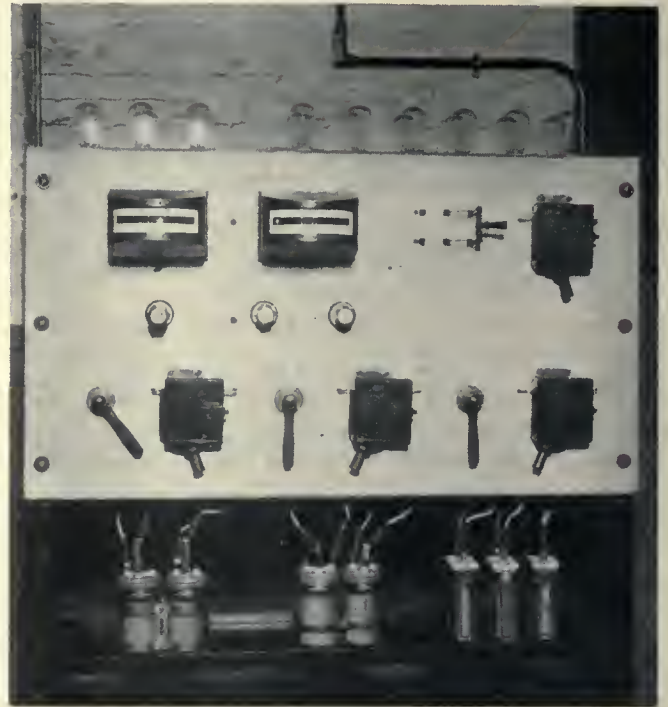
# Lightning Arrester Testing Set

By JEFF RUCK

Engineer Rolling Stock and Shops Department, New Orleans Public Service, Inc., New Orleans, La.

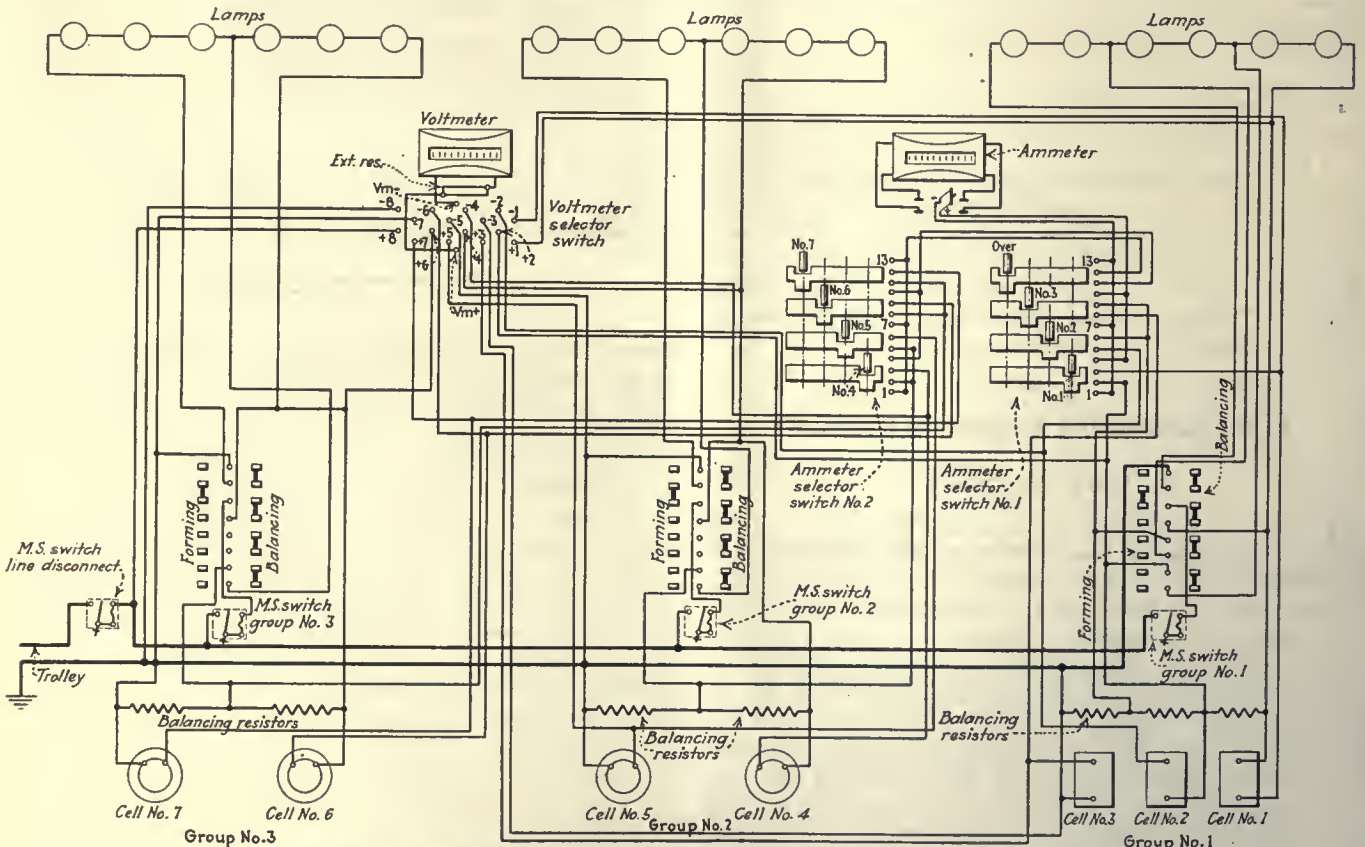
CHARGING and balancing lightning arrester cells of the electrolytic type, as used by the New Orleans Public Service, Inc., is done with a testing set whose general layout and connections are shown in accompanying illustrations. Three groups of cells may be handled at one time. In the half-tone shown the Westinghouse two-cell type is on the left, the General Electric two-cell type in the center, and the General Electric three-cell type on the right. Each group is controlled by the switch directly above it. The entire set may be disconnected from the power supply by the switch at the upper right corner of the switchboard.

When preparing a cell for service, a protecting film must be formed on the plates. To do this the reverse handle is moved to the left, thereby placing the six lamps in series with the cells. After from ten to twenty seconds the reverse handle may be moved to the right, placing the cells in parallel with the lamps and balancing coils. The condition of balance of the cells may now be determined by using the voltmeter and taking a reading across each cell. The true voltage is secured by multiplying the readings by four. Usually the cells are not balanced with respect to each other, and the balancing current may be left on until the voltage across each cell is very nearly the same, which may require two or three hours. The current flowing through the cells may be checked by the double-scale ammeter which has a range of 1.0 amp. on the upper scale and 50 milliamperes on the lower scale. The double-pole, double-throw switch is used for selecting the proper scale. The two ammeter selector switches are used for sending charging



General view of lightning arrester testing set

or balancing currents through the ammeter. The need for balancing of the voltage drop across cells before placing them in service becomes greater with the use of the General Electric three-cell type arrester, which is used without balancing coils. However, all guesswork has been eliminated in connection with the two-cell type of arrester as well, since it is possible to send out arresters from the overhauling shops which are known to be in first class condition.



Wiring diagram for lightning arrester testing set of the New Orleans Public Service, Inc.

# Truck Overhauling Systematized

## in Brooklyn

In the Coney Island shops of the Brooklyn-Manhattan Transit Lines car trucks are brought in on a dismantling track and go out on assembling tracks. Between and perpendicular to these tracks are eight bays used for inspection and repair work

By Clarence W. Squier

Associate Editor *Electric Railway Journal*

CONTINUOUS flow of the work along definite paths is an outstanding feature of the truck overhauling plan carried out in the Coney Island shops of the Brooklyn-Manhattan Transit Lines. The large volume of work handled permits specialization of the various subdivisions to a degree not found in many electric railway shops. Flexibility, so important in this class of work, results directly from the "spot" system used, in which truck frames are placed on stands in definite positions for various jobs, such as stripping, repairing and building up.

Some 20,000 sq. ft. of floor space in the central part of the large main repair shop is devoted to truck overhauling. On the west side of this section the trucks are brought in on one track and dismantled, and on the east side the trucks are assembled and returned to the car bodies on two similar tracks. The space between is divided into eight bays devoted to the detailed inspection and repair of the various parts after they are dismantled. Seven of these have 5-ton overhead traveling cranes controlled from the floor. A 15-ton overhead traveling crane

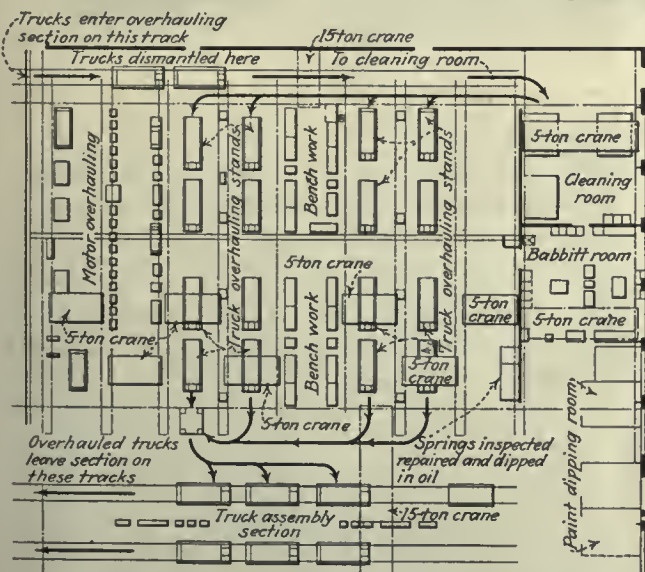


Dropping out wheels and journal boxes while the truck frame is lifted and carried by overhead crane to the cleaning room

serves the dismantling track and another traveling crane of the same size serves the two assembly tracks.

Trucks are brought into this section of the shop for overhauling every two years. Intermediate and running repairs are made in another section. During the intervening two-year period it frequently happens that trucks are changed, so that when the car comes in for its next overhauling it may have different trucks from those with which it went out originally. In that event the trucks which are under the car when it comes in for repairs are sent to the intermediate truck repair section, and those which were under the car when it went out originally are removed from other cars in the intermediate truck repair section and are sent to the truck overhauling section for the regular scheduled inspection and repair. The procedure insures that trucks are overhauled on their regular schedule and gives increased flexibility to intermediate repair work.

When cars are brought into the repair shop they come in on the track on the west side, which extends into the truck overhauling section. After the car body is lifted off, the trucks are pushed by storage-battery tractors into position on the dismantling track in the truck section. Provision has been made for future installation of control equipment so that trucks can be run under their own power into and out of this section. The proposed equip-

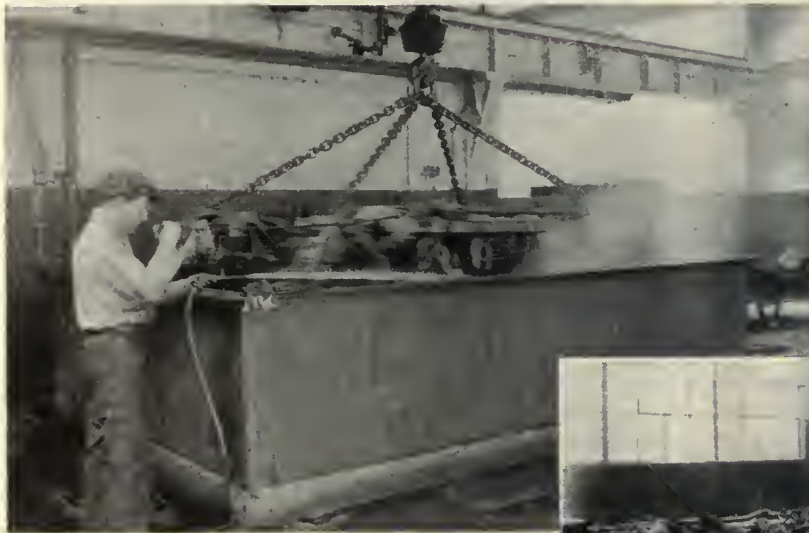


Truck overhauling section in Coney Island shops of Brooklyn-Manhattan Transit Lines



bolsters, journal boxes, bottom brake rods, miscellaneous hangers and brake rigging parts, spring planks, radius bars and elliptic springs are placed on large trays with legs to raise them off the floor so that an elevating truck platform can be run underneath for raising and transporting this material to the cleaning room. A clamp is placed over one end of each complete elliptic spring so that the various sections comprising it are held together. Small parts such as bolts, nuts, etc., are put in pails and are carried to the cleaning room by the electric trucks.

The cleaning room at present has three tanks, each 10x14 ft., with its top 3 ft. above the floor level. Two of the tanks have a chemical cleaning solution, steam heated to the desired temperature. The third tank is for rinsing. Truck frames and parts to be cleaned are lowered into the cleaning solution by a 15-ton floor-operated overhead traveling crane which serves the cleaning room. With the present cleaning solution, when the truck and parts come out, after remaining in the tank for three hours, they are about 75 per cent clean. They then are placed over the washing tank and water is sprayed on them with



At top—Placing a truck frame in the chemical cleaning tank.  
Center, left—Washing a truck frame after it has been removed from the chemical cleaning tank.  
Center, right—Cleaning a frame with a wire brush.  
At bottom—A truck frame and stand containing journal boxes after they have been removed from the cleaning tank.

ment consists of contactors and resistors controlled from push-button stations alongside the tracks. A single lead will supply power to the truck to be moved.

#### STRIPPING OF TRUCKS IS DONE RAPIDLY

As soon as the truck is run in, all large parts are loosened and the 15-ton traveling crane over the incoming track is used to lift off removable parts, such as the motor, gearcase, bolster, elliptic springs, spring plank, radius bar and shoe beams. Motors enter the motor overhauling section immediately adjacent to the track on which the trucks are stripped. The journal boxes, with wheels and axles, are left on the track as the truck frame is lifted and carried to the wheel and axle shop, after which they are moved to the wheel and axle shop. Waste and oil are removed from the journal boxes and are placed in large drums, which when filled are transported by electric tractors to the waste and oil reclaiming department.

The larger parts removed from the truck, such as

a hose, the nozzle of which has a metal scraper at the end so that accumulations of grease and dirt can be loosened readily.

After this cleaning, the trucks and parts are returned to the section between the incoming and outgoing tracks and are placed on assembling stands which raise the truck frame up to a convenient height for the workmen. The general type of truck overhauling stand used in the B.-M.T. shops was described in *ELECTRIC RAILWAY JOURNAL* for May 19, 1923, page 853. Those used in the Coney Island shops have locked chests for tools extending across one end. The workman has one key and the foreman a duplicate.

#### TESTING FOR DEFECTS IS DONE THOROUGHLY

In the overhauling bay, truck frames are cleaned with a wire brush. An inspector goes over them carefully to discover cracked parts, loose rivets and worn parts which are to be replaced. He indicates any changes in construction that are to be made. The practice of the con-





At left—Cutting off heads of rivets to loosen parts that require replacement. At right—Truck frames with parts marked in chalk for replacement and rivet heads cut off so as to loosen parts that are to be removed

pany is not only to put the trucks in as good condition as they were when new, but to incorporate any improvements in material or design that are available. Some of the changes that are now being made during overhauling are the installation of manganese wear plates on journal boxes and pedestals, installation of new end frames, new spring plates and Potter end castings on elliptic springs. The inspector chalks with X marks the parts which are to be taken out and replaced. Parts which in general are being replaced, but which will not be changed on a particular truck are marked O.K. with chalk. For instance, the installation of manganese wear plates has been going on for some time. On some of the trucks that come in the replacement already has been made. The inspector tests the plates with a magnetized iron bar, as manganese steel is non-magnetic, to determine whether the plates are to be replaced or not. He detects cracks in gusset castings which it would be impossible to see without the thorough cleaning to which the trucks are subjected. All defective material is indicated for removal.

After the inspection all rivet heads are burned off with an oxy-acetylene cutting torch if the rivets need replacing or if it is necessary to loosen parts that must be removed. Where cracks in large parts are found, these are burned out to determine their depth and to see if a satisfactory weld can be made. After the heads are cut off, the rivets are driven out with an air punch.



Dismantling brake rigging at a bench

Following removal of defective parts or those which are to be replaced, the new material is installed. New parts are held with rivets if this was called for originally. For this purpose there are several rivet-heating furnaces which can be moved alongside the work for the convenience of workmen. In assembling, all joints are coated with red lead. After the new parts have been attached, the truck is placed over a test jig to make certain that the pedestal jaws line up and have proper clearance. The present practice is to have the jaws  $\frac{1}{8}$  in. wider apart than the journal boxes.

#### INDIVIDUAL PARTS ARE BROUGHT BACK TO STANDARD DIMENSIONS

All of the material removed from the trucks goes to adjacent benches or departments for dismantling and individual repairs. Brake rigging, for instance, is taken to a bench and completely dismantled. Worn holes are filled in by electric welding and are redrilled. Worn surfaces are also built up and finished to size. This includes such parts as live and dead leaders, motor nose suspensions and shoe-head hangers.

Journal boxes are taken to the blacksmith shop after they come out of the cleaning tank. The old liners for the pedestal ways are removed and the boxes made ready for installation of new ones. From the blacksmith shop they go to the machine shop and are assembled ready for installation in the truck. New torsion springs are installed for the journal box lids. As these require a little more clearance than the springs previously used, a recess has to be cut with the oxy-acetylene torch. The old wear pieces are taken off journal bearings, which then go to the babbitt room, where they are rebabbitted. A new wear piece is then installed and they finally are finished to proper dimensions.

One section of the shop is devoted to inspection and repair of springs. The truck elliptic springs have six sections. After being cleaned with a wire brush, each is inspected carefully for broken leaves. After defective parts have been replaced, the assembled springs are dipped in an oil bath and placed on a rack to drain. Motor nose suspension springs go through the same process.

#### ASSEMBLING IS DONE ON STANDS

After everything except the larger parts has been assembled, the truck frames are brought to the truck assembly track and have the journal boxes, wheels and axles placed under them. They then rest on elevated



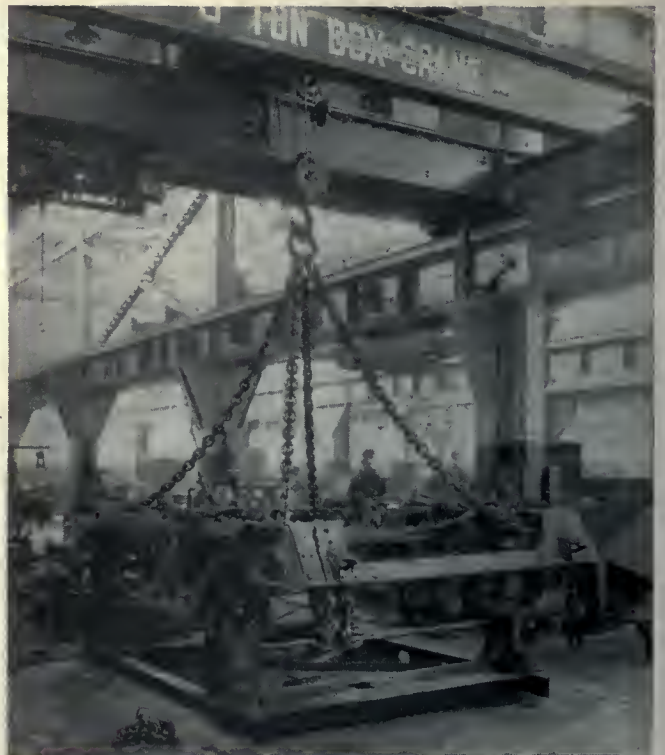
At left—Heating rivets in a portable fuel oil forge alongside the work  
 At right—Riveting new manganese wear plates to truck pedestals

stands while the remaining work is going on. Repair bolsters, elliptic springs, spring planks, radius bars, etc., are installed, and motors with gearcases, axle caps, etc., are put in place. The truck frames are sprayed with one coat of black paint before the assembling commences and with another coat after it is completed. The work goes on before the first coat is dry. Dipping tanks and draining racks will be installed later, so that trucks can be dipped in paint at the beginning and end of the assembling instead of paint being sprayed on.

After final adjustments have been made, the trucks are run back to the car repair shop for placing under the car bodies. High-voltage tests and running tests are given the equipment after it is installed in the cars.

The present schedule requires that nine cars be completed each 5½-day week, which means that eighteen trucks must be overhauled in the same time, or a maximum of four per day. More than four trucks at a time are being handled, since otherwise one set of workmen might interfere with another. In the overhauling bays are a large number of repair stands on which rest trucks in various stages of repair. The man doing a particular job moves from one truck to the next and completes his work, and then another follows along. This makes the system very flexible and enables the work to be done with surprisingly few workmen. One man is sufficient to do most of the jobs. Of course this could not be done were it not for the ample facilities in labor-saving equipment in the shop.

When the truck comes into the overhauling section, one man dismantles the large parts with the aid of a man in the overhead crane. There is but one man in the cleaning room. The dismantling of brake-rigging parts, such as live and dead levers, motor nose suspensions, and shoe-head hangers, is done by one man, who also carries the parts to the benches. There another man dismantles the various parts and does the bench work. The wire-brush cleaning is done by one man, and one inspector locates defects and looks after parts to be replaced. He tests all rivets with a hammer, and marks any blowholes which



At top—Jig for testing trueness of pedestal guides on truck frames  
 At bottom—Placing a truck frame on the testing jig



At top—Truck assembly section—bolsters, springs, motors, shoe beams, etc., are placed on trucks here  
 At bottom—Pushing an overhauled truck by means of an electric tractor out of the overhauling section for placing under car body



Dipping tanks and draining racks for springs

The tank at the left contains oil in which the springs are dipped. A quantity of motor suspension springs are shown in piles on the draining basin; at the extreme end of the rack are three elliptic springs.



Free stores are located immediately adjacent to the truck overhauling section. Small parts are kept in bins and larger parts in racks

might be dangerous and require filling up. One man with a blow torch loosens all defective parts, while a machinist with one helper puts on the new ones. A crew of three men do the riveting. One heats the rivets, one operates the air riveter, and the other holds on. Where a rivet hole is too large, or oblong, a welder fills it up and then it is redrilled with an air drill. One man puts on small parts, such as brake-rigging springs. A total of four men do the bench work and inspect various detail parts. On the general assembling track where four trucks are being worked on at the same time, only four men with two helpers are needed.

In the layout of shop equipment and facilities particular attention has been given to prevent unnecessary movement of the workmen in obtaining material for the repairs, in handling it to the job and in the use of any hand tools needed for the work. The material and spare parts for truck repairs are kept on racks and in steel bins and cabinets alongside the work. No order forms or requisitions are used for obtaining parts from these free stores. Most of the parts are of such a nature that there is no temptation toward theft and parts that are of brass or copper are kept in locked cabinets.

Small parts such as bolts, nuts, rivets, etc., are kept in steel cabinets with bins of convenient size. The practice is to replenish material from the general storeroom or from departmental stores at frequent intervals and about one week's supply is kept on hand in the truck overhauling section. This method also provides a convenient check of the material on hand or which may be needed in the immediate future. It also insures that the material is at the spot ready for use as required.

Portable hand and air tools such as riveters, punches, drills, chisels, etc., are issued to workmen on a check system. Each workman has a tool box right at his job to hold his tools, and he can lock it to make sure that the tools are always in place when they are needed. Duplicate keys to all lockers are in charge of the general foreman of the section.

The section is also provided with waste bins and receptacles for parts which are to be moved to other sections of the shop for reclaiming or repairs. All bins and receptacles are of such a form that they can be picked up quickly by an elevating platform truck and moved swiftly and without confusion. The section is also equipped with several inclosed urinals but near the work so no time is lost and workmen have no excuse for leaving the section when work is in progress. All these facilities help to speed up work and insure that highest efficiency is maintained.

# Oil House for Denver Tramway

By H. L. MINISTER  
Denver, Col.

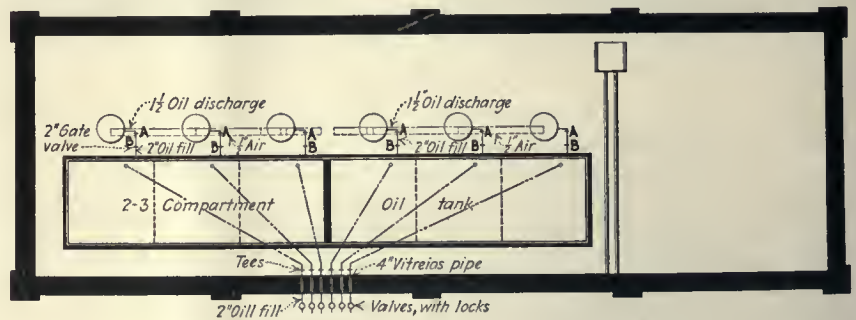
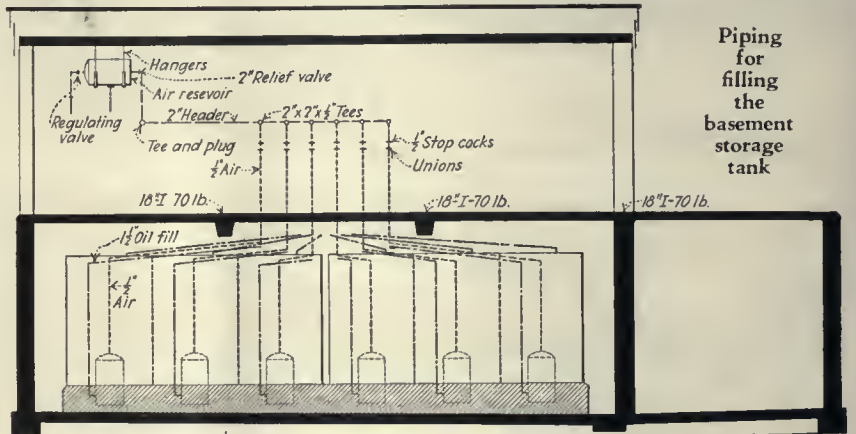
IN THE DESIGN of a new oil house for the Denver Tramway attention was given to future as well as to present needs. The location was an old river or lake bed; therefore precautions were needed to prevent entrance of water. This also made the excavation difficult and increased the cost. In digging for the foundation a good grade of sand was encountered, a portion of which was used in the concrete for the building. This sandy soil and gravel bed necessitated the use of sheet-piling and also required the handling of more dirt, both in excavating and in backfilling.

On completion of the excavation a heavy reinforced-concrete mat used to insure a firm foundation and avoid settling on account of shifting of the sandy soil was first put in. Next the reinforcement for the concrete walls and pilasters was inserted and they were poured. This reinforcement consisted of old steel rails and wire mesh. Allowance was made for ties and bonds between sub-floors or mat and the main floor, sump, walls and concrete tank foundations. Approximately 1/2 in. of bituminous cement was poured between the finished floor and the mat and in the various ties. To make the basement watertight the outside wall was painted with a heavy coat of bituminous cement. This was necessary, as during high water the water level would be above the basement floor.

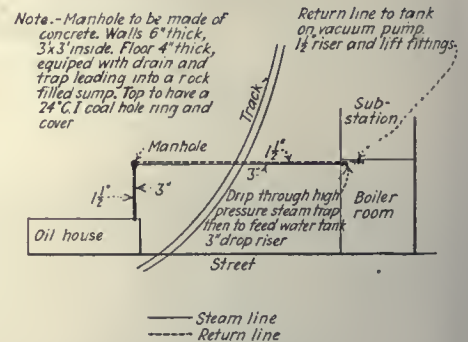
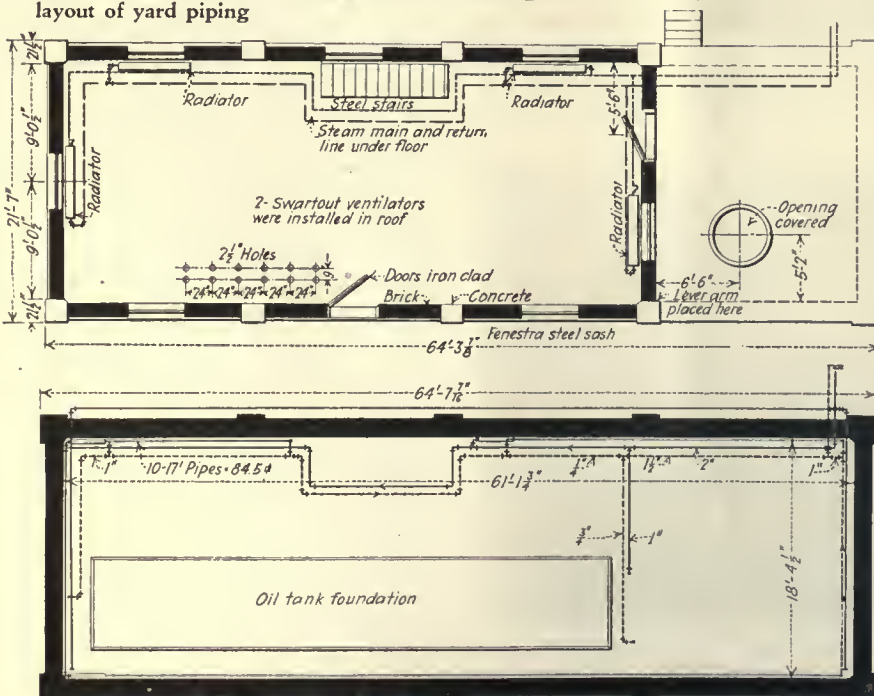
A car repair shop, an inspection shop, a paint shop and a power house are con-

venient to the oil house, so that air and steam were supplied from the compressors and boilers in the shop. The oil house is fireproof. For protection of its contents there is a high-pressure steam line laid in half-section porous tile connecting perforated lengths of pipe and running along the ceiling of the basement. The oil tanks are located in the basement. The main steam valve of this line is on the outside of the building.

In equipping the oil house an oil-reclaiming waste vat, filter tank, waste-saturating tank and dirty oil waste cans were placed on the first floor. Separate oil-air

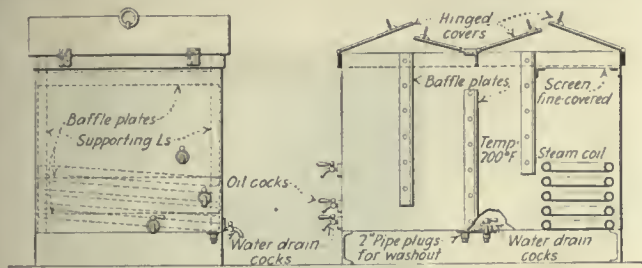


Plan of the oil house. The upper view shows the ground floor and the lower one the basement. At the right is the layout of yard piping



pumps with automatic governing devices were originally called for but later were replaced with an air tank, as shown in the accompanying illustration. Oil runs by gravity from tank cars to the two large three-compartment oil tanks in the basement. Likewise oil flows by gravity from these compartments to the small individual tanks.

The oil house is arranged so that one man can take care of it. Lighting fixtures and wiring are vapor proof.



Settling and filtering tanks

The oil house is covered with magnesite stucco both inside and outside, the inside finishing coat being made with white portland cement.

Water is brought to the oil house from the boiler house and shops. The steam line was laid in half-section vitreous pipe and covered with Johns-Manville pipe-covering material. A swinging lever arm placed in the outside wall over the open platform has a block and fall to raise and lower material from and to the basement. This platform is at car height.

## Block for Running in Bus Engines

By F. J. FOOTE

Superintendent of Motive Power and Equipment, Dayton & Columbus Transportation Company, Springfield, Ohio

FOLLOWING an overhaul, the bus engines of the Dayton & Columbus Transportation Company, Springfield, Ohio, have the bearings, piston rings and cylinder walls smoothed up by giving the engine a running test while being driven by a motor. The base of the test block is made up of structural shapes so that an engine can be placed in position quickly. A retired railway motor is used to drive the engine. The original field has been replaced by a shunt winding.

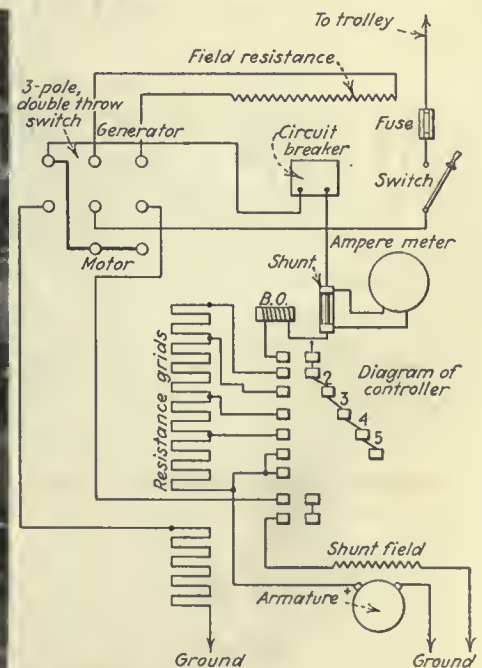
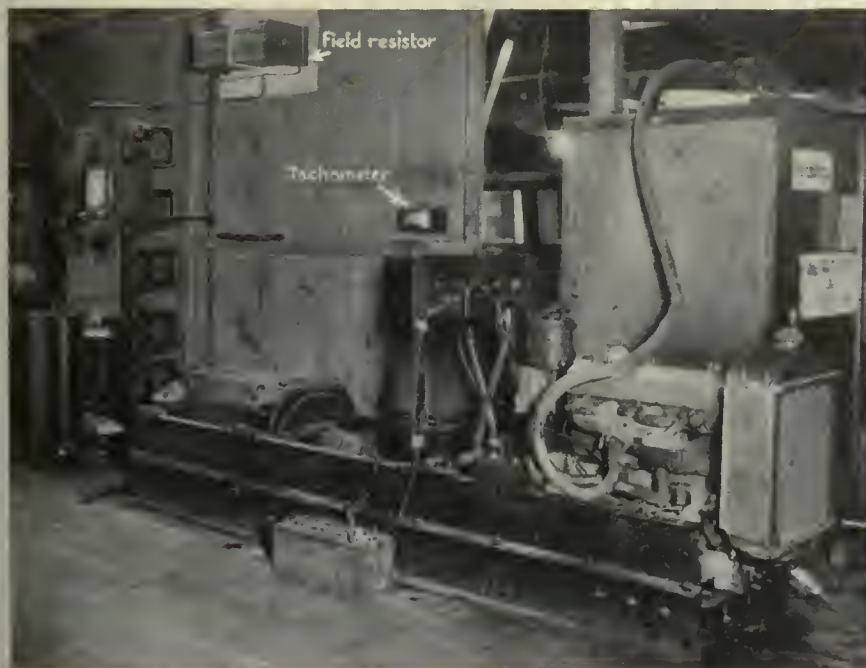
The control equipment includes a modified K-10 controller, resistors for the armature circuit which are

standard car equipment grids, field resistors made of headlight resistance, an ammeter from a substation switchboard, a circuit breaker retired from a car, together with necessary switches and fuses. The accompanying diagram shows the connections. All overhauled bus engines are put on this block and are driven at a speed of about 500 r.p.m. till bearing surfaces are smoothed up. This is indicated by the gradual lowering of the running temperature. It requires from five to eight hours. After this test the gasoline and exhaust connections are made, and the engine is started by means of the motor. The three-pole, double-throw switch shown in the diagram is then thrown over, so that the motor acts as a generator and furnishes the load for running the engine under its own power. The engine is operated for some four to six hours, driving the generator, whose load can be regulated with the controller.

Practically all the parts used were discarded material picked up at the railway company's shop. Data covering resistances, field winding, etc., are not included, as these depend on the size and type of motor used. A motor smaller than 50 hp. should not be employed.

An examination of the diagram shows that, as a motor, the machine operates with the field connected directly from trolley to ground without resistance, and with the lower section of armature resistors cut out. As a generator, it operates with a resistance in the field circuit to hold down the generated voltage, and both upper and lower sections of the armature resistors are in circuit to hold down the load. The armature is then entirely disconnected from the trolley. The reverse drum of the controller is not used, and not all of the main contacts.

A magneto mounted on the motor frame and belted to the armature shaft is connected to an a.c. voltmeter and calibrated to read r.p.m. of the motor armature. This equipment has enabled us to put bus engines in dependable condition. We feel that the wearing in of bearings, rings and cylinder walls without using fuel, and therefore holding down the temperature at the most critical period is of particular advantage.



Test block for running in bus engines and diagram of connections for the various equipment used

The three-pole, double-throw switch should be down when the machine is run as a motor and up as a generator. The resistance shown at the top is in series with the field when the machine is used as a generator.

# J. A. McCartney

## Wins Maintenance Prize for March

Mounting for shovel truck receives award.  
Charles Herms given honorable mention  
for method of broaching brush-holders



**C**ONVENIENT mounting for an electric shovel truck somewhat simpler and less expensive than the usual caterpillar type, which was described by J. A. McCartney, superintendent of construction, Pittsburgh Railways, Pittsburgh, Pa., was awarded the \$25 monthly prize for March. The novel feature of the device consisted of a pair of axles with ends extended so that they rest outside of the excavated portion between tracks.

Honorable mention for March was awarded to Charles Herms, general foreman San Diego Electric Company, San Diego, Cal., for the description of his method of broaching worn brush-holders. Wear of brush-holders from the

carbon brushes cannot be prevented, but the method described by Mr. Herms gives maximum life from these parts.

### J. A. McCartney

who won the monthly prize for March in *ELECTRIC RAILWAY JOURNAL'S* Maintenance Contest, is superintendent of construction for the Pittsburgh Railways, Pittsburgh, Pa. When the railway went into the hands of receivers some years ago, he was chosen to organize a construction division of the way department for the purpose of rehabilitating the tracks, which then were in very bad condition. This organization began to function in 1919 and since that time has been rebuilding approximately 35 miles of track each year. One of the practices inaugurated by Mr. McCartney was that of setting up schedules for starting and finishing dates on each job. This permits municipalities which

are affected by the reconstruction work to arrange their contract letting so that no delay occurs when the flanks of the street are to be rebuilt. It also permits the traffic department to arrange and take care of traffic problems.

The first electric railway experience of Mr. McCartney was with the Second Avenue Passenger Street Railway of Pittsburgh on its engineering corps. When this company was merged with the United Traction Company he continued in the engineering department as transit man and draftsman. Upon the merger of this company with the Philadelphia Company he continued in the engineering department in general engineering practice, power house design, transmission lines, street railway extension, etc. He became supervisor of tracks in 1915.

## MAINTENANCE CONTEST Extended Three Months

**M**AINTENANCE men with knowledge of improved methods or devices which may win a \$25 monthly prize in *ELECTRIC RAILWAY JOURNAL'S* maintenance contest have three more months to send in their ideas. The time limit for submitting items, which previously was set as April 30, has been extended up to and including July 31.

Instead of confining the publication of articles submitted in the contest to the third issue of *ELECTRIC RAILWAY JOURNAL* each month, they will be published in other issues also. The prize winner each month will be selected from the items published that month. This change was found desirable

as some of the articles sent in do not make up readily into the Data Sheet size used for items in the third issue each month. Also, some contestants submitted so many items that not all could be published in time to be considered by the judges for a prize if publication was confined to but one issue each month.

The following are the revised conditions for submitting material in the contest.

1. Any employee of an electric railway or bus subsidiary may compete.
2. The author does not need to be the originator of the idea.
3. Articles may be submitted by several persons or by a department.
4. Any maintenance practice or device for electric railway or bus repairs may be submitted.
5. Articles should be 100 to 200 words

long, with one illustration, and in no event longer than 400 words with two illustrations.

6. Illustration material may be in the form of drawings, sketches, blueprints or photographs. All sheets should be marked "Maintenance Competition."

7. Manuscripts should be mailed to the Editor of *ELECTRIC RAILWAY JOURNAL*, 10th Avenue at 36th Street, New York, N. Y.

8. A prize of \$25 will be awarded each month for the best maintenance idea in the group published during that month. A minimum of \$5 will be paid for each article accepted for publication. Manuscripts will be received until July 31, 1928.

9. Announcement of the winner each month will be made in the issue devoted to maintenance and construction (the third issue each month) following the month in which the article was published.

10. Additional details were given in *ELECTRIC RAILWAY JOURNAL* for April 16, 1927, pages 700-701.

*Electric Railway Journal Maintenance Data Sheet*

BUSES AND TRUCKS—11

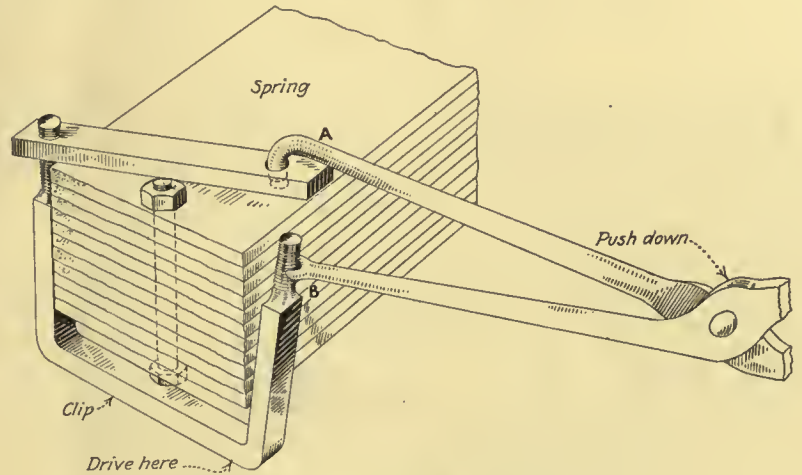
## Clip Tongs Aid Bus Spring Installation\*

BY FARRELL TIPTON

Electrician San Diego Electric Railway, San Diego, Cal.

IT IS quite difficult to get both legs of the clip for holding laminated springs of buses into the holes of the draw plate, and when driving it over an automobile spring the leg of the clamp is often sprung. Installation of these clips has been made much easier in the shops of the San Diego Electric Railway, San Diego, Cal., by use of a pair of tongs with the handles remodelled to form a special tool for the work.

The tool is constructed by bending the end of one handle down and tapering this so as to fit readily into the hole of the draw plate. The other handle is cut off and drawn nearly to a chisel edge. A slot is cut on this edge so as to keep it from slipping off the bolt when applied. To bring the leg into position by means of the tool, the bent end A is



Special tool for installing bus spring clips

placed in the hole of the draw plate against the clip. By pushing down as shown in the accompanying illustration, and the other end B is placed the projecting end can be inserted.

placed in the hole of the draw plate against the clip. By pushing down as shown in the accompanying illustration, and the other end B is placed the projecting end can be inserted.

\*Submitted in ELECTRIC RAILWAY JOURNAL Prize Contest

*Electric Railway Journal Maintenance Data Sheet*

TRACK AND WAY DEPARTMENT—24

## Valve Regulator for Pneumatically Operated Wire Brush\*

BY FRANK J. MARTIN

Superintendent of Maintenance Pittsburgh Railways, Pittsburgh, Pa.

FOR the cleaning of steel work on bridges and other way structures with a pneumatically operated rotary wire brush the Pittsburgh Railways has added a minor attachment in the form of a valve regulator that eliminates a dangerous hazard when the operator is working on high scaffolding.

A 1/2x3-in. stove bolt is mounted in the top of the handle of the pneumatic engine so that it limits the amount of air admitted by the trigger valve and can be set as desired. This enables the operator to maintain a strong grip on the handle and trigger of the machine so as to do efficient work with comparative safety. With the full air pressure it was found that the torque exerted



Setscrew in handle of pneumatic engine limits travel of trigger valve as desired

by the rotary brush was sufficient to upset the operator if particular care was not exercised.

\*Submitted in ELECTRIC RAILWAY JOURNAL Prize Contest

*Electric Railway Journal Maintenance Data Sheet*

BUSES AND TRUCKS—12

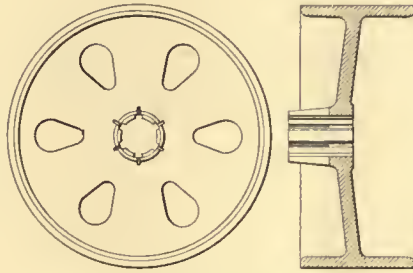
**Gun Iron Used for Brake Drums\***

BY D. S. MACKAY

Supervisor of Automotive Equipment  
Boston Elevated Railway, Boston, Mass.

IN THE early part of 1923 the Boston Elevated Railway faced a problem of having to renew drive-shaft brake drums two or three times a year. This was due to their scoring in service, which made it necessary also to replace the brake linings. The maximum service of the brake linings obtained was but 2,200 miles. This increased the maintenance cost for buses.

To overcome these troubles, drive-shaft brake drums are now made of gun iron, which is obtained from a local manufacturer. This material develops a smooth and even finish on the braking surface of the drums without apparent signs of wear.



First type of brake drum  
using gun iron

Service from brake linings has been increased to approximately 16,000 miles and the life of the drums appears indefinite. This material is now used for all driveshaft drums and several rear wheel brake drums on the heavier type of buses and since its adoption brake drum renewals are practically unknown.

Correction of this trouble has improved brake conditions and resulted in a decided economy in labor and material with a corresponding marked reduction in maintenance cost. The accompanying illustration shows the first type of brake drum where gun iron was used.

\*Submitted in ELECTRIC RAILWAY JOURNAL Prize Contest

*Electric Railway Journal Maintenance Data Sheet*

TRACK AND WAY DEPARTMENT—25

**Strengthening Wheel Construction for Portable Equipment\***

BY WILLIAM BUKER

Master Mechanic, Way Department, Toronto Transportation  
Commission, Toronto, Canada

SEVERAL failures of steel wheels on portable air compressors have been experienced by the Toronto Transportation Commission due to running over hard surfaced city streets. These wheels are built with an iron hub into which are fastened cast-steel spokes, these in turn being welded into the steel tires as shown in the first illustration.

To overcome the trouble two worn-out bucket loader disks were dished. After cutting out the center hole to clear the hub flange these were welded to the tire on either side of the wheel, as shown in the accompanying illustration.

Other circles 10 in. in diameter with center hole cut to make a close fit on the hub proper were welded in two parts to both large disks, and the whole was pulled tight with six  $\frac{3}{4}$ -in. bolts.



Method of strengthening steel spoke cast-iron hub wheels  
on construction equipment

\*Submitted in ELECTRIC RAILWAY JOURNAL Prize Contest



*Electric Railway Journal Maintenance Data Sheet*

ROLLING STOCK—TRUCKS—22

**Fixture for Boring Journal Bearings in a Lathe\***

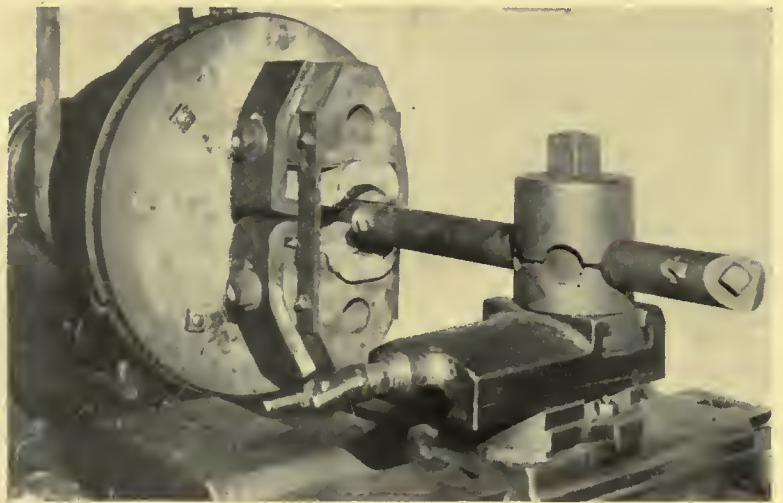
BY FRANK B. CARPENTER

Master Mechanic Charleston Interurban  
Railroad, Charleston, W. Va.

**L**EAD-COPPER bronze is used for journal bearings by the Charleston Interurban Railroad, Charleston, W. Va. The mixture is known as Ex. B metal and consists of 78 per cent copper, 15 per cent lead and 7 per cent tin. Journal bearings are bored to necessary dimensions two at a time, in a lathe, by using the fixture shown in the accompanying illustration. The fixture is made of ordinary gray cast iron and has two projections into which the bearings fit for machining. The outside ends of these projections are braced by means of two bars bolted to the sides.

Four forged and machined jaw clamps are used to hold a pair of bearings in position for boring. These clamps are self-centering, and as the work is drawn down it

is pulled to the center at the same time. The boring is done by attaching a boring bar to the tool post of the lathe. With this fixture three pairs, or six bearings, are machined per hour.



Boring two journal bearings in a special fixture

\*Submitted in ELECTRIC RAILWAY JOURNAL Prize Contest

*Electric Railway Journal Maintenance Data Sheet*

ROLLING STOCK—ELECTRICAL—44

**Grease Fittings for Lubrication of Ball Bearing Motors\***

BY R. T. CHILES

Master Mechanic Cumberland County Power &amp; Light Company, Portland, Me.

**W**HEN the General Electric type 258-C motors went through the shops of the Cumberland County Power & Light Company for their first general overhauling it was found that the ball bearings with which these armatures were equipped were not receiving proper lubrication. To improve conditions, two grease pipes were applied to the motor, which consist of a  $\frac{1}{4}$ -in. pipe with nipple and cap. An Alemite grease compressor is used, which is equipped with a flexible connection and  $\frac{1}{4}$ -in. Alemite fitting. When



Standard Alemite grease compressor used for lubricating armature bearings

greasing, the pipe cap on the motor connection is removed and the  $\frac{1}{4}$ -in. pipe coupling attached to the Alemite compressor is screwed on. Armature bearings are now lubricated once each month with grease, a summer grade being used in the warm weather and a winter grade during cold weather. With this improved method of lubrication increased armature bearing mileage has resulted. For the year 1926, with 46 motors in active service, the average bearing mileage obtained was 121,851 miles.

\*Submitted in ELECTRIC RAILWAY JOURNAL Prize Contest.

## Electric Railway Journal Maintenance Data Sheet

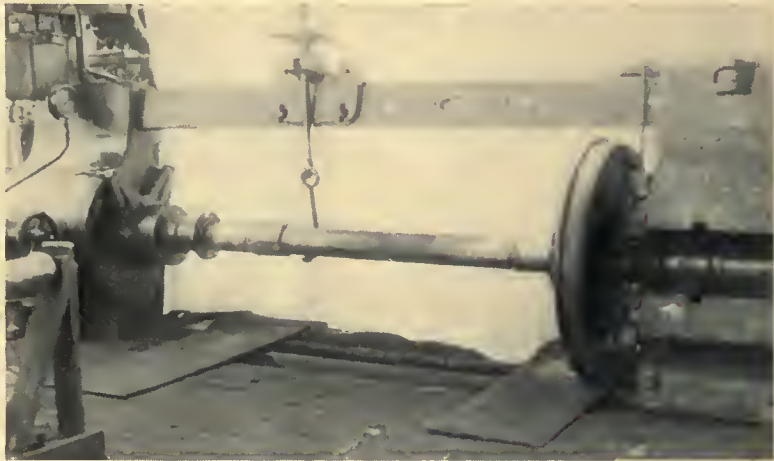
ROLLING STOCK—TRUCKS—23

## Split Sleeve Protects End of Shaft While Being Pressed into Wheel\*

BY C. B. HALL

Chief Clerk Mechanical Department Virginia Electric &amp; Power Company, Norfolk, Va.

**D**ANGER from bending axles at the journal bearing section while pressing on wheels has been overcome in the Norfolk shops of the Virginia Electric & Power Company by a split steel casting devised by T. W. Madison, master mechanic. The casting is constructed so as to fit over the journal end of the axle and apply pressure to the shoulder of the axle at the inside end of the bearing. The casting is so constructed that a ring keeps the casting in position while under pressure. Previous to the use of this device bent axle journals reached a menacing number.



A split steel casting placed on the end of the axle while pressing on wheels prevents bending

\*Submitted in ELECTRIC RAILWAY JOURNAL Prize Contest

## Electric Railway Journal Maintenance Data Sheet

ROLLING STOCK ELECTRICAL—15

## Air Compressor Armature Stand\*

BY ARTHUR E. CLEGG

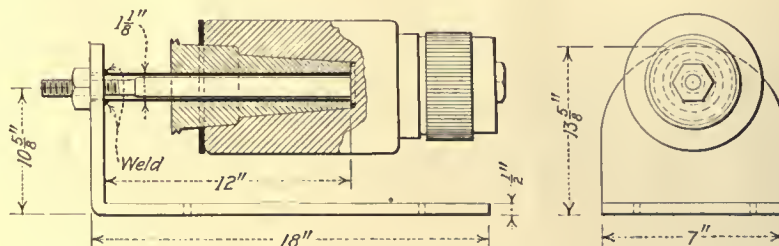
Foreman Electrical Department, San Diego Electric Railway, San Diego, Cal.

**S**OME types of compressor armatures have an extension of the shaft at the commutator end so short that it cannot be used for support. To support this type of armature while it is being repaired a stand was designed and made in the electrical department of the San Diego Electric Railway. The ac-

companying sketch shows the construction.

The supporting base is made from mild steel 7 in. wide by  $\frac{1}{2}$  in. thick. This is bent in the form of an "L" and the end is rounded off. The upright extension is  $13\frac{5}{8}$  in. high and the base is 18 in. long. The stand can be bolted to a table which

has castors on the legs if it is desired to have this portable. For supporting the armature a pipe is arranged to slide over the armature shaft. With the type of armature used in San Diego a  $1\frac{1}{8}$ -in. inside diameter pipe 12 in. long is used. This is fitted to the end piece and welded.



Stand for air compressor armature used in the electrical department of the San Diego Electric Railway

\*Submitted in ELECTRIC RAILWAY JOURNAL Prize Contest

## HEAT ALONE IS NOT SUFFICIENT FOR ARMATURE BAKING

It takes more than heat to properly bake an armature or a field coil for electric railway service.

The baking of the dipped coil or armature is probably the most important of the series of operations through which it passes. Under-baking will leave the varnish soft and liable to be thrown off by the centrifugal force of the rotating armature, leaving it unprotected and out of balance. The remaining solvent and thinner in underbaked portions also decrease the dielectric strength and are apt to promote deterioration in both fabric and insulation. Overbaked insulation represents an economic loss in heat consumed beyond that necessary to bring the process to its proper point. But more important still, it also tends to shorten the effective life of the varnish in service.

It is therefore very important in baking to maintain the proper oven temperature and to hold all parts of the oven at the same temperature, to get uniformity of bake throughout. The fumes and gases from the volatile oils driven off by heat must be removed immediately in order to maintain the most effective drying conditions in the oven. Oxygen in sufficient quantity must be available in order to properly oxidize the heavier oils in the varnish compound.

For large armatures with deep windings, the better practice is to begin the bake with a temperature of about 150° F. holding this for about one hour before the maximum temperature is reached. This preliminary low temperature bake allows a thorough volatilization of the lighter oils from the interior of the coils before the oxidization of the outer layers has proceeded far enough to trap them. This precaution is not necessary with the shallower windings.

The volatiles having been driven off, the oven is brought up to full baking temperature and oxidization of the heavier oils is carried on. Full baking temperatures range from 200° to 250° F., the duration of bake from 5 to 48 hours on large magnet and field coils.

To meet successfully the requirements above stated it is essential that baking time, temperature and air conditioning be constantly under close control.

And the control of these factors can only be obtained in an oven that is properly constructed, properly heated and properly ventilated—in short an oven intelligently designed and built for a specific purpose.

In view of the recognized economy of trouble-free motors, it is just good business to use the procedure and equipment which will produce a strong, durable protection for the armature windings.

**YOUNG BROTHERS COMPANY**  
6520 MACK AVENUE, DETROIT, MICHIGAN

DISTRICT SALES OFFICES

<p>39 Church St. - - - New York 1424 Guarantee Title Bldg., Cleveland 410 Granite Bldg. - - - St. Louis 419 Call Bldg. - - - San Francisco 908 Elliott Square - - - Buffalo 20 E. Jackson Blvd. - - - Chicago 807 San Fernando Bldg., Los Angeles 248 Central Bldg. - Seattle, Wash. 10 High St. - - - Boston, Mass. Hiram Walker &amp; Sons Metal Products, Ltd., Walkerville, Ontario, Canada</p>	<p style="text-align: center;">OVENS FOR</p> <p>Core and mold baking — Low temperature heat treating — Drying. Japanning and Enamelling — Electrical appliance baking — Adapted to all methods of heat-tog.</p>
---	---



INDUSTRIAL OVENS

## ELECTRICAL INSULATION

**MICANITE and EMPIRE**  
INSULATOR

Micanite and Super-Micanite Sheets, Commutator Segments, and Commutator Rings

Micanite Tubes and Washers

Linotape, Seamless or Sewn Bias  
(Yellow or Black Varnished Tapes)

Empire Oiled Cloths and Papers  
(Yellow or Black)

Compounds, Varnishes, Etc.

Send for catalog and helpful booklet on Commutator Insulation and Assembly

**MICA INSULATOR COMPANY**

*Largest manufacturers in the world of mica insulation.*  
Established 1893.

New York: 200 Varick St. Chicago: 542 So. Dearborn St.  
Cleveland Pittsburgh Cincinnati  
San Francisco Toronto Los Angeles Seattle  
Works: Schenectady, New York. London, England

## Perform—Because They Fit

Coils that *fit* slip into grooves without abuse. Elliott-Thompson coils are made to fit—abuse is unknown. That's why the performance records of Elliott-Thompson coils are so remarkable.

It makes them especially fine for maintenance work. They last longer, save time, labor, money, give full efficiency at all times.

Try Elliott-Thompsons on your next replacement job.



**ELLIOTT-THOMPSON  
ELECTRIC COMPANY**  
AJAX BLDG., CLEVELAND, OHIO



# How Car Shops Now Operate 2 Spray Guns From One Material Pressure Container

Two spray gun operators can now be supplied by one 15 gallon Material Pressure Container. This eliminates much servicing,—keeps color and flow to both guns exact and uniform.

Each gun has individual control of atomizing pressure so that both operate independently, yet apply the same material.

This Pressure Container is also equipped with an Air Motor Agitator which keeps material stirred in uniform consistency. The operator never stops to agitate material. The color never settles. Every ingredient in the material is essential,—every color pigment has a bearing on the shade produced. Now, sure, mechanical agitation keeps these ingredients and color pigments so uniform that color never varies in shade; and the flow to both guns never changes from the first drop to the last.

This development is a revelation in its economy and its safeguard of results. It will be a big step forward for your shop to equip with this "Two-Gun" Material Pressure Container. Write us for detailed information.

**BINKS** SPRAY EQUIPMENT CO.  
Dept. D, 3109 Carroll Ave.,  
Chicago

*Branch Offices*

New York City  
56 Warren St.

Detroit  
4456 Cass Ave.

San Francisco  
371 Fifth St.

Representatives in Principal Cities



TRUCK WITH TOWER IN RUNNING POSITION

## TRENTON TOWER This 3-Section

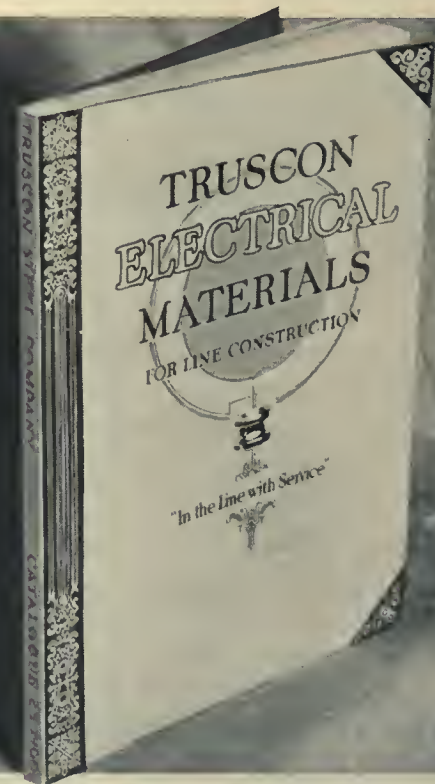
is not only more convenient, but stronger than the older type.

The top section is reinforced by the intermediate section. The 3-section design makes it possible to raise the platform 16 inches higher and drop it 12 inches lower than can be done with the old-style 2-section tower.

We'll gladly send you details.

**J. R. McCARDELL CO.**  
Trenton, New Jersey, U. S. A.

## Now Ready for Mailing



TRUSCON STEEL COMPANY—YOUNGSTOWN, OHIO

Electric Railway Journal Maintenance Data Sheet

ROLLING STOCK—MISCELLANEOUS—28

# Truck for Handling Lift Jacks\*

BY A. G. POLLARD

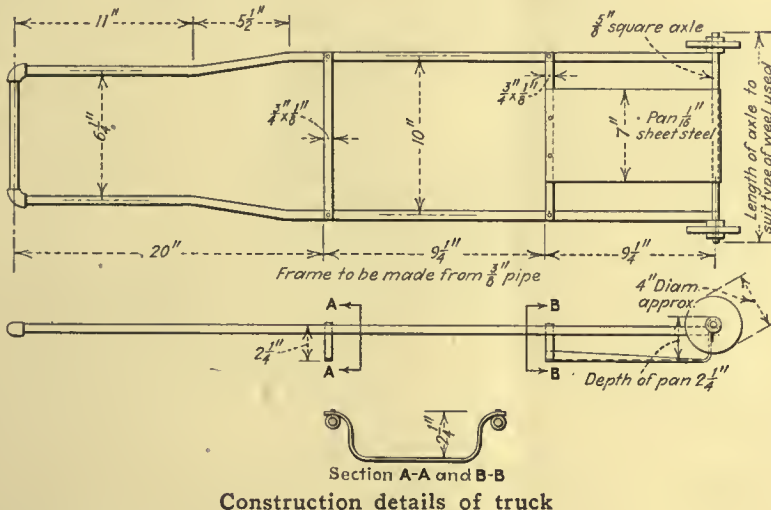
Rolling Stock Department Toronto Transportation Commission, Toronto, Canada

RECENTLY a small hand truck was designed for use in the Hillcrest shops and the car houses of the Toronto Transportation Commission, Toronto, Canada. This truck conveys lift jacks easily and quickly to those places in the shop where they are required.



Labor-saving truck for handling jacks

As may be seen in the accompanying illustration, the truck is simple and inexpensive, the framework being ordinary  $\frac{3}{8}$ -in. black iron pipe. It is so light it can be pushed with one hand.



\*Submitted in ELECTRIC RAILWAY JOURNAL Prize Contest

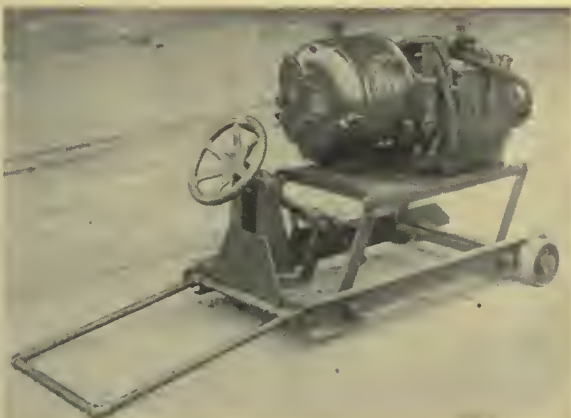
Electric Railway Journal Maintenance Data Sheet

ROLLING STOCK—MISCELLANEOUS—30

# Elevating Truck for Air Compressors\*

BY PAUL UHLICH

Engineer Rolling Stock and Shop Department New Orleans Public Service, Inc., New Orleans, La.



Elevating truck for placing or removing air compressors

HANDLING air compressors efficiently prompted the design of a special truck which was built for the railway overhauling shop of the New Orleans Public Service, Inc. This truck is used for removing or replacing compressors under cars and has resulted in a great saving of labor. An overhead crane serves the aisles between car tracks so that the truck is used to transport compressors but a short distance.

The platform is raised and lowered by swinging on four links fastened to the framework. A screw fitted with a hand wheel at the top and with nuts to give the desired movement is used to raise and lower the platform. When fully lowered the platform is  $6\frac{1}{2}$  in. above ground, and when fully raised  $17\frac{1}{2}$  in. When raising or lowering it the operator stands on the pipe handle to steady the truck.

The side members of the truck are constructed of 4-in. channels. The front has an upright member for supporting the nut through which the screw turns. The links from the framework to the platform are  $1\frac{1}{2} \times \frac{3}{8}$ -in. bar. Wheels are 6 in. diameter.

\*Submitted in ELECTRIC RAILWAY JOURNAL Prize Contest

*Electric Railway Journal Maintenance Data Sheet*

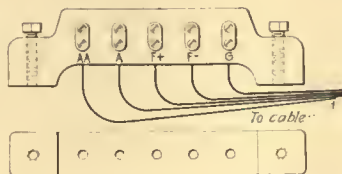
ROLLING STOCK—MISCELLANEOUS—29

**Motor Lead Connection Block\***

BY BENJAMIN H. HALL

Shop Foreman West Penn Railways, McKeesport, Pa.

**I**N ORDER to overcome trouble in wet weather due to water splashing on motor lead connectors and causing short circuits, the West Penn Railways, McKeesport, Pa., now uses a motor lead connection block of the form illustrated. This is used to join the leads from the motors and the car body. Besides overcoming trouble from the short circuiting, it has proved a great time saver when removing a truck from underneath the car or replacing motor leads.



Motor lead connecting block

The connection block is made of ash and is fastened to the car sills by lagscrews. Connectors are soldered to the ends of the cable leads and are inserted in the block from the back. These connectors have two set screws, used to fasten the wire. A piece of No. 2 solid wire is soldered to the end of the motor lead that goes into the end of the connector. The block is stenciled and wires are tagged to correspond. By use of such a block, taping of connectors or covering with canvas is unnecessary.

\*Submitted in ELECTRIC RAILWAY JOURNAL Prize Contest

*Electric Railway Journal Maintenance Data Sheet*

ROLLING STOCK—MISCELLANEOUS—31

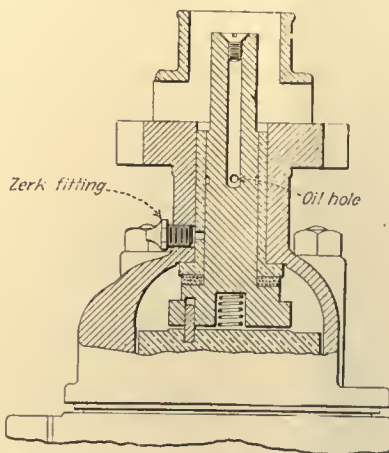
**Grease Fitting Applied to Motorman's Brake Valve\***

BY CHARLIE HERMS

General Foreman San Diego Electric Railway, San Diego, Cal.

**Z**ERK fittings are being used successfully for lubricating M-24 air-brake valves on the San Diego Electric Railway. The fitting is installed by drilling a  $\frac{1}{8}$ -in. hole through the valve body and bushing. The hole is then redrilled to size for tapping to take the thread of the grease fitting. This larger hole is drilled only through the body, leaving the  $\frac{1}{8}$ -in. diameter in the bushing.

Experience has shown that the grease fitting should be as close to the key-seat washer as possible, and it always should be at least 2 in. below the top of the valve-stem bushing. This is necessary to prevent the grease from forcing out upward



Method of applying Zerk fitting to air-brake valve

instead of going down and lubricating the key-seat washer. Failure to lubricate this joint is the cause of stiffness of the brake valve.

A good grade of alemite grease should be used. Common hard oil and graphite grease are unsatisfactory, as they have a tendency to lodge in the small valve ports, where they solidify and cause brake failures.

The grease inserted through the Zerk fittings remains in the valves longer than oil, and the difficulties due to clogging of oil holes are prevented. The grease also is forced past the key-seat washer and lubricates the rotary valve.

\*Submitted in ELECTRIC RAILWAY JOURNAL Prize Contest.

# Adventures of Old Man Trouble

on the

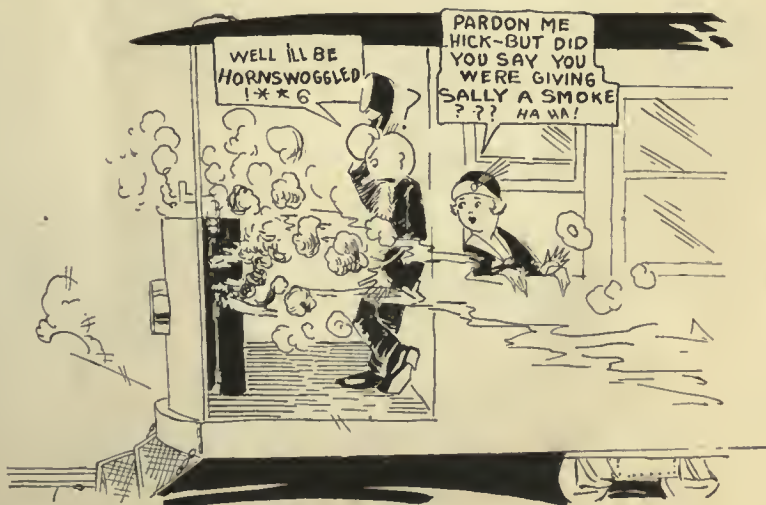
## Hicksville Railway

You always get a skilled physician to set a dislocated finger, why not insist on a skilled electrician to set dislocated controller fingers?



It is costly to permit trainmen to tinker with controller fingers. Many controller failures can be traced to this source. Authorized, trained workmen can adjust the pressure to give maximum contact life with safe and easy operation.

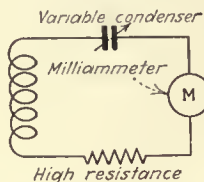
ELECTRIC RAILWAY JOURNAL will be glad to furnish press proofs of this page for posting on bulletin boards and will supply electrotypes of this series at cost for use in company publications.



## New Equipment Available

### Radio Waves Search Out Insulation Faults

RADIO waves are now used to detect insulation faults in the coils of motors, generators, and other electrical machines by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. In describing the new method, the company states that two insulation tests are necessary. First, to prove that a reasonable overload will not cause a short circuit between the windings and the frame of



Connections of receiving set

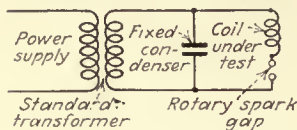


Diagram showing connection of coil under test

the machine, and second, to prove that a reasonable overload will not cause a short circuit between turns of the coil winding. The equipment used for the test is shown diagrammatically in the accompanying illustrations. Power is supplied by a standard transformer. By adjusting the length of the rotary spark gap, the point on the voltage curve at which a spark will occur is determined. This testing device is a simple type of radio transmitter.

A second diagram shows the connections for detecting faults in coils by means of a special radio receiving set having a sensitive milliammeter in the circuit. By adjusting the variable condenser the receiving set is tuned to the wave sent out by the transmitter. The milliammeter will then indicate the maximum reading. If with this setting a faulty coil is put into the circuit of the transmitter the wave length will be altered, so the receiving set will be out of tune and the milliammeter reading will drop. One of the chief merits claimed for the test is that it invariably shows the cause of the failure as the arc is of only such intensity as to burn out the weak insulation without burning the adjacent insulation or the copper.

## Dick Prescott Attends a Meeting And Gets an Ovation



WHEN Dick Prescott returned to the Consolidated Railway & Light Company's shop after having been told by General Manager Milburn of his appointment as superintendent of equipment, he proceeded with his own duties just as though nothing had happened.

Along toward the middle of the following forenoon, Tom Mullaney, retiring superintendent, sent for him. Dick responded promptly and was surprised to find all the foremen assembled and standing about Mullaney's office.

As Dick entered the room he was quickly aware that something unusual was transpiring. On Mullaney's desk, from which he had directed the destinies of the Consolidated shop for many years, was a large vase of flowers. Even Miss Stevens, Mr. Mullaney's secretary, was in the room, and it was apparent that she was responsible for the floral decorations. Everyone looked expectantly at Dick as he entered.

Tom Mullaney lost no time in getting things started. Motioning to Dick to stand beside him he addressed himself to the assembled foremen. "Gentlemen," said Mullaney with a broad smile, "I called you together to present to you your new superintendent of equipment."

A moment of silence followed this introduction, while the full import of what Mullaney had said spread through the group of foremen. Then a deafening burst of applause filled the little room. Dick was decidedly ill at ease and struggled valiantly to master the tension that welled up in his throat at this manifestation of popularity among the men upon whose co-operation his future success would depend.

"I am going to take it easy on my farm for awhile," continued Mul-

laney. He tried to say this in an offhand manner, but his own feelings at laying down the reins he had held so long were manifest in his face and his voice.

"Dick is the logical man for the job. All of you know that he has earned this promotion by initiative and hard work. I join with you and Mr. Milburn in wishing him success in this larger responsibility."

Again the room broke into applause.

"You men all know that I'm not a speechmaker," went on Mullaney as soon as he could make himself heard again. "However, I do want to say that there is a real inspiration for all of you in Dick's success. He came in here as a carpenter's assistant and he is becoming superintendent of the department after just a little more than four years. Some men are inclined to think that they need luck or 'pull' to get ahead. Dick didn't have either. But he did have a keen mind and he wasn't afraid to use it. When the company faced a problem he tried to find a way of solving it. He wasn't afraid of doing more work than he was paid for. He never claimed credit for the other fellow's ideas. He is interested in the success of the men that work with him. He's fair and he's honest in dealing with those below him in rank as well as those above him. He's got a backbone and he won't stand for any nonsense. I want to congratulate you as well as him and I'm proud to turn over to Mr. Prescott the position of superintendent of equipment."

As Mullaney finished this brief speech he turned and shook hands with Dick, pointed to his vacant chair and stepped around the table to stand with the foremen while another burst of applause—longer this time—filled the little office.



## Association Activities

### U. S. Chamber of Commerce Program

"TEAMWORK for Prosperity" is the subject selected by the Chamber of Commerce of the United States for its sixteenth annual meeting to be held in Washington, D. C., May 7-11, 1928. What teamwork means to agriculture, civic development, domestic distribution, finance, foreign commerce, insurance, manufacture, natural resources, production and transportation and communication will be discussed by prominent men throughout the United States. The annual dinner will be held in the Washington Auditorium at 7 p.m., Thursday, May 10. Arrangements have been made for luncheon and dinner meetings, in addition to the general sessions.

According to the announcement of the meeting, the various opportunities for teamwork, nationally and locally, and the factors affecting such teamwork, with indication of successful methods that have been pursued, will be passed in review in this meeting of business men. The new competition, business traffic rules for the future, a broader outlook on business at home and abroad are projected in this comprehensive program.

### Southwestern Program Announced

STREET traffic, buses and the development of car riding are the subjects for the railway section at the convention of the Southwestern Public Service Association to be held in Dallas, Tex., May 2-5, according to an announcement by Secretary E. N. Willis.

The program of the railway section follows:

WEDNESDAY, MAY 2, AT 2 P.M.

#### Subject: Traffic

"Progress in Relieving Traffic Congestion," by Charles Gordon, editor ELECTRIC RAILWAY JOURNAL, New York.

Discussion by D. C. O'Dowd, New Orleans Public Service, Inc., and others. This will include contributions by police traffic officers as well as railway men.

"Effect of New Equipment in Speeding up Traffic," by J. L. Alexander, Houston Electric Company, and G. I. Plummer, Dallas Railway & Terminal Company.

"Personnel—Selection and Training," by C. J. Crampton, Dallas Railway & Terminal Company, and others.

Discussion by J. L. Alexander, Houston Electric Company, and others.

THURSDAY, MAY 3, AT 2 P.M.

#### Subject: Buses

"Buses in Interurban Service."—Discussion, led by R. L. Miller, Texas Coaches, Inc., Ft. Worth.

"Buses in Urban Service."—Discussion, led by R. B. Allen, Houston Electric Company, and W. R. Castle, San Antonio Public Service Company.

"New Developments in Rail and Rubber Borne Vehicles," by L. E. Thorne, Northern Texas Traction Company, Fort Worth.

Discussion led by R. M. O'Brien, New Orleans Public Service, Inc., and F. B. Scurlock, El Paso Electric Company.

FRIDAY, MAY 4, AT 2 P.M.

"Rebuilding the Car Riding Habit," by W. W. Holden, manager traction department, San Antonio Public Service Company, and L. C. Singleton, Eastern Texas Electric Company, Beaumont.

### Mathematical Symbols

MATHEMATICAL symbols have been approved as American standards, thus completing the first step in a program of unification of the scientific and engineering symbols and abbreviations used in engineering and industry under the auspices of the American Engineering Standards Committee. The confusion resulting from variations in symbols used in different publications, reports and tables, led to the initiation of a project of unification by the A.E.S.C. early in 1923. The work has been progressing since that time, with fourteen national organizations participating.

The approved mathematical symbols include those for arithmetic and algebra, elementary geometry, analytic geometry, trigonometric and hyperbolic functions, calculus, special functions, and vector analysis. The effort was made to select from symbols already in use those that are most clearly understood and least likely to lead to confusion with other symbols.

Prof. E. V. Huntington of Harvard University, representing the American Mathematical Society, was chairman of the mathematical symbols subcommittee. This sub-committee is part of the sectional committee on scientific and engineering symbols and abbreviations, of which Dr. J. Franklin Meyer of the Bureau of Standards is chairman. The sectional committee includes other subcommittees on symbols for hydraulics, for heat and thermodynamics, for aeronautics, navigation and topographical symbols, electrotechnical symbols (including radio), symbols for photometry and illumination, and for mechanics, structural engineering and testing materials.

### New York Association to Meet at Coney Island

JUNE 14 and 15, the New York Electric Railway Association will hold a two-day summer meeting at the Half Moon Hotel, Coney Island, N. Y. Special arrangements will be made to give the delegates an opportunity to inspect recent improvements and developments in the traction field in and around New York City. The banquet will be held in the Half Moon Hotel Thursday evening, June 14. A complete program will be announced later.

### COMING MEETINGS

OF

## Electric Railway and Allied Associations

April 25-27—American Society of Civil Engineers, spring meeting, Washington Hotel, Washington, D. C.

April 25-27—American Welding Society, annual meeting, 33 West 39th Street, New York, N. Y.

April 26-28—Missouri Association of Public Utilities, Jefferson City, Mo.

May 2-5—Southwestern Public Service Association, Dallas, Texas.

May 4—Metropolitan Section, A.E.R.A., 33 W. 39th Street, New York, N. Y.

May 6-12—Union Internationale de Tramways, de Chemins de fer d'Interet Local et de Transports Publics Automobiles, Rome, Italy.

May 8-11—United States Chamber of Commerce, Washington, D. C.

May 9—A.E.R.A. Executive Committee, Washington, D. C., 3 p.m.

May 9-10—Central Electric Railway Master Mechanics' Association, Lawrence Hotel, Erie, Pa.

May 24—New England Street Railway Club, annual meeting, Boston, Mass.

June 4-6—Midwest Electric Railway Association, Hotel Baltimore, Kansas City, Mo.

June 6-8—Canadian Electric Railway Association, annual convention and exhibits, Toronto, Canada.

June 14-15—New York Electric Railway Association, Half Moon Hotel, Coney Island, N. Y.

June 20-27—American Railway Association, Div. 5—Mechanical, annual convention and exhibit, Atlantic City, N. J.

June 21-22—American Railway Association, Motor Transport Division, Atlantic City, N. J.

June 21-22—Wisconsin Utilities Association, Accounting Section, Hotel Pfister, Milwaukee, Wis.

June 28-29—Central Electric Railway Association, Cedar Point, Ohio.

July 8-12—Public Utilities Advertising Association and International Advertising Exposition, Detroit, Mich.

July 25-27—Electric Railway Association of Equipment Men, Southern Properties, Cincinnati, Ohio.

July 27-28—Central Electric Railway Accountants' Association, Detroit, Mich.

Aug. 16-17—Wisconsin Utilities Association, Transportation Section, Sheboygan, Wis.

SEPT. 22-28, 1928

American Electric Railway Association, 47th annual convention and exhibit, Cleveland, Ohio.

# News of the Industry

## No Transit Survey by Port Board

**Governor Smith of New York disapproves bill to authorize Port Authority to consider suburban traffic problem**

Governor Smith of New York on April 6 vetoed the bill which would have authorized the New York Port Authority to make a survey of the interstate suburban transit problem in the metropolitan areas with a view to enlarging the comprehensive port plan so as to include suburban traffic relief.

The Governor said that he was convinced that there was urgent need that something be done to improve suburban traffic conditions, but that he also believed the Port Authority should stick to its original program of improving freight distribution in the port.

Calling attention to the fact that he was once a member of the Port Authority, the Governor said it had been a source of pleasure to him to note the soundness of the financial principles back of that body, but that he had been disappointed because the opposition of the railroads had prevented it from making any real progress. The Governor said, in part, in his veto message:

There can be no question as to the urgent need of working out a solution of the suburban passenger traffic problem in the metropolitan district. The present railroad stations and traffic facilities in New York City, so far as suburban transportation is concerned, are already hopelessly inadequate, and no hope for the future lies in the efforts to expand these facilities.

On the other hand, I am satisfied that no solution can be found by merely dumping suburban passengers at the outlying parts of the city and forcing them into the already overcrowded city subway and elevated systems. Some solution must be found along the lines of an entirely new suburban subway system through which suburban trains can be operated connecting New Jersey, Westchester and Long Island with New York City and with each other.

Various attempts to solve this problem have been made through special legislative commissions and through private agencies and organizations. The solution now proposed is that the Port of New York Authority finance these facilities through the issuance of bonds similar to the bonds issued to finance the various Hudson River and Staten Island bridges.

No one can question my interest in and support of the Port of New York Authority. I was a member of this authority by appointment of Governor Miller between my first and second terms as Governor and represented the authority at Albany when the comprehensive plan for port development was adopted by our State Legislature. I have been and am vitally interested in carrying out this comprehensive plan.

It has been a source of great satisfaction to me to see the soundness of the financial principles back of the Port Authority demonstrated in the building of the great

bridges which are now under way. On the other hand, it has been a great disappointment to me to find that the opposition of the railroads has to date prevented the making of real progress in working out the program of freight distribution in the port which always has been the main object and purpose of the Port of New York Authority.

I am satisfied that the Port Authority should stick to this program and I am entirely unwilling to give my approval to any measure which at the expense of the solution of the great freight distribution problem will set the Port Authority off on an entirely new line of endeavor connected with the solution of the suburban passenger problem.

## Free Rides in Portland to Spring Window Displays

All cars and buses of the Portland Electric Power Company, Portland, Ore., were chartered by the Chamber of Commerce recently during the spring opening. Between the hours of 7 and 8 p.m., inbound carriers served the public free of charge, as indicated on posters placed in the cars and in the stores several days previous to the affair. Thousands took advantage of the free ride to go into the loop district to view the window displays showing new spring apparel.

## Suburban Fares a Problem

**Cleveland Council unwilling to have railway operate in Cleveland Heights unless fare pays cost of service—Survey shows 46 per cent of riders originate in suburbs**

A BATTLE is going on to extend the service-at-cost provisions of the Tayler grant to the suburbs. The rate of fare for East Cleveland over the lines of the Cleveland Railway is before a board of arbitration since the East Cleveland franchise provides for revision every five years. In Cleveland Heights the matter has taken a different course. The suburb wants a new franchise providing for extensions. The Cleveland Council has refused to approve one franchise and has served notice on the Heights it will refuse to approve any franchise unless it provides a rate of fare that will pay the cost of the service.

In both suburbs the same rate of fare is proposed by Traction Commissioner C. M. Ballou, who represents the interests of the Cleveland car riders. This is a fare always three steps higher in the Tayler grant schedule of fares than the rate of fare which prevails in Cleveland. With the Cleveland fare 7 cents cash, 8 tickets for 50 cents, the suburbs would pay 10 cents cash, 6 tickets for 50 cents.

The arbitrators in the East Cleveland fare case are: Ed Doty, Charles M. Buss and Charles Higley. The situation is complicated by the fact that a portion of Cleveland extends beyond East Cleveland, so that these Clevelanders presumably could ride farther than East Clevelanders and pay a lower fare.

In a brief submitted to the arbitrators the general problem was outlined as follows:

Since March 1, 1910, the city of Cleveland and the Cleveland Railway have had a contract for railway service based on the service-at-cost principle, but not once in the entire period of 18 years have the city and the railway entered into a single contract with a suburban city on the same basis,

though strangely enough this plan was contemplated essentially in the original Tayler grant, since the costs to be met by suburban fares were definitely specified. The city of Cleveland throughout this period has had a flexible or variable rate of fare, one that fluctuates with the cost of service. The suburbs on the contrary have had a fixed rate of fare and one that does not fluctuate with the cost of service. One wonders how two such diametrically opposed ideas on systems could live side by side for so long a period without more serious friction than has actually occurred. One wonders also why this principle has never found more favorable consideration for suburban service in face of the many claims made for it in the city of Cleveland.

It is inescapable that if one part of a system has a fluctuating rate of fare which will absorb rising costs by an increase in the rate of fare and the balance of the system has no such provision, then the elastic part will assume the burden of the increased cost of the entire system and the fixed part none of the increased costs. So long as the central city is very large in comparison to a few insignificant suburbs, this arrangement can be tolerated. But can we continue to ignore the suburbs as insignificant in view of the facts already pointed out?

Meanwhile the population of the suburbs has increased until a recent survey by Parsons, Klapp, Brinkerhoff & Douglas showed that on the lines tapping the major suburbs 46 per cent of the riders originate in the suburbs and 54 per cent in the city. Last year the loss from operations in the three suburbs totalled more than \$1,000,000. Had this money been saved, Clevelanders would be riding for 6 cents today instead of paying 7 cents.

The matter of suburban fares in Cleveland has claimed much attention from the daily newspapers and from community and other papers devoted to civic subjects.

## Record Men at Salt Lake City Honored

The winners of the January safety contest of the Utah Light & Traction Company, Salt Lake City, Utah, and the men having no accidents during the year just past were banquetted at the Newhouse Hotel, on the evening of Feb. 18, in honor of their successful participation in the yearly safety contest, as well as the monthly team contest.



Forty-one trainmen were successful in keeping a clear accident record for the year; four of these were operators having no accidents for a period of three years. The men holding this enviable record are John Winward, Dolph Evans, Lars Christensen and Byron Sperry. The one-year men are: C. O. Strong, Carl Peterson, Frank Pickering, William Shelton, Robert Moss, Joseph Lindsay, E. Johanson, Joseph DeBry, E. E. Crutchfield, Paul Eckman, D. B. Woodhead, Roy Goodman, H. Natter, Dan Parker, Jacob Hill, Allan Davis, Ike Roden, Charles Carlson, Vern Crawford, Fred Timmerman, Mark McDaniels, Herbert Cherrington, Bruce Tingley, W. A. Cobble, F. Groom, Karl Booth, C. McLeod, Leonard Woods, Henry Scheutter, William Schrader, J. E. Jeppson, William Summers, B. Thormstorff, E. L. Jenkins, Samuel Hazen, Robert Gee, and last, but not least, Elgin Johnson. Each of the three-year men was presented two \$20 gold pieces, while the one-year men received one.

Cor Vreeken, White team captain, was the toastmaster.

## Fare Raise on Pennsylvania Line Upheld

Complaints launched by the Delaware County communities against the 2-cent increase in fares on the lines of the Philadelphia & West Chester Traction Company, Upper Darby, Pa., were dismissed April 13 by the Public Service

Commission. That body ruled that the higher rate was not unjust or unreasonable and refused the proposition of the complainants that the regular rider should be carried at a commutation rate of less than 10 cents per zone and that school children be carried at a special rate.

The company increased its cash fares from 8 cents to 10 cents on June 20, 1927 and discontinued the general sale of tickets. It was contended by the

railway that since the general use of motor vehicles was reducing its revenues fares had to be raised or the standard of service lowered.

## 3,600 "Ads" Submitted in Public Utility Contest

A total of 158 of the leading public utility operating companies of the United States and Canada entered the better copy contest conducted by the Public Utilities Advertising Association. They submitted 3,600 advertisements for the judging. The contest, which closed April 1, included newspaper and periodical advertising released during the previous. Awards will be made for the three best ads in each of three divisions: electric, gas and transportation. The awards will be made jointly by the Public Utilities Advertising Association with the National Electric Light Association, American Gas Association and American Electric Railway Association in their respective divisions.

The ads will be judged by a board representing these four associations, and by a committee consisting of P. L. Thomson of the Western Electric, J. C. McQuiston of Westinghouse and T. J. McManis of General Electric. The awards will be made at the annual convention of the Public Utilities Advertising Association in Detroit in conjunction with the International Advertising Association on July 10.

## Refusal on Piedmont & Northern Extensions

Applications of the Piedmont & Northern Railway for permission to extend its lines of railroad from Spartanburg, S. C., to Gastonia, S. C., and from Charlotte, N. C., to Winston-Salem, N. C., have been denied by the Interstate Commerce Commission. The Piedmont & Northern construction proposals, the commission held, would result in the paralleling of existing railroads, chiefly the Southern Railway, and would not be necessary to the agricultural and business interests of the territory proposed to be traversed. It was declared by the commission that the presumption against such paralleling as was proposed could not be overcome by such evidence as was presented. That body added that the investment proposed would not be justified by the net addition to the railway revenues of the country. The order said in part:

The competitive nature of the enterprise is aggravated by the association of the applicants with large interests which have the power to control or influence much traffic on other grounds than transportation service.

There would be some advantage both to the applicants and to the communities served in joining the Piedmont and Northern to existing lines. Only a small part of the traffic handled on either is, or would be, destined to points on the other. They are being operated successfully and the evidence presented does not justify further paralleling the Southern closely for a distance of 53 miles. Upon the facts presented we find that the present and future public convenience and necessity are not shown to require the construction by the applicants of the line of railroad described.

Commissioners Esch, McManamy and Brainerd dissented from the majority and voted to grant the application. Commissioner McManamy in his dissenting opinion declared that the Southern and other railroads which objected to the Piedmont & Northern extension were among the most prosperous railroad lines of the country and not in danger from the threatened competition.

## Paving an Issue in St. Paul

The matter of paving in St. Paul, Minn., has come to a head as a result of defeat early in March of a proposed charter amendment which would have relieved the St. Paul City Railway of paving obligations. As a matter of fact, half a dozen issues complicate the St. Paul situation. City officials are making efforts to prevent an increase in fare, particularly seeking to prevent the St. Paul fare from being made higher than the Minneapolis fare.

As recently as April 9 a program of paving between tracks in St. Paul was the subject of a conference between Council members and railway officials. Whether the city and the company can get together on work to be done this year by the company is likely to determine the city's policy as to future negotiations aimed at amicable settlement of the entire problem.

### Public Utility Investigation to Be Resumed April 24

Two thousand returns from public utility operating companies have been filed with the Federal Trade Commission as answers to the first general questionnaire sent out by the commission in connection with its investigation of public utilities. This was made known by the commission on April 16 in sending its second monthly report of progress to the Senate.

The returns contain data regarding electric energy and gas capacity, production, purchases, sales, interstate business, inter-company relationships, earning and investment.

Public hearings will be resumed on April 24 when officers and employees of the National Electric Light Association, American Gas Association and the Joint Committee of National Utilities Associations will testify.

A large number of exhibits has already been obtained from these organizations and will be introduced into the record at the hearings. Examination of the books and papers of still other public utilities and bureaus is in progress.

The interim report sent to the Senate on April 10 is the second such record transmitted to that body by the commission in accordance with the provisions of Senate resolution 83 referring the public utilities investigation to the commission and calling for public hearings and monthly reports of progress. Accompanying the report just made is a transcript of the recent three-day public hearings. A list of the large number of exhibits entered at these hearings and descriptions of each are being prepared for use of the Senate.

### Propriety of Extensions Questioned in Cincinnati

Extreme caution must be used in extension of car or bus service at Cincinnati, Ohio. This is the gist of a report presented by E. Dow Gilman, Public Utility Director, to Col. Sherrill, City Manager. In his report, Mr. Gilman makes a preliminary survey of ten extensions of service which have been requested and calls attention to the fact that by the year 1930 the Cincinnati Street Railway will be compelled to make an annual expenditure of approximately \$1,075,600 more than in 1926, 1927 or 1928, exclusive of any extension.

Closely connected with the financial consideration of the extensions is the fact that the city has been requiring expenditures for improvements in the existing system far beyond the earning capacity of the system, the report states. Attention also is called to the fact that the company has been permitted to borrow \$1,150,000 and that this borrowing does not solve a financial problem but merely defers it. If the loan is not paid back in five or six years it may become a capital charge. In concluding his report Mr. Gilman says:

In order to balance the estimate of increased expenditures in the coming years, it will be necessary either to increase the fares or to increase business or decrease operating costs or to permit a certain amount of capitalization of operating costs. We are hoping that there will be an increase in business. We are sure that there will be a considerable decrease in operation costs as a result of the better condition of the property. An annual increase in the operating expenses of more than \$1,000,000 a year must receive careful consideration before adding further to such expenses.

### Survey of Omaha Suggested

The real estate board of Omaha, Neb., has asked the City Council and city planning commission to employ traffic engineers for the purpose of making a complete survey of electric railway and bus service in their relation to the parking problems. It points out that the present street car system was laid out 30 years ago when the city was less than half its present size, and very few reroutings have been made since then and practically no extensions for a number of years. The communication sets out that the present management of the Omaha & Council Bluffs Street Railway has indicated a willingness to meet the public demand for rerouting of lines, if necessary, and to take care of needed bus and car line extensions.

### Rehearing Sought by Los Angeles Railway

A petition was filed by the Los Angeles Railway, Los Angeles, Cal., with the Railroad Commission on April 14 seeking a rehearing in its application for an increase in fares. The company claims that continuation of the 5-cent fare as ordered by the commission is a confiscation of the company's property and would result in poorer service. Application for a 7-cent rate was denied by the commission last month, and another

application for a 6-cent rate was denied in June of last year. Officials of the company claim that it is impossible to make savings in operating methods as recommended by the commission in its denial of the application.

### Freight Service to Improve Texas Earnings

An amendment to the charter of the Texas Electric Railway, which operates interurban lines between Dallas and Waco, 100 miles; between Dallas and Denison, 110 miles; and between Dallas and Corsicana, 60 miles, has been filed in the secretary of state's office providing for the establishment of freight service upon all of these roads. This action automatically placed the system under the jurisdiction of the Texas Railroad Commission. According to James P. Griffin, vice-president in charge of operation, it is planned to start fast freight service over the three lines as soon as schedules can be worked out.

### Dispute in Memphis Settled

The differences between the Memphis Street Railway, Memphis, Tenn., and its trainmen have been adjusted satisfactorily. A new contract for three years subject to cancellation by either side at the end of any twelve months' period has been agreed upon. The wage scale in effect for the past two years is to be continued for one year. If the contract is continued beyond one year, the wage scale may be opened upon demand of either party, and if a satisfactory agreement cannot be reached arbitration may be resorted to.

The controversy now settled arose over a demand of the trainmen for arbitration of disagreements arising in connection with suspension and discharge of employees in the administration of discipline. The company declined to accede to this demand. The city intervened through the Mayor and a final appeal committee was agreed to consisting of two members of the board of directors of the street railway and one outside member, all named by the Mayor. Only recently a board of arbitration recommended that the old wage scale should be continued in effect.

### Improvements and Changes on New York State Lines

Several important changes were put into effect by the New York State Railways on April 15. They were: Adoption of a high speed schedule for the city-owned subway railroad in the bed of the abandoned Erie Canal; diversion of Rochester & Syracuse Interurban cars into the subway within the city limits, and rerouting of Arnott-Clifford surface cars through Main Street.

The new city subway schedule calls for ten-minute service during the rush hours (between 6:30 and 9 a.m. and

HERE'S YOUR CHANCE TO WIN A PRIZE...AND AT THE SAME TIME HELP US CHOOSE THE BEST COLOR OR COLORS TO REPAINT OUR STREET CARS—YOUR STREET CAR!



ANNOUNCING

## Street Car Painting CONTEST

by the



**JACKSONVILLE TRACTION COMPANY**  
A. P. TRAMWAY COMPANY

in which

**106 prizes are offered for your color suggestions for repainting the cars of this company**

The Jacksonville Traction Company means just what it says: to provide the best looking and practical in color to repaint its cars.

THE RULES OF THIS CONTEST ARE VERY SIMPLE

THE PRIZES

- First Prize \$25
- Ten Second Prizes Each \$15
- Three Third Prizes Each \$10
- One Hundred Fourth Prizes at \$1 Each

Send your suggestions to the Contest Department, Jacksonville Traction Company, Jacksonville, Fla.

Soliciting the people's ideas on color

4:30 and 7 p.m.) and fifteen-minute headway during the rest of the day up to 6:30 p.m. when twenty-minute service will be maintained until midnight.

The terminals of the subway are the Driving Park loop at the northwestern edge of the city and Winton Road at the northeastern rim, the subway bisecting the heart of the business district. Feeder power lines have been installed to take care of the additional subway service.

The diversion of the Rochester & Syracuse cars to the subway shortens the running time between Rochester and Syracuse by ten minutes. Three interurban railroads entering Rochester now are using the subway: The Rochester & Syracuse, the Rochester & Eastern and the Rochester, Lockport & Buffalo.

President Hamilton said that the placing of the interurban cars in the subway would relieve the congestion on Main Street so that the rerouting was possible.

### Macon's Utility in the News

A newspaper section covering 14 pages is given over to the history of the Macon Railway & Light Company in the *Macon News*, of Thursday afternoon, April 5, 1928. Although the story begins with the year 1902 when a consolidation put six companies under one and the present name, incidents in the chartering of Macon's first railway in 1868 are related. There are portraits of the officials, together with pictures of the morning shift, afternoon shift, construction crew, cars and routes. In addition, some well-poised advertisements for the Macon service are included. Editorial comment called attention to the improvements projected by the company and to the expected public appreciation.

### New Line to Ford's River Rouge Plant

Arrangements have been approved by the Detroit Street Railway Commission for the construction by the Department of Street Railways of a new double-track extension from the city's Michigan Avenue line to the River Rouge plant of the Ford Motor Company at a cost estimated at \$85,000. Del A. Smith, general manager, says the extension will eliminate the present Ford-McGraw bus line and will result in an annual saving of \$22,000.

The money for constructing the new line will come from the sinking fund of \$3,705,000 required to make payments on the \$7,580,000 D.U.R. purchase debt due in 1931. Both G. Ogden Ellis, president of the Street Railway Commission, and Mr. Smith have approved this plan of financing as has also the department's counsel.

The general manager pointed out the economies that result from investing the sinking fund in profit producing properties rather than letting it remain in the bank at a low rate of interest.

## Negotiations Reopened

**With primary out of way matter of settlement of railway situation is again before Chicago Council**

Members of the local transportation committee of the Chicago City Council have re-opened the local railway negotiations. They were abandoned before the April 10 primary for "political reasons." The new efforts, however, are expected to be on a much more modest scale than in the past because of the opposition indicated at the polls to Mayor Thompson and Governor Small, who are in agreement on the nature and method of obtaining the proposed railway legislation.

It is understood that the transportation committee will now confine its activity to obtaining passage of only two of the five bills recently drafted—one, creating a local transit commission; the other, amending the cities and villages act to permit term franchises longer than the present twenty-year limitation. Whether or not Governor Small, in the light of his defeat for renomination, will abide by his decision to summon a special session of the Legislature next month to enact legislation to help settle Chicago's railway problem, is a matter of speculation among the Aldermen. Many believe that the proposed session was merely a campaign promise. Representatives of the railways have refused to comment on the franchise negotiations or legislative bills, but they are reputed to be at work on a new plan for a settlement.

When the local transportation committee discontinued discussion on the bills early in March, five proposed legislative measures were before them, one for home rule, one creating the terminable permit, another authorizing the construction of subways by special assessment, a fourth permitting the consolidation of the local railway systems and one amending the cities and villages act to remove the twenty-year limit on franchises.

Three of these bills had been recommended for passage to the full transportation committee by a sub-committee. These were the measures dealing with home rule, subway construction, and consolidation of systems. The hills on terminable permits and on amending the cities and villages act are still being considered by the subcommittee.

### Baltimore Fare Suits Set for Hearing

Judge Joseph N. Ulman, in the Circuit Court, Baltimore, Md., has signed an order setting April 30 as the date to open all the cases involving the street car fare in Baltimore. The cases will be tried on the same record. All the suits are against the Maryland Public Service Commission, which recently authorized the United Railways & Electric Company to charge a fare of 9 cents straight or three tokens for 25 cents.

The Maryland Public Service Commission has answered in the Circuit Court, Baltimore, Md., the bills of com-

plaint of the People's Corporation and the Socialist party of Maryland. Both these bills seek to restrain the commission from enforcing or continuing its order under which the United Railways & Electric Company, Baltimore, was permitted to charge an 8½-cent fare. Recently the commission answered a bill filed by the United through which the latter seeks to restrain the commission from interfering with a straight 10-cent fare.

### Does Municipal Ownership Loom at Youngstown?

Henry Engle, street railway commissioner at Youngstown, Ohio, says the city may be forced, as a matter of self protection, to take over the local railway and bus lines due to the movements now under way to expand the city. Railway extension, north, south and west, may be necessary as a result of expansion in those directions and in the event the Municipal Railway can not agree to make those extensions the city may be forced to provide for its own transportation development.

### More Jacksonville Franchises Drawn

The Council of Jacksonville, Fla., has received drafts of two proposed ordinances from Peter O. Knight, Tampa, counsel for the Stone and Webster interests in Florida, for comparison with the proposed franchise drawn by the Jacksonville citizens' committee to be granted to the Jacksonville Traction Company. It is expected that Mr. Knight or some official of the local railway will explain the two drafts to the Council and that all three drafts will be referred to a special committee to compile a franchise for the company that will prove satisfactory to the city and company alike.

### Bright Cars for Summer in Norfolk

On the theory that summer equipment should have a summer appearance to attract riders, officials of the Norfolk division of the Virginia Electric & Power Company have announced that they had decided to repaint open cars used in handling resort traffic in bright colors, resembling awnings and porches. The tops of the cars will have orange and blue 18-in. strips, with the upper body and supports in cream color and the lower body in bright green.

### Rehearing on Peoria Opposition

Peoria, Ill., has been granted a rehearing in the matter of its opposition to the proposed fare increase sought by the Illinois Power & Light Corporation from the Illinois Commerce Commission. Effective on March 1 the railway abolished the permit card and seven tokens for 50 cents system for a three for 25 cent system and a straight 10-cent cash fare.

## Counsel for Brooklyn Companies Deplored Attack on Commission

Clarence J. Shearn, special counsel for the Brooklyn City Railroad and the Brooklyn-Manhattan Transit Corporation in the bus hearings, said on April 17 that "there is no basis whatever for any reflection upon the Transit Commission, political or otherwise." He did this in reply to the charges made by William Bullock, director of the city affairs committee of the New York County Republican Committee.

Mr. Shearn explained that his clients were opposing the application of the Equitable Coach Company, which was attacked in the Republican statement, because the proposed bus system would cripple the surface lines. He said:

In recent statements issued for publication by the city affairs bureau of the Republican County Committee dealing with the Equitable Coach Company the Transit Commission, before which proceedings are now pending, is characterized as "a Tammany Commission" and severely criticized for its conduct of the case. My clients, the Brooklyn surface railroads, strongly deprecate any attempt to turn a judicial hearing into a political controversy.

Believing that the injection of 60 miles or more of competitive bus routes parallel with established surface lines would have a crippling effect upon the companies that must be depended upon to carry 500,000-000 passengers annually, the case of the surface lines is, naturally, being tried thoroughly and vigorously. The Brooklyn companies rely upon the merits of their case for success and consider it unfair and unfortunate that a political attack upon the tribunal charged with responsibility for deciding the case should be made in the newspapers.

While we have urged before the commission that the financial ability of the Equitable Coach Company should be established in the first instance, and thus perhaps save the expense of a long drawn-out contest, we have bowed with entire respect to the decision to postpone this issue until the various routes have been passed upon.

On behalf of the Brooklyn surface companies I wish to state that we feel that Commissioner Godley has conducted these hearings with marked ability, with complete fairness and with great patience, and there is no basis whatever for any reflection upon the Transit Commission, political or otherwise.

## North Shore Goes After Business

The third annual better business campaign of the Chicago, North Shore & Milwaukee Railroad, Highwood, Ill., has been launched. In the January and February drives five different departments scored 100 per cent of their quota and a total of 5,247 new business tips was submitted. In addition to the \$300 in regular quarterly prizes four special awards totaling \$100 will be made during the first-quarter for the largest number of tips resulting in sales of 25-ride commutation tickets.

Records for the 1927 campaign activity show that 48 per cent of the North Shore Line personnel took part in the organized drive for new business. Tips on sources of additional business turned into the traffic depart-

ment by employees during the year totaled 16,654. It is estimated that 36 per cent of these tips were converted into additional business to the railroad.

## Abandonment Petition of Pacific Electric Withdrawn

Following an agreement reached by officials of the railway and the city of Redlands, Cal., the application of the Pacific Electric Railway to abandon the Smiley Heights car line was withdrawn on March 29, when the hearing opened

## Extension Appeal in O'Fallon Case

Federal District Judge Harris, at St. Louis, has granted the St. Louis & O'Fallon Railroad a time extension to May 9 for the docketing of the valuation appeal in U. S. Supreme Court. Postponement of the docketing means the case will not be argued this term, since arguments usually close late in April. It is expected a motion will be made to advance the case for hearing early in the next term, which opens on Oct. 1.

## "You Must Share This Responsibility"

THERE comes a time when community progress stops. Its most common enemy is lack of civic interest—lack of honest consideration for the agencies that make a community happy, prosperous and progressive.

Had the public banded together to block all street paving projects Wichita could not have reached its present size.

Had the majority been opposed to the bond issues that made possible our beautiful new schools and University, Wichita would not rank as an educational center.

Had you fought the hundreds of improvements that together have made Wichita a city of over a hundred thousand population, your investments, your real estate and your business would be worth only a fraction of today's value.

Yet the one agency that *must* grow even faster than the community is held in check—*Transportation*. If Wichita fails to maintain its present rate of growth it will be because of lack of transportation facilities. The arms of the bus and street car lines must penetrate the outlying districts before a community can be built.

Lack of an adequate transportation fare must necessarily curtail maintenance and extension. Without an adequate fare the entire growth of Wichita will be undermined. It is your responsibility to see that Wichita transportation lines are maintained and extended. It is your responsibility to see that the transportation company is granted a rate sufficient to maintain and surpass its present service.

This is a serious matter and deserves your careful consideration. Without an increased rate transportation will suffer—without transportation the growth of Wichita will suffer.

Think it over—*Wichita, Kan., "Eagle."*

before the Railroad Commission. The agreement provided that the Pacific Electric continue to operate the line, and keep it in good shape and operate cars on a schedule as reliable as that now in use. Certain paving requirements were mentioned in the pact. The city of Redlands opposed abandonment.

## Skip-Stop Voted in Omaha

A straw ballot on abolishing the skip-stop in Omaha, Neb., taken at the recent primary election resulted in 14,184 negatives and 8,083 affirmatives. Only one line reported a majority in favor of abolition on the Omaha & Council Bluffs Street Railway. Manager Porter devised the ballot for the purpose of finding out if the demand evidenced by complaints was a universal one. He told the patrons that the abolition would cost the company from \$30,000 to \$40,000 a year and distributed cards showing the delay to traffic under the proposed plan.

## Utility Story Told Effectively

The Penn-Ohio System, Youngstown, Ohio, has reproduced in booklet form, principally for the further information of Penn-Ohio investors, the series of advertisements which appeared in the *New York Times Annalist* during the early months of 1928.

Their purpose was to acquaint business men with the facts about the remarkable growth which the Penn-Ohio System has enjoyed, and also to state to the public the principles and ideals which underlie the Penn-Ohio policies and management.

The ads. referred to previously in *ELECTRIC RAILWAY JOURNAL*, provoked much favorable comment both from the standpoint of their content and the manner of their presentation. "The Penn-Ohio System—Its Place in the Community" deserves a place in the portfolio of all executives interested in the subject of better public relations.

## Recent Bus Developments

### Georgia Commission Restrained Until Court of Appeals Ruling

A permanent injunction restraining the Georgia Public Service Commission from exercising jurisdiction over the bus lines in the state has just been denied by Judge John D. Humphries, of the Fulton Superior Court. However, Judge Humphries issued a supersedeas order keeping the temporary injunction in effect until the State Court of Appeals can construe the law.

Attorney Paul Lindsey, representing the bus line operators, contended that the Public Service Commission had no jurisdiction over buses, since they were not common carriers. Attorney S. J. Smith, Jr., representing the Public Service Commission before the court, held that buses were common carriers and as such amenable to the rules and regulations of the State Public Service Commission. Judge Humphries held that the buses were common carriers, and denied the petitioners a permanent restraining injunction.

### Reading Wins Franchise Over P.R.T. Objection

The Reading Transportation Company, a subsidiary of the Reading Company, was granted the right to operate buses between Jenkintown and New Hope by the Public Service Commission on April 12 over the protest of the Philadelphia Rapid Transit Company, Philadelphia, Pa. The commission upheld the application on the ground that the bus service was intended to supplement rail service between those two points. The Philadelphia Rapid Transit Company operates electric lines through part of the territory which the Reading buses will serve.

The Reading buses will stop at 24 intermediate stations between Jenkintown and New Hope, but will not pick up incidental traffic along the road.

### Permits Sought for Extensions in St. Louis

An application has been made by the St. Louis Public Service Company, St. Louis, Mo., to the Board of Public Service for a permit to operate a bus line from Grand Boulevard and Meramec Street southward along Grand-Kings Highway to Carondelet Park, a distance of 1.75 miles. It is planned to use three single-deck, pneumatic tired buses on this route. This bus line would be considered as part of the railway service. The fare would be the same as on the street cars, 8 cents or two tokens for 15 cents and transfers would be issued to and from the cars without extra fare.

The company has also sought author-

ity to install a bus line on Kings Highway between Oakland and Southwest Avenues to connect the Southampton with the Manchester, Market and Taylor Avenue lines and through those street cars with other lines in Central and North St. Louis. The fare on this line would also be the same as on the street cars with transfer privileges. On this line three single-deck, pneumatic-tired buses would be used.

### Insulls Participate in Deal for Chicago Terminal

Control of the Chicago Consolidated Bus Terminal Building Corporation has been acquired by the Insull, Motor Transit and Yelloway interests, the three largest interstate operators entering the city. Plans are practically completed to start operation of the modern terminal at Wabash Avenue and Roosevelt Road which has lain idle up to the present time.

The terminal will be used jointly by the Motor Transit Corporation, with its Greyhound, Royal, Rapid, Oriole, Mohawk, and other subsidiaries: The Shore Line Motor Coach Company, Metropolitan Motor Coach Company, Western Motor Coach Company, and by Yelloway, Inc. For the present these lines will retain existing terminals merely as stops to pick up passengers.

### New Service in Marinette-Menominee

Electric railway cars in Marinette, Wis., and Menominee, Mich., were replaced by buses on March 24. Eight buses have been placed in service, four being licensed in Wisconsin and four in Michigan. These eight Reo buses are the latest in 21-passenger city coach transportation equipment. Street car tokens are being redeemed in exchange for bus tokens.

The fare for children on the new bus lines, and in fact for all transportation systems operated by the Wisconsin Public Service Corporation, is determined by height rather than by age. Marks on bus doors indicate the height of children. Those under 40 in. are carried free if accompanied by a person paying fare. Children more than 40 in. and less than 52 in. pay half fare and those over 52 in. full fare, except where special rates for school children are in effect.

The substitution of bus service for railway lines in the Twin Cities loomed as long ago as early in 1927 when J. P. Pulliam, vice-president and general manager of the Wisconsin Public Service Company, stated that railway service in Marinette and Menominee had been supplied at a loss of \$80,000 in 1926.

### Minnesota Vehicle Law Upheld

The Minnesota Supreme Court on April 13 upheld the state vehicle regulation law of 1925 under which the Railroad & Warehouse Commission licenses bus lines operating between fixed terminals. It affirmed the denial by Judge B. F. Wright of Itasca district court of the plea of Andrew J. LeFebvre to set aside the order by the commission denying him permission to operate buses for 38 miles between Grand Rapids and Hibbing. He had been granted a license to operate until a federal mail contract expired on July 1, 1927. The complainant charged that the act was discriminatory and the state had gone beyond its authority.

The higher court ruled that the state had control of its highways and might prohibit intrastate common carriers by motor vehicles from doing business unless licensed by the commission. Even though it excludes taxicabs, hotel and school buses and vehicles transporting farm products from regulation, the act is held not to be discriminatory.

### Repair Work Expedited by Running Buses at Night

The Washington Railway & Electric Company, Washington, D. C., has obtained permission from the Public Utilities Commission of the District of Columbia to conduct with buses an owl service on three of its rail lines. This plan of service, which is scheduled to go into operation on May 1, will result in saving \$18,000 a year, according to the estimates of officials. The three lines affected are: Lincoln Park-Georgetown; Ninth Street-Brightwood, and the Columbia line.

Although these lines constitute some of the longest hauls on the company's system, it is expected that fifteen buses, each making eight trips per night, will be sufficient to give the service. Officials point out that this bus operation will greatly facilitate track repair work, the major part of which is done during the night hours in order to interfere as little as possible with car schedules. Because of the prevalence of the conduit trolley system in Washington it is practically impossible to run temporary lines around repair work and considerable difficulty is therefore experienced in handling owl cars when the repair crews are at work.

### Bus Service Sought on Berkeley Line

An application has been made by the Key System Transit Company, Oakland, Cal., to the California Railroad Commission for permission to abandon its present railway service from the intersection of San Pablo and Ashby Avenues, to the Hotel Claremont, in the city of Berkeley. A certificate of public convenience and necessity is sought to operate bus service over the route now traversed by the railway.

## Necessity for Regulation Shown

Conclusion to this effect seems inescapable from trend of testimony presented before the Senate Committee on Interstate Commerce which is considering the Parker Bill for regulation

CHANGES in the Parker bill to regulate interstate buses that will lead toward greater centralization of authority and consequently away from home rule by the state regulatory board seem likely as a result of the recent hearings before the House committee on interstate commerce, but nothing conclusive can be stated because all presumptions necessarily are based on things that are intangible.

As indicated in the *ELECTRIC RAILWAY JOURNAL* for April 13, S. A. Markel, chairman of the Legislative Committee, Bus Division, A.A.A., outlined the case for the bill. He introduced a group of ten amendments, mostly to clarify the wording.

At the hearing on the second day Samuel I. Lipp, representing the Cincinnati, Lawrenceburg & Aurora Electric Street Railroad, favored early passage of the bill as drawn with a change of definition for motor carriers to include all bus operators in interstate service of any kind and omission of the grandfather clause.

Frank R. Fageol expressed his conviction that the interstate bus business should be regulated. He suggested, however, that the grandfather clause might well be modified so as to permit carriers to prove the convenience and necessity of their operation on the basis of their revenue per mile or the riding factor. He emphasized his belief that it was not the function of the manufacturer to concern himself with the formulation of the terms of the statute under which the operators of his product would be regulated.

The third day was opened by Judge C. C. McChord, former chairman of the Interstate Commerce Commission, reading a statement outlining the position of the National Automobile Chamber of Commerce. He said that at the present time a provision for issuing a certificate of convenience and necessity is enough, that insurance is necessary but that the states now have power to compel its carriage, that the machinery provided by the bill is hopelessly complicated and grave doubt exists that it is constitutional, and last that, because of the diversity of conditions, the matter should be considered carefully.

Following Judge McChord, La Rue Brown took up the case specifically for the N.A.C.C. He said the Chamber accepted a statement of the motor carriers themselves that regulation was needed and consequently favored regulation of the kind proposed. A radical extension of regulation by the federal government was being proposed and he entertained grave doubts about it being constitutional. In this connection Mr. Brown quoted Chief Justice Fuller to the effect that delegation of federal power to local governmental units is unconstitutional.

Mr. Brown continued with the assertion that while the N.A.C.C. believed

regulation is needed, it should rest lightly on the operating industry. Probably this could best be done with a federal commission, which could be either the I.C.C., a part of it or a separate board. This plan would be complex but not nearly as much so as the procedure outlined in the Parker bill. If regulation were put into effect it would be enough to have certification only, with revocation of the certificate as a disciplinary measure. He felt that all carriers operating one year should be granted certificates as a matter of right. In conclusion, he said that the N.A.C.C. favors regulation, but wants the committee to remember that the motor carrier industry is new and that requirements may be added to any system of regulation much more readily than they can be dropped.

Three other witnesses appeared at the fourth session. A. R. Williams, general manager of the United Electric Railways, Providence, R. I., urged that the bill be passed in order to protect investor's capital. Day Baker representing the Motor Coach and Bus Association of Massachusetts, favored regulation but felt that the time was not ripe for fixing rates. C. W. Fairchild, representing a group of casualty and indemnity insurance companies, felt that the bonding provisions of the proposed law should be amended since it was very doubtful whether his companies or any others could write insurance for the carriers under the bill as it now stood.

When the session was resumed after adjournment over the week end associations that favor the bill began their rebuttal presentations. John E. Benton of the National Association of Railroad and Utilities Commissioners, reiterated that few buses out of the total are in interstate service and consequently the state boards should have power to control these few along with the many. Most interstate lines, he continued, are comparatively short, operating through only two states. Before the Buck and Bush cases the states did well in regulating the interstate bus and should be empowered to take it up again. Regarding constitutionality of the proposed law Mr. Benton felt that if there were doubt it would be worth while to use it as a test.

At the hearing on the last day George H. Pride, representing the New York Board of Trade and Transportation, opposed the bill. Mr. Pride said no law is needed, that its passage would allow the railroads to stifle the bus business and consequently that it would be against the public interest.

The proponents of the bill then took up their rebuttal arguments. C. D. Cass, for the American Electric Railway Association, quoted Examiner Flynn's report concerning the abuses now found in the interstate bus industry. He said reliable transportation could be

obtained only by a certification provision. Essential to any such act as the one contemplated are four points: Certification, protection for passenger, rate regulation, and the necessary machinery. He again brought up Mr. Benton's contention that operation through many states is exceptional. In the case cited by Mr. Brown the applicant would get some law student to file carbon copies of the application with each state board. Mr. Cass thought each state should have a veto power, with provision for appeal to the Interstate Commerce Commission.

A second session was held on this last day to complete the hearings. In concluding his remarks Mr. Cass charged that the N.A.C.C., is only attempting to obstruct passage of the bill. He could not understand why the manufacturers should appear at a matter concerning the operator.

E. W. Wakelee for the Public Service Co-ordinated Transport, made a clean cut plea for protection of existing utilities in the interest of the public. Cut-throat competition, now provided by interstate operators in the territory his company serves, is ruining the existing transportation companies. This is not to the interest of the public. He brought out specific instances of the irresponsibility of the bus operators. Competition is continuous. The regular operators must keep a huge reserve of equipment for peak loads, but their competitors avoid this burden. He believed that the newcomers in the field should bear their full share of the burdens of regulation.

Mr. Cass read into the record a statement by B. B. Cain, general counsel for the American Short Line Railway Association, to the effect that he was in harmony with attempts to secure passage of the bill as presented.

Alfred P. Thom, Jr., for the Association of Railway Executives, said the public was entitled to any form of transportation it wants, if it is economically sound. The rights of rail lines must be considered if the institution of bus operation will affect the steam road so substantially that it cannot carry out its obligations to the public. The mere existence of a rail line, however, should not be enough to cause refusal of a certificate to the bus company. To contend that investment in present bus lines should be protected by a grandfather clause while ignoring the investment in rail lines is inconsistent.

In summing up the case for those who favor the bill S. A. Markel said the necessity for regulation had been shown by the following:

Examiner Flynn's report.  
The approval of the National Association of Railroad & Utility Commissioners.  
The support of the Bus Division A.A.A.  
The backing of the railroads, both steam and electric.

The admission by every witness before the committee to the effect that some form of regulation is necessary. Even the witness most opposed to the bill admitted that regulation regarding insurance was necessary. He said that the public have a tremendous investment in the highways and those persons who do not own private automobiles should have the use of this tremendously costly system by means of public automotive conveyances.



# Financial and Corporate

## Diversion of Detroit Sinking Fund to Improvement Defended

During March, the net income of the Department of Street Railways at Detroit, Mich., after sinking fund payments was \$26,362, compared with \$67,402 a year ago. In March 43,761,251 passengers were carried. This is 500,838 fewer than in March, 1927.

According to William M. Hauser, auditor, \$1,589,652 has been taken from the department's sinking fund for use in financing improvements of the system. He says the increased savings from these expenditures will make it possible to restore the original amounts to the fund before the final purchase payment is made by the city to the Detroit United in 1931.

The auditor's statement accompanying his monthly report refers to the communication addressed by the governmental committee of the Detroit Board of Commerce to Mayor Lodge and the Common Council with respect to certain reserves of the D. S. R. which were not funded. The funds for these reserves have been used for road and equipment (capital costs, so-called) temporarily.

Disbursements have been made for road and equipment (capital costs, so-called) in excess of the resources and funds available for that purpose, so that \$1,589,652 will have to be provided from future earnings, in order to restore funds to certain reserves which it has been the department's policy heretofore to fund.

## Washington Merger Bill Before Congress

Another move toward the proposed merger of the transportation lines of the District of Columbia was made on April 14 when the Public Utilities Commission transmitted the revised unification agreement to Congress. The agreement will have to be ratified by the Senate and House before it can be made effective.

The commission's letter of transmittal contained the draft of a proposed bill to make the merger agreement effective, together with a brief review of the history of the merger agreement and the correspondence between the District Commissioners and the Bureau of the Budget with respect to certain provisions providing for the transfer of the cost and maintenance of paving between car tracks and the payment of the salaries of crossing policemen from the consolidated company to the taxpayers of the District.

The merger plan had been before the Utilities Commission since Oct. 31, 1927, when Harley Peyton Wilson, principal owner of the Washington Rapid Transit Company, submitted a skeletonized outline of a scheme for con-

solidating the companies. This plan formed the basis of the merger agreement, which was later subscribed to by the boards of directors and stockholders of the companies. The agreement, however, was modified by the Public Utilities Commission before it approved the document.

Senator Capper, chairman of the Senate District Committee, is reported to have said that there was some doubt as to whether a merger bill could be passed at this session. He based this belief on expression that had come from several of his colleagues.

## Purchase Discussions Resumed in New York

Negotiations between Samuel Untermyer, special counsel for the New York Transit Commission, and representatives of the Brooklyn-Manhattan Transit Corporation, have been resumed. The object is to reach an agreement for the purchase of the B.-M.T. properties by the city as the first step in a program of transit unification.

The main outlines of the proposed agreement are said to have been drafted and both sides are virtually in agreement. This tentative draft includes the method of exchange of securities in payment for the lines and practically everything except price.

A committee of engineers representing the city, the Transit Commission and the company has been at work for several weeks compiling data which will be used in the subsequent price negotiations.

The immediate concern of the conferees is said to be to find a way to overcome the handicap which resulted from the failure of the Legislature to pass the Untermyer bills. Mr. Untermyer does not believe the bills were essential, but the railway representatives felt differently about them. Now, however, they are said to be willing to join in a test suit in the courts to clear up some of the points involved.

## Good Showing in Toledo in March

According to the March report of operations of the Community Traction Company, Toledo, Ohio, total revenue was \$321,377 against \$311,192 for the similar month last year. The statement showed 4,481,629 passengers compared with 4,358,747 for March, 1927. The showing this year is better than in any previous month this year or last year.

Due to the expiration of the sinking fund payments, the operations for March resulted in a surplus of \$25,449 for the stabilizing fund after all charges required under the Milner ordinance. Operating expenses were \$220,424 against \$224,972 for March last year.

Considerable additional service has been operated and coach mileage has been increasing. The railway system showed 536,959 car-miles at a cost of 39.404 cents per car-mile and total revenue of 53.322 cents per car-mile. Buses were operated 121,989 miles with total revenue of 27.638 cents per mile and total expense and taxes of 22.559 cents per mile. The short special bus runs were most profitable, while the Long Belt was the most profitable car line.

## Traffic, Fare and Wage Figures

Evidence of improvement in electric railway traffic was noted in January. The number of passengers carried was less than in January, 1927, but the amount of the decrease was not so great as that registered for December. The number of revenue passengers, including bus passengers, reported by 212 companies to the American Electric Railway Association for January, 1928, compared with January, 1927, is as follows:

January, 1928.....	843,241,464
January, 1927.....	860,850,256
Decrease, per cent.....	2.05

Average cash fares in cities of 25,000 population and over:

	Cents
February 1, 1928.....	8.1070
January 1, 1928.....	8.0953
February 1, 1927.....	7.9015

The average maximum hourly rates paid motormen and conductors in two-man service by companies operating 100 or more miles of single track:

	Average Hourly Rate, Cents	Index Number 1913 = 100 Per Cent
February 1, 1928...	57.36	214.50
January 1, 1928...	57.27	210.17
February 1, 1927...	56.94	208.95

## Report Lord Rothermere After British Columbia

Dispatches from London report that Lord Rothermere and associates had made a bid for the British Columbia Electric Railway, Vancouver, B. C., Canada. The deferred ordinary shares rose by nearly 40 points to £275 per share, while the preferred ordinary was up 60 points to £235. The reported offer for the railway stock is £280 the share for the deferred and £240 for the preferred. Stock of the British Columbia Electric is all of £1 par value. As of June 30, last, the company had about £8,000,000 of stock of various classes outstanding. Last December additional stock was created and this will probably be included in the deal, although that is not made plain.

The British Columbia Electric Railway is an English company. It operates the electric power, gas and railway services in Vancouver, New Westminster, Point Grey, etc., and Victoria and Esquimalt, serving in all an area

in excess of 1,500 square miles. There has been a gradual segregation of assets under the principal Canadian company of the group, the British Columbia Electric Power & Gas Company, a British Columbia incorporation of 1926.

Total assets of the company as shown in the consolidated balance sheet for the year ended last June 30, are \$66,856,866. Gross earnings for 1927 were \$12,313,394.

### Sale of Indiana Interurban Set for April 30

The property of the Indianapolis & Cincinnati Traction Company, Rushville, Ind., in the hands of a receiver, has been ordered sold on April 30 by Judge Will M. Sparks in Circuit Court after a motion for a new trial had been overruled. C. T. De Hore, a prospective purchaser, has an option on \$2,600,000 of the company's bonds and it is expected that he will bid in the road in behalf of himself and his associates.

### Terms of Proposed Ohio Merger Announced

After conference with the holders of substantial amounts of stock of the Northern Ohio Power Company, the directors of the Penn-Ohio Edison Company, on April 12, approved a plan and agreement of reorganization under which the Penn-Ohio Edison Company is to acquire at least a majority of the capital stock of the Northern Ohio Power Company. In furtherance of the proposal a meeting of stockholders of the Penn-Ohio Edison Company is to be held on May 1, 1928, to reorganize by (1) increasing its authorized shares of common stock to 2,000,000 shares without par value; (2) approving the plan; (3) authorizing the officers to take all necessary action.

Holders of capital stock of the Northern Ohio Power Company who deposit their certificates of stock properly endorsed will become parties to the plan. For each share of stock surrendered for exchange, if the plan becomes operative, there will be delivered  $\frac{3}{4}$  share of common stock of the Penn-Ohio Edison Company and  $\frac{1}{4}$  of an option warrant, series B, each option warrant, series B, entitling the holder to purchase 1 share of common stock of the Penn-Ohio Edison Company at \$50 per share if exercised on or prior to Dec. 31, 1928; at \$55 per share if exercised during the calendar year 1929; or at \$60 per share if exercised thereafter but on or prior to its expiration date, Nov. 1, 1935.

The plan is to become operative only upon favorable action by stockholders of Penn-Ohio Edison Company, the approval of counsel, and the deposit of 70 per cent of the capital stock of the Northern Ohio Power Company or at least a majority of the capital stock of the Northern Ohio Power Company on or before May 15.

Upon completion of the exchange, giving effect to the deposit of all of the capital stock of the Northern Ohio Power Company, the outstanding capitalization of the Penn-Ohio Edison Company will be

\$5,999,000	debentures 6 per cent due November 1, 1950.
\$8,151,800	7 per cent prior preference stock.
49,229	shares \$6 preferred stock (no par).
717,003	$\frac{3}{4}$ shares common stock (no par), including scrip for fractional shares.
119,270	option warrants issued in 1925 expiring Nov. 1, 1935, for purchase of common stock at \$25 per share.
166,650	option warrants, series B, for purchase of common stock at \$50 per share to Dec. 31, 1928; at \$55 during 1929, and at \$60 thereafter to expiration date Nov. 1, 1935.

It is planned that the generating plants of the respective companies ultimately will be physically interconnected as are the railways at the present time. This should increase operating efficiencies, for it will diversify the load and since the Penn-Ohio property now has generating capacity greater than its immediate needs and ready means of adding thereto should benefit the Northern Ohio, which is now purchasing a substantial part of its power requirements.

Dividends are being paid by the Penn-Ohio Edison Company at the rate of \$1 per share in cash and 1/25 of a share of common stock per annum.

## Increase in Pittsburgh's Net Revenue

Recession in many lines of business and the continued subnormal condition of the bituminous coal mining industry affected the Pittsburgh Railways throughout the year 1927

OPERATING revenues of Pittsburgh Railways, Pittsburgh, Pa., for the year 1927 were \$21,525,912, a decrease of \$362,447, or 1.6 per cent as compared with 1926. By constant attention to details of management, scientific research in operating problems and the adoption of new economical methods, the company was enabled to reduce operating expenses \$390,446, or 2.2 per cent, to \$17,066,567. Net revenues after depreciation increased \$27,999, or 0.6 per cent, to \$4,459,345. The company was able to meet all obligations in accordance with its operating agreements and closed the year with a satisfactory addition to surplus.

As a result of the company's belief that its task of rendering street car service is facilitated and there is greater likelihood of improvement in operations when the many problems which arise are approached from the standpoint of scientific research, recourse to this method of approach is playing an important part in placing operations on an efficient basis since light is thus being thrown on various problems by the dissemination of information throughout the organization.

Considerable time has been devoted to designing an improved street car that will attract more car riders. In this age of keen competition for traffic, new cars must feature quicker acceleration and still more comfortable riding qualities. Further additions to equipment have awaited the results of joint studies with car builders based on experimental cars under construction.

During 1927 the operations of the company continued to show a steady improvement. The number of car failures was reduced from an average of 1,203 per month in the preceding year to an average of 182 per month. Fewer cars awaited shop repairs. The installation of meters on all cars to measure the current consumed in daily passenger service is making it possible to isolate instances of uneconomical practices requiring instruction and to discover defective equipment more quickly. Instal-

lation of a mechanical device which records the spacing of cars on the different routes was begun and will be completed during the coming year. The purpose is better maintenance of schedules through automatic communication to

### SUMMARY OF INCOME AND PROFIT AND LOSS OF PITTSBURGH MOTOR COACH COMPANY FOR 1927

Operating revenues .....		\$483,569
Operating expenses:		
Maintenance of equipment .....	\$98,615	
Traffic .....	7,414	
Transportation .....	187,364	
General administrative .....	25,759	
Other general .....	27,871	
Taxes .....	18,932	365,955
Net revenue from operations...		\$117,613
Non-operating revenues .....	\$1,504	
Non-operating expenses .....	110	
Net revenue from other operations .....		1,393
Gross income .....		\$119,007
Income charges:		
Interest on unfunded debt ....	\$12,043	
Less interest charged to construction .....	841	11,201
Net income before appropriation .....		\$107,805
Appropriation for retirement (depreciation) reserve .....		62,848
Net income for the year .....		\$44,957
Surplus, Jan. 1, 1927 .....		20,851
Gross surplus .....		\$65,808
Deductions from surplus:		
Loss on equipment retired from service .....	\$11,381	
Miscellaneous (net) .....	1,392	12,773
Surplus, Dec. 31, 1927—per balance sheet .....		\$53,035

STATISTICS OF PITTSBURGH MOTOR COACH COMPANY	
Garages operated .....	1
Routes operated .....	6
Route miles operated (single way)†	25.2
Coaches owned .....	50
Revenue coach-miles operated††	1,348,333
Passengers carried .....	1,834,752
Passenger revenue per revenue coach-mile, cents*	36.82
Average fare per passenger, cents.	24.70
*Including special coach revenue and mileage.	
†Including 24 and 74 sightseeing routes.	
††Including special coach mileage.	

**SUMMARY OF INCOME OF PITTSBURGH RAILWAYS FOR THE YEAR 1927**

(Prepared in accordance with the terms of the agreement between city of Pittsburgh, sundry other municipalities, Philadelphia Company and Pittsburgh Railways)

Gross revenue from street railway operations .....	\$21,365,542	
Operating expenses:		
Maintenance of way and structures ..	\$995,558	
Maintenance of equipment .....	1,047,380	
Traffic .....	170,047	
Power .....	2,034,998	
Transportation .....	7,463,135	
General .....	1,036,817	
Miscellaneous .....	1,508,730	
Depreciation .....	2,055,245	
Taxes .....	608,137	16,920,047
Net revenue from street railway operations .....		\$4,445,495
Auxiliary operations:		
Operating revenues .....	\$160,369	
Operating expenses (including depreciation) .....	146,520	
Net revenue from auxiliary operations .....		13,850
Total net revenue from operations .....		\$4,459,345
Non-operating revenues:		
Rental of real estate and buildings .....	\$20,461	
Interest and discount .....	150,203	
Miscellaneous .....	4,191	
Total .....	\$174,856	
Non operating expenses .....	9,198	
Net revenue from other operations .....		165,658
Gross income .....	\$4,625,003	
Income Charges:		
Items under agreement:		
Return of 6 per cent on property valuation of \$62,500,000 .....	\$3,150,000	
Return of 6 per cent on additional capital for new property .....	328,800	
Payments to county of Allegheny, city of Pittsburgh and other municipalities in lieu of licenses, paving assessments, etc. ....	429,168	
Amortization of debt discount and expense on additional capital .....	67,325	
Items not under agreement:		
Interest on judgments and settlements .....	1,324	
Rental of seventeenth Street incline plane .....	7,102	4,583,720
Net income for the year .....		\$41,283

headquarters, which provides means for meeting emergencies and reducing delays due to blockades. Every means is employed, through close supervision and control of operations, to insure more reliable service.

The one-man car has been developed to a point where it compares with the two-man car in safety, speed and comfort. To these qualities it adds economy of operation which permits the company to give more frequent service. There are now 247 cars of this type on 33 routes, and this operation is proving uniformly successful. The fact that last year 23.01 per cent of the total mileage was one-man operated, as compared with 14.67 per cent in 1926, indicates the growth of this class of service.

In 1927 the Pittsburgh Railways operated its cars at the rate of 3,091 miles per accident, an improvement of 4.2 per cent over 1926. Accidents involving employees decreased 8.75 per cent, and those involving the public reduced 3.5 per cent. These records are indicative of accomplishments growing out of the company's accident prevention policy. In recognition of this performance the company received a certificate of honorable mention in the Anthony N. Brady Memorial Award for excellence in accident prevention and health promotion work.

The effort of the management to inform employees concerning the problems of management and to obtain their suggestions in formulating plans and policies has, according to President A. W. Robertson, met with a ready response and "the co-operation received from employees has helped to work out a situation which could be handled successfully in no other way."

The report says that the close working relations which prevailed during the year between the Traction Conference Board and the company helped materially in the operations of the property. During the last twelve months seven municipalities entered this quasi-partnership agreement, so that at the close of the year 73 per cent of the total population served and approximately 75 per cent of the total paved track mileage operated came under this agreement.

No definite plan has been evolved for readjustment and improvement of the financial structure of the railway system as a whole, but studies are progressing towards a solution of this complex problem.

During the year, 32.6 miles of track was reconstructed and 4.77 unused miles was abandoned. The report says:

The personnel is interested and its

**STATISTICS OF THE PITTSBURGH RAILWAYS**

Miles of road .....	327.25
Miles of track .....	585.99
Carhouses operated .....	20
Car shops .....	1
Trainmen's quarters and administration buildings .....	12
Rolling Stock:	
Passenger cars—motor .....	1,207
Passenger trailers—motorized .....	81
Passenger trailers—non-motorized .....	144
Freight cars .....	9
Snow sweepers .....	39
Snow plow .....	1
Snow scrapers .....	17
Sand cars .....	27
Flat cars .....	65
Work cars, etc. ....	74
Total cars .....	1,664
Passengers Carried:	
Revenue .....	262,061,272
Free transfer .....	38,243,105
Free .....	919,723
	301,224,100
Passengers carried (revenue, free transfer, free and estimated extra rides on passes) .....	389,615,236
Car-miles operated .....	41,588,216
Car-hours operated .....	5,045,323
Passenger revenue per revenue car-mile, cents .....	50.51
Average fare per revenue passenger, cents .....	7.97
Average fare per passenger (revenue, free transfer and free), cents .....	6.94
Average fare per car ride (total passengers carried), cents .....	5.36

morale high. The management is committed to scientific research and progressive methods. These factors, combined with good public relations, present a promising outlook and the management is pledged to continue efforts to render more and better service to patrons and create a progressively better situation for car riders and investors.

**\$2,496,769 Paid to Chicago by Surface Lines**

Payments aggregating \$2,496,769 and representing 55 per cent of the 1927 net receipts were made on April 11 to the Chicago City Council traction fund by the Chicago Surface Lines under the terms of the original 1907 ordinance. Of this total, the Chicago Railways, now operated by federal receivers, paid \$1,562,714 and the Chicago City Railway and subsidiary lines, \$934,055. The payments were made as the result of the extension on March 30 of the Surface Lines franchises for the fourteenth time since the twenty-year grants expired a year ago last January. The present extension, like the six previous ones, is for a 30-day period.

**Sunday Pass Record in St. Louis**

The St. Louis Public Service Company, St. Louis, Mo., on Sunday, April 8, sold 43,000 unlimited-ride tickets at 25 cents each. The passes were good between 3 a.m., Sunday and 3 a.m., Monday. This set a new record for the company.

**Six Lines Continued in Portland on Reduced Schedule**

After a study of the evidence by the Public Utilities Commission and officials of the Portland Street Railway, Portland, Me., operated under lease by the Cumberland County Power & Light Company, it was decided to continue the operation of cars on six of the seven lines on the reduced schedule plan. A month's trial has been ordered by the commission until May 15. In this way it is hoped to reduce the losses sufficiently so as to maintain service. The other line of the seven petitioned for abandonment—the Spring Street line—will be supplanted by bus service. If the plan does not succeed the commission will continue the hearings after May 15, when it will be settled that the lines are either to be discontinued or supplanted by another type of service.

At the hearing Manager Fred D. Gordon cited instances of decreased revenues, mounting costs of operation and construction, even with higher tariff. The deficit in 1927 was \$171,000. The suggestion of higher fares was rejected.

F. W. Hinckley, Republican candidate for nomination as Governor, said that since the Cumberland company was operating the lines under lease it had no legal right to seek to put into effect a plan that might tend to destroy property rights or franchise values.

## Kansas Line Would Issue Bonds

An application has been filed by the Kansas City, Merriam & Shawnee Electric Railway with the Kansas Public Service Commission for permission to issue \$35,000 in first mortgage bonds and 2,000 shares of preferred stock with a value of \$10 a share. The purpose is to provide funds to construct an electric line from Southwest Boulevard, Kansas City, Kan., to Rose Hill in Johnson County. At the same time Herman Sonken applied to sell to the company a right-of-way owned by the old Kansas City, Lawrence & Topeka Railway for some years.

## Question of Inter-Company Charges Settled in Dallas

Surplus reserves of the Dallas Railway & Terminal Company, Dallas, Tex., have been swelled to a total of more than \$583,000 by action of the directors of the Dallas Power & Light Company in restoring about \$240,000 in overpayments of power bills by the railway. They cover a period of several years and result from the agreement by the power company to a basis of rate charges to the railway which the city insists is the correct one. Both the action of the railway directors and the power company directors comply with request made by John W. Everman, the supervisor of the city public utilities, during and previous to the recent public hearing on the application for higher car fares.

Action just taken came after extended conferences between Mr. Everman and officials of the affected companies. C. E. Calder, president, and C. W. Davis, vice-president and general manager of the Dallas Power & Light Company, were credited with working out the details.

## \$1,444,330 Award to Fonda Road Upheld

The award by the Hudson River Regulating District Commission of \$1,444,330 for the Fonda, Johnstown & Gloversville Railroad right-of-way in the Sacandaga Valley has been upheld unanimously in a decision of the Appellate Division, third department. The decision removes the last legal barrier to the huge project which is to impound a lake 25 miles long and 5 miles wide as a storage for the Hudson River watershed, unless the Appellate Division consents to permit the railroad to take an appeal to the Court of Appeals.

The railroad had asked \$4,500,000 for its property and the Hudson River Regulating District Commission had offered \$550,000 before the commission made its survey. The price actually paid for it, \$1,440,330, was held as fair by Justice Whitmyer, who directed the commission to resume work in the area.

The court held in short that the Hudson River Regulatory Commission's work is both constitutional and necessary as a health measure for the protection of the inhabitants of the Capitol

district and that because power is to be incidentally developed by impounding water and building dams it is not a private enterprise even though 95 per cent of the project is financed by private corporations, because public good is being served and the use of all of the resultant power is subject to regulation by the state for the public good.

## Texas Line Sold

Sale of the railway system of the Wichita Falls Traction Company in Wichita Falls, Tex., is announced by Frank Kell, president of the company. The purchaser is A. P. Barrett, Fort Worth, the head of electric power interests in Texas. The consideration was not announced, but officials said that assets of the company total over \$500,000. The line covers 17 miles.

A. P. Barrett will succeed Mr. Kell as president and the latter will be chairman of the board of directors. Other officers of the company will be L. L. Albeiton, vice-president and general manager; A. L. McNab, treasurer; and William N. Bonner, general attorney.

## Capital Increase Before Philadelphia Stockholders

A special meeting of stockholders of the Philadelphia Rapid Transit Company, Philadelphia, Pa., will be held on June 18 to vote on increasing the preferred stock \$5,000,000 to \$35,000,000, making total authorized capitalization \$65,000,000 of which \$30,000,000 is common stock.

Title has been taken by the Mitten Bank Securities Corporation, Philadelphia, Pa., from G. H. Daley to the 13-acre plant of the Commercial Truck Company at the southwest corner of Hunting Park Avenue and American Street for a price of \$500,000, of which \$300,000 remained on mortgage. The property has been leased to the Philadelphia Rural Transit Company, a subsidiary of the Philadelphia Rapid Transit Company, to be occupied by shops in connection with the operation of its buses. The Philadelphia Rapid Transit Company has conveyed to the Motor Real Estate Company the car-house property at the southeast corner of 27th Street and Allegheny Avenue, assessed at \$200,000.

## Canadian Border Cars Still Run at Loss

Gross operating revenue of the Hydro Electric Railways, Windsor, Ont., operating in the so-called border cities, was \$1,069,631 last year, as against operating expenditures of \$1,089,611. On the other hand, the gross revenue for the last fiscal period was substantially higher than during the 1926 season, the figures being cited as \$1,031,443 for 1926, compared with \$1,069,631 for 1927. Likewise, 18,928,737 passengers were carried last year compared with 18,410,520 in 1926, or an increase of 518,217.

## Dividend on Eastern Massachusetts Common in 1929

Since March 12, the day on which Public Trustee Arthur G. Wadleigh of the Eastern Massachusetts Street Railway expressed the opinion that common dividends would be started in 1929, the stock issues of the road have advanced five to ten points on the Boston Stock Exchange. To the highs they are up as follows: First preferred, 74 to 84½; preferred B, 70½ to 79½; adjustment, 53 to 62; common, 30½ to 41½.

For the 1927 calendar year the public trustees reported net earnings after all deductions of \$772,060 and paid preferred and adjustment stock dividends of \$866,201, making it necessary to draw upon surplus to the extent of \$94,141. Last year there was a charge against income of \$276,000 for amortization of obsolete equipment account, which charge has since been eliminated inasmuch as the account has been entirely amortized. Had this charge not been in effect last year the road would have had \$1,048,060 available for dividends, equal after all the senior stock dividends to \$2.13 a share on the 85,254 shares of common.

Another factor tending to enlarge the earnings applicable to the common is the reduction of funded debt. As bonds mature and are paid off the interest charge is reduced. Naturally the interest saving is greater than the interest loss on the cash or investment securities used to retire the maturing debt.

Mr. Wadleigh felt that dividends would not be initiated at \$6 a share on the common stock, but at a rate that would be "a very good return on its present market value." As the market value of the stock at that time was about \$30 a share, presumably a dividend of \$2 to \$3 a share would be regarded as a very good return.—*Barron's*

## Earnings of Ohio Road Impounded

Judge Frank M. Krapp in Common Pleas Court has ordered Willits H. Sawyer, receiver of the Springfield Railway, Springfield, Ohio, to impound all receipts for the benefit and protection of the Real Estate, Land Title & Trust Company, Philadelphia, trustee under the indenture securing outstanding bonds. The trustee asserted in its application that the railway had defaulted in the payment of bond interest. The ruling by the court precludes the receiver from paying out any funds except those necessary for the actual operation of the railway and the expenses of the receivership.

## Would Discontinue Short Kansas Interurban

The United Power & Light Corporation, Abilene, Kan., applied to the State Public Service Commission recently for permission to discontinue its electric interurban line between Junction City and Fort Riley.

## Personal Items

### C. A. Brooks Honored at Dinner

Friends of C. A. Brooks, who shapes the destinies of railway properties owned by the National Electric Power Company, honored him at a testimonial dinner in the Commodore Hotel, New York, on the evening of April 16.

W. G. Gove, superintendent of the Brooklyn-Manhattan Transit Corporation, acted as toastmaster. The speakers were J. S. McWhirter, Joseph K. Choate, Silas Hinckley and Harry Reid. All of the speakers, including Chairman Gove, were railway executives with whom Mr. Brooks has formerly been associated, while Mr. Reid is president of the company with which Mr. Brooks is now connected. Thus, as these men reminisced they outlined the entire experience of their guest in the railway business.

Mr. Brooks joined the forces of the National Electric Power Company when that organization acquired railway properties formerly controlled by A. E. Fitkin Company. He had been general manager of the Poughkeepsie & Wappingers Falls Electric Railway, Poughkeepsie, N. Y., to which property he went in April, 1913, after having served as a member of the J. G. White staff in New York. He left Poughkeepsie in March, 1925, to join the Fitkin organization.

Back in 1902 Mr. Brooks entered the transportation business with the Brooklyn Rapid Transit Company. Later he was with Sanderson & Porter for a short period, but left their employ to enter the service of the Third Avenue Railroad, New York. Following that he directed the construction of the so-called South Shore railway lines in Long Island and in 1912 joined the staff of the White organization.

### Members of Montreal Commission Re-Named

J. F. Saint-Cyr, chairman of the Montreal Tramways Commission, and J. S. Archibald, member of the same commission, have been reappointed by provincial order-in-council to the same positions for a further period of ten years.

Both these members were named to the commission when it was originated in 1918. The third member of the commission is Paul Beique, appointed in 1926, upon the death of L. A. Herdt, the third original member of the commission.

The Montreal Tramways Commission is the governing body as to tramways matters in Montreal, controlling the Montreal Tramways in all matters of expenditure for capital purposes, and also controlling other expenditure. Appeal lies in the Quebec Public Service Commission only in certain matters, notably, as to what is to constitute

capital expenditure, since the company is allowed 6 per cent on all such expenditure.

Mr. Saint-Cyr left the provincial criminal bench in 1918 to take the chairmanship of the Tramways Commission. He had sat in the Court of Sessions for two years up to that time, but previously had been judge at St. Johns. He devotes all his time to the commission.

Mr. Archibald is a well-known architect. He recently built several schools, the forum on St. Catherine Street, and was one of the consulting architects for the new court house.

Mr. Beique is a civil engineer, as was his predecessor, Dr. Herdt.

The city of Montreal is a partner in the tramways contract, and it is as representative of the city that the commission acts.

### New Honor for H. B. Potter

H. B. Potter, general manager of the United Railways & Electric Company, Baltimore, Md., since 1925, was elected a vice-president at the annual meeting held on April 11. "Bert" Potter is well known in railway circles especially for his activities in Maine and Massachusetts. It was from the Boston Elevated Railway, where he had served as assistant general manager under Edward Dana and previously as assistant to Matthew C. Brush, that he went in 1923 to Baltimore as assistant to the president of the United Railways & Electric Company. Before going to Boston where his legislative, operative and safety work, covering a period of thirteen years were especially commendable, he had been identified with the building and operation of electric railways in Maine.

Mr. Potter was born in Providence, R. I., on Nov. 14, 1881. He was educated in the public schools of Cambridge, Mass., and at Lowell Institute, from which he was graduated in electrical and mechanical engineering.

WARREN VIESSMAN, an engineer formerly with the United Railways & Electric Company, Baltimore, Md., has been appointed head of the Bureau of Mechanical-Electrical Service, one of the divisions of Baltimore's Department of Public Works. In addition to being with the United Railways & Electric Mr. Viessman has been associated with the Westinghouse Company, the Consolidated Gas, Electric Light & Power Company and the Union Shipbuilding Company. His most recent position was with the Consolidated. He is engineering officer in the United States Naval Reserve. He was graduated from the Baltimore Polytechnic Institute and the engineering department of Johns Hopkins University.

### C. E. Bostwick at Savannah

Charles E. Bostwick, for six years superintendent of the Jacksonville Traction Company, Jacksonville, Fla., and more recently manager of the White Star Stage Line at Tampa, organized to take over bus properties reported to have been purchased by Stone & Webster, has been assigned to the Savannah Electric & Power Company.

### R. J. O'Brien in New Rôle with Westinghouse

R. J. O'Brien has been appointed assistant to the transportation sales manager of the Westinghouse Electric & Manufacturing Company, having the Atlantic seaboard district as his territory. Since April, 1920, Mr. O'Brien has been on the staff of F. H. Shepard, director of heavy traction of the Westinghouse Company, and has been the Westinghouse representative on the Virginian electrification. Mr. Shepard's staff more recently has been engaged in self-propelled car work.

After he was graduated from the University of Minnesota, Mr. O'Brien was made resident engineer of the Great Northern Railway at New Rockford, N. D., and had charge of the construction of 10 miles of main line railroad and the new engine division terminal. Following this, for approximately a year and a half, Mr. O'Brien was an apprentice at the Westinghouse plant at East Pittsburgh, later being assigned to railway engineering.

From 1913 to 1917 he was engaged in general engineering work for Gibbs & Hill, consulting engineers. His work was principally in financial and engineering estimates, plans and the supervision of steam railroad electrifications. He was the engineering supervisor of the electrical features of the Pennsylvania Railroad on the Philadelphia-Paoli-Chestnut Hill electrification and was in charge of electrical tests of the Norfolk & Western electrification. From 1917 to 1920 Mr. O'Brien was an officer of the A.E.F.

## Obituary

GEORGE PARTRIDGE BULLARD, chairman of the Board of Public Trustees of the Eastern Massachusetts Street Railway, Boston, Mass., since late in 1925, died suddenly on April 17. He had served on the board since 1924, when he was appointed by Governor Channing Cox. In 1901 and 1902 he was a member of the Massachusetts Legislature, serving as chairman of the House committee on railroads. At the time of his death Mr. Bullard was president of the West Newton Savings Bank. He was 71 years old.

CHARLES FORBES, connected with the freight department of the Indianapolis & Cincinnati Traction Company, Indianapolis, Ind., died recently at his home in Connersville. He was 53 years old.

# Manufactures and the Markets

## \$8,000,000 Long Island Track Changes

The Long Island Railroad, New York, N. Y., has been ordered by the Transit Commission to eliminate 31 grade crossings in Queens, New York, at an estimated cost of \$8,000,000. The order is in accordance with the plan of the railroad and work is expected to start at once. Twenty-seven of the crossings are between Rockaway Park and Arverne, N. Y., and four are in Corona, N. Y.

On both branches the tracks of the Long Island Railroad will be elevated. On the Rockaway division the tracks will be placed on a steel and concrete structure. In Corona the tracks will be raised on an embankment sufficiently high to allow them to be carried over the four streets on bridges with only a slight depression of the street grade.

The structure to be erected will allow a street clearance of 14 ft. on existing and new streets which may be constructed. The structure will have a concrete floor and will be so solidly built as to make train operation possible with very little noise. Provision will be made for additional tracks which may be required in the future.

## Committee Approves Vitrified Paving Brick Sizes

The five recognized varieties and sizes of vitrified paving brick have again been approved as standard for the coming year by the U. S. Department of Commerce committee on simplification of variety and standards for paving brick. The five recognized varieties are:

- Plain wire-cut brick.....2½x4x8½ in.
- Plain wire-cut brick.....3x4x8½ in.
- Plain wire-cut brick.....3½x4x8½ in.
- Repressed lug brick.....4x3½x8½ in.
- Wire-cut lug brick.....4x3½x8½ in.

## Locomotives for Paulista

Three electric locomotives have been built for the Paulista Railway, Brazil, by the General Electric Company, Erie, Pa. They are of the geared-motor type, and each locomotive has two driving trucks articulated together, and a cab mounted on center plates. Each driving truck has three individually-driven axles and is provided with a single-axle, radius-bar guiding truck.

Direct current is obtained from an overhead trolley at 3,000 volts and is supplied to the traction motors which are wound for 1,500 volts and connected, each pair in series, across the line. Locomotive speed is controlled by series-parallel connections of the motors using accelerating rheostats, and by reductions in motor field strength.

Control is of the standard electro-pneumatic type arranged for non-automatic, multiple-unit operation. Current

is collected by means of two air-raised trolleys, either of which has sufficient capacity to supply the entire locomotive. Control couplers are provided by means of which the two locomotives can be operated from a single controller. Each locomotive is equipped with a dynamotor which supplies 1,500 volts for the operation of auxiliaries.

## Detroit United Cars Delivered

Ten cars were recently delivered to the Detroit United Railway, Detroit, Mich., from the shops of the G. C. Kuhlman Car Company, Cleveland, Ohio. The cars are of the semi-steel type with arch roofs.

Although the cars weigh only 30,700

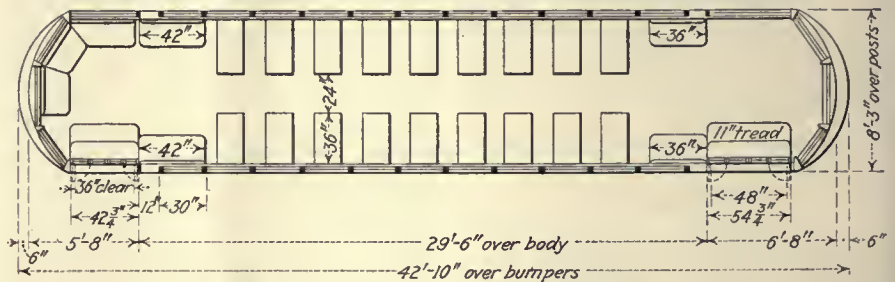
lb. they are 42 ft. 10 in. long, 8 ft. 5½ in. wide and seat 51 passengers. The exterior finish is ivory with red panels and blue skirt. In the interior the trim is cherry, the floors are covered with linoleum and the seats are upholstered in genuine brown leather. The accompanying plans and specifications give in detail the construction of the cars.



The upholstery is in brown leather



One of the ten cars recently delivered to the Detroit United Railway



Floor plan of the 51-passenger Detroit cars

Name of Railway.....	Detroit United Railway	Door mechanism.....	National Pneumatic
City and State.....	Highland Park, Michigan	Fare boxes.....	Cleveland
Number of units.....	10	Finish.....	Lacquer
Type of unit.....	one-man, two-man, motor, passenger, city, single-end, double-truck	Floor covering.....	Battleship linoleum
Number of seats.....	51	Gears and pinions.....	General Electric
Builder of car body.....	G. C. Kuhlman Car Company	Glass.....	DSA selected
City and State.....	Cleveland, Ohio	Hand brakes.....	Brill geared type
Date of order.....	9/27	Hand pole.....	Cleveland
Date of delivery.....	Mar. 1, 1928	Heaters.....	Consolidated Car Heating Company
Weights:		Headlights.....	Golden Glow RM 96
Car body.....	16,120 lb.	Headlining.....	Agasote
Trucks, motors.....	12,480 lb.	Interior trim.....	Cherry
Equipment.....	2,100 lb.	Journal bearings.....	Brill
Total.....	30,700 lb.	Journal boxes.....	Brill
Booster centers.....	19 ft.	Lamp fixtures.....	Dayton Mfg. Company, No. 341
Length over all.....	42 ft. 10 in.	Motors.....	4 GE. 258, inside huog
Length over body posts.....	29 ft. 6 in.	Painting scheme.....	Stream line, red panels, ivory above belt, blue skirt
Truck wheelbase.....	5 ft. 4 in.	Roof material.....	Poplar
Width over all.....	8 ft. 5½ in.	Safety car devices.....	Safety Car Devices Company
Height, rail to trolley base.....	10 ft. 5 in.	Sash fixtures.....	Adams & Westlake
Window post spacing.....	30 in.	Seats.....	Brill No. 105
Body.....	Semi-steel	Seat spacing.....	30 in.
Roof.....	Arch	Seating material.....	Genuine brown leather
Doors.....	End, folding	Steps.....	Stationary
Air brakes.....	Westinghouse	Step treads.....	Kass
Axles.....	Brill	Trolley catchers.....	Earl
Car signal system.....	Faraday	Trolley base.....	O.B.
Compressors.....	DH-20	Trolley wheels.....	General Electric
Conduit.....	Duratube	Trucks.....	Brill 177 EX
Control.....	K	Ventilators.....	Nichols-Lintern
Destination signs.....	Hunter	Wheels.....	Rolled steel, diameter 26 in.
		Wheelguards.....	Brill

**Paris May Get Danville Line**

Paris, Ill., has hopes that the proposed railway connection between Danville and Indianapolis may be so arranged as to serve it, thus eliminating the necessity of building a new bridge over the Washash and reducing new track construction to less than 13 miles.

Paris, already served by railway from Terre Haute, proposes that the city street line in Paris—for which there no longer are any cars—be donated to the railway companies, and that the tracks be extended by the railway people from Paris to Ridgefarm, there to link up with the present Danville-Ridgefarm service of the Illinois Traction Company.

From Danville to Indianapolis via Paris and Terre Haute would be, roughly, 30 to 35 miles farther than would the Indianapolis route via Crawfordsville.

**Twenty Cars Being Constructed for N. Y., W. & B. Ry.**

Construction of the twenty new cars for the New York, Westchester & Boston Railway, New York, is under way in the plant of the Osgood Bradley Car Company, Worcester, Mass. These cars are of the all-steel type made up of unit side frame, Stillwell design. The 11,000-volt single-phase trolley feeds through one of two pantographs through high tension leads to the transformer. The

**Exhibitograph No. 5**

**Intending Exhibitors Should Answer All Questions**

on

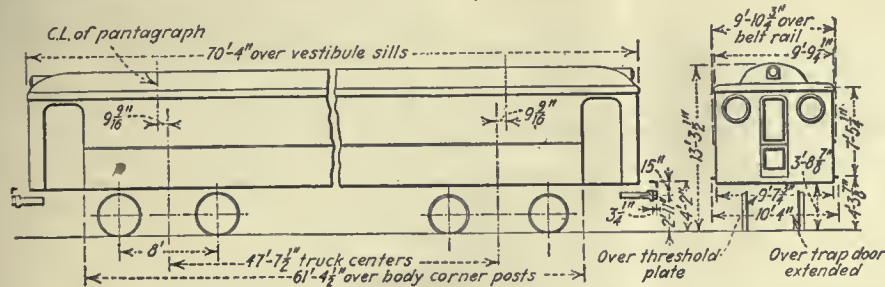
**The Exhibit Space Application for the A.E.R.A. Convention**

**Unanswered Questions Mean Delay**

**CO-OPERATE WITH THE EXHIBIT COMMITTEE**

voltage is then stepped down for use on motors and auxiliary circuits.

These cars, for heavy suburban service, are 72 ft. 7 1/2-in. long and 9 ft. 10 3/4-in. wide. The car body weighs approximately 63,200 lb. and the total weight of the car is about 124,830 lb. The detailed features of the cars, are given in the accompanying specifications and plans.



General dimensions of the twenty cars being built for the New York, Westchester & Boston Railways by the Osgood Bradley Car Company

Name of Railway	New York, Westchester & Boston Railway
City and State	New York City
Number of units	20
Type of unit	Motor, passenger, suburban, double end, double truck
Number of seats	80
Builder of car body	Osgood Bradley Car Company
City and state	Worcester, Mass.
Date of order	12/14/27
Date of delivery	1st del. 5 mos. after date of contract
Approx weights:	
Car body	63,200 lb.
Motor	16,585 lb.
Trucks	14,738 lb.
Trailer	14,738 lb.
Air	5,572 lb.
Equipment	10,905 lb.
Total elec. mot.	13,830 lb.
Bolster centers	47 ft. 7 1/2 in.
Length over all	72 ft. 7 1/2 in.
Length over body posts	61 ft. 4 1/2 in.
Truck wheelbase	8 ft. 0 in.
Width over all	9 ft. 10 3/4 in.
Height, rail to trolley base	13 ft. 3 1/2 in.
Window post spacing	2 ft. 8-13/16 in.
Body	All-steel
Roof	Steel
Doors	Center and end sliding
Air brakes	Westinghouse-AMUE
Armature bearings	Plain
Axles	5 1/2 x 10, M.C.B.
Car signal system	Westinghouse
Compressors	Westinghouse XD2EG
Conduit	Metal
Control	Westinghouse AB, 32 volts
Couplers	Pitt, 9 in. face

Curtain fixtures	Curtain Supply Company
Curtain material	Pantasote No. 85
Destination signs	Morton Manufacturing Company
Door mechanism	National Pneumatic Company, type GS-8EVP
Energy saving device	Watthour meter
Finish	Enamel
Floor covering	Tucolith
Gears and pinions	Nuttall BP
Glass	Plate
Hand brakes	H. B. Blackall
Hand straps	Bisco Steelkar No. 12
Heat insulating material	3 ply Salamander and Turock
Heaters	No. 405-E
Headlights	Golden Glow, 14 in.
Headlining	Agasote
Interior trim	Agasote and steel
Journal bearings	Plain
Journal boxes	Symington A.R.A.
Lamp fixtures	Safety
Motors	2 Westinghouse 409B, outside hung
Painting scheme	Green, white ceiling
Pantagraph	Nuttall No. 131-A
Roof material	Steel
Safety car devices	Deadman's Automatic Airbrake
Sash fixtures	O. M. Edwards
Seats	Hale & Kilburn Company
Seat spacing	2 ft. 8-13/16 in.
Seating material	Pantasote No. 85
Slack adjusters	American Steel Foundries & Westinghouse
Steps	Stationary
Step treads	Kass
Trucks	Built up, Stillwell design
Ventilators	Utility
Wheels	Rolled steel-tire diameter 36 and 42 in.

**G.E. Orders Increase**

Orders received by the General Electric Company for the first three months of the present year amounted to \$79,925,840, compared with \$77,550,581 for the corresponding quarter in 1927 and with \$86,433,658 for the first quarter of 1926. This represents an increase of 3 per cent for the first quarter of 1928 over the corresponding period of 1927.

**N.E.M.A. Indorses Principles of Business Conduct**

The board of governors of the National Electrical Manufacturers Association has indorsed the "Principles of Business Conduct" which is the result of a study of many codes of ethics that have been adopted by many lines of business, supplemented by suggestions from the membership.

The name, "Principles of Business Conduct," and the first section, designated "General Principles" was adopted *in toto* from the code developed and adopted by the Chamber of Commerce of the United States.

The second section deals with competitive bidding and is given in full as follows:

1. The electrical manufacturers indorse the principle of a one-price policy.

2. A request for competitive prices on the part of a buyer involves definite obligations toward all bidders. The electrical manufacturers indorse as in the interest of sound, ethical and economic relations between buyer and seller the following principles to apply to competitive bidding under any specific inquiry: (a) That the bids be considered as confidential information between buyer and bidder until all bids are in and the buyer has placed the business. (b) That bidders exchange where practicable full information regarding their bids after the business is placed.

3. Where specifications call for various items involving different types and classes of apparatus, the relative merit of the different bids is best determined and freedom of choice on the part of the buyer promoted if each bidder quotes segregated prices at which any individual item would be accepted.

The succeeding sections deal with the relations of manufacturers to customers, agents or others and the relation of manufacturers to each other.

**ROLLING STOCK**

Boston & Worcester Street Railway, Framingham, Mass., has added to its fleet of fifteen Macks, two additional Macks of four-cylinder, parlor-car chassis, 25-passenger capacity, with Lang bodies.

BOSTON, REVERE BEACH & LYNN RAILROAD, Boston, Mass., placed an order for a 29-passenger A.C.F. de luxe urban coach.

INTERSTATE STREET RAILWAY, Attleboro, Mass., bought two 27-passenger A.C.F. parlor coaches.

**ELECTRIC RAILWAY MATERIAL PRICES—APRIL 17, 1928**

Metals—New York	
Copper, electrolytic, cents per lb.	13.9625
Lead, cents per lb.	6.10
Nickel, cents per lb.	35.00
Zinc, cents per lb.	6.10
Tin, Straits, cents per lb.	52.75
Aluminum, 98 or 99 per cent, cents per lb.	24.30
Babbitt metal, warehouse, cents per lb.:	
Commercial grade.	57.00
General service.	31.50
Bituminous Coal	
Smokeless Mine Run, f.o.b. vessel, Hampton Roads, gross tons.	4.15
Somerset mine run, f.o.b. mines, net tons.	1.875
Pittsburgh mine run, Pittsburgh, net tons.	1.975
Franklin, Ill., screenings, Chicago.	1.825
Central, Ill., screenings, Chicago.	1.675
Kansas screenings, Kansas City.	2.375
Track Materials—Pittsburgh	
Standard steel rails, gross ton.	\$43.00
Railroad spikes, drive, 1/2 in. and larger, cents per lb.	2.80
Tie plates (flat type), cents per lb.	2.15
Angle bars, cents per lb.	2.75
Rail bolts and nuts, cents per lb.	3.80
Steel bars, cents per lb.	1.875
Ties, white oak, Chicago, 6 in. x 8 in. x 8 ft.	\$1.40
Hardware—Pittsburgh	
Wire nail, base per keg.	2.65
Sheet iron (24 gage), cents per lb.	2.85
Sheet iron, galvanized (24 gage), cents per lb.	3.70
Galvanized barbed wire, cents per lb.	3.35
Galvanized wire, ordinary, cents per lb.	3.10
Waste—New York	
Waste, wool, cents per lb.	16-20
Waste, cotton (100 lb. bale), cents per lb.:	
White.	16-19.50
Colored.	11-16

Paints, Putty and Glass—New York	
Linseed oil (5 bbl. lots), cents per lb.	10.2
White lead in oil (100 lb. keg), cents per lb.	13.25
Turpentine (bbl. lots), per gal.	\$0.625
Putty, 100 lb. tins, cents per lb.	5.50
Wire—New York	
Copper wire, cents per lb.	16.00
Rubber-covered wire, No. 14, per 1,000 ft.	5.30
Weatherproof wire base, cents per lb.	16.5125
Paving Materials	
Paving stone, granite, 5 in., f.o.b.	
New York—Grade 1, per thousand.	\$150
Wood block paving 3 1/2 x 16 lb. treatment, N. Y., per sq. yd., f.o.b.	\$2.70
Paving brick 3 1/2 x 8 1/4 x 4, N. Y., per 1,000 in carload lots, f.o.b.	51.00
Paving brick 3 x 8 1/4 x 4, N. Y., per 1,000 in carload lots, f.o.b.	45.00
Crushed stone, 1 1/2 in., carload lots, N. Y., per cu. yd., delivered.	3 00
Cement, Chicago consumers' net prices, without bags, f.o.b.	2.05
Gravel, 1 1/2 in., cu. yd., delivered.	2.80
Sand, cu. yd., delivered.	2.00
Old Metals—New York and Chicago	
Heavy copper, cents per lb.	11.625
Light copper, cents per lb.	10.125
Heavy yellow brass, cents per lb.	7.125
Zinc, old scrap, cents per lb.	3.125
Lead, cents per lb. (heavy)	4.875
Steel car axles, Chicago, net ton.	\$16.25
Cast iron car wheels, Chicago, gross ton.	13.75
Rails (short), Chicago, gross ton.	15.25
Rails (relaying), Chicago, gross ton (65 lb. and heavier)	28.50
Machine turnings, Chicago, gross ton.	7.25

J. H. WILLIAMS & COMPANY, Buffalo, N. Y., and the HUSKY WRENCH COMPANY, Milwaukee, Wis., have joined in a working arrangement whereby they can offer a complete line of combination wrench sets. This combination is made for selling purposes only and does not effect the financial structure or management of either company.

LEW WEISENBURGER, sales representative for the Hale & Kilburn Company, whose headquarters are at Chicago, has submitted his resignation, to take effect April 30. Mr. Weisenburger's activities for the past three years have been in the electric and bus fields in the central and western territory. Prior to this he was at the Hale & Kilburn Philadelphia factory.

C. H. WILL MOTORS CORPORATION, Minneapolis, Minn., has tripled its business this spring. The output is now one \$12,000 bus a day. Capitalization has just been increased from \$50,000 to \$750,000, the payroll has been increased from about \$95,000 to \$190,000 a year and the force from 60 to 125 men.

HYATT ROLLER BEARING COMPANY, Newark, N. J., has appointed as chief engineer, O. W. Young, formerly located with the western division sales office. He takes up his new duties at the company headquarters in Newark.

LEEDS, TOZZER & COMPANY, New York, N. Y., has appointed as western sales representative, Wm. McCormick, formerly Pittsburgh sales manager of the Niles Tool Works Company and the Pratt & Whitney Company.

R. D. NUTTALL COMPANY's commercial activities will be handled by and through the parent company, the Westinghouse Electric & Manufacturing Company. All inquiries should be addressed to the nearest Westinghouse district office. J. E. Mullen, formerly assistant sales manager of the R. D. Nuttall Company, will head the new commercial set-up with offices at the Nuttall plant, McCandless Avenue at Butler Street, Pittsburgh, Pa.

**ADVERTISING LITERATURE**

CONSOLIDATED CAR HEATING COMPANY, Albany, N. Y., describes its new motor resistor heater, sheath wire heaters, automatic treadle-operated door control, car buzzers, visible thermostats and safety switches in an advertising folder recently issued.

PEREY MANUFACTURING COMPANY, New York, N. Y., has issued a folder entitled, "Stop the Revenue Leaks," dealing with the use of turnstiles in recording revenue.

SUPERHEATER COMPANY, New York, N. Y., has published a booklet on the word "Elesco-operation" which gives facts about Elesco superheaters for power plants and industrial use.

INTERNATIONAL HARVESTER COMPANY, Chicago, Ill., has published a booklet entitled "Automotive Equipment for Railroads."

CHESTNUT RIDGE TRANSPORTATION COMPANY, Derry, Pa., has ordered two 21-passenger A.C.F. parlor coaches.

CLEVELAND RAILWAY, Cleveland, Ohio, has ordered 49 one-man-two-man cars from Kuhlman Car Company. The cars are to be of the Peter Witt design and each car will have two treadle doors in the center.

NEW ENGLAND TRANSPORTATION COMPANY, a subsidiary of the New York, New Haven & Hartford Railroad, South Station, Boston, Mass., has received six Mack four-cylinder 230-in. chassis with Brown bodies.

BOSTON & MAINE RAILROAD, Boston, Mass., purchased five A.C.F. 29-passenger parlor observation coaches.

CITIZENS TRACTION COMPANY, Oil City, Pa., has ordered from the American Car & Foundry Company, ten series 602 23-passenger buses.

MONONGAHELA WEST PENN PUBLIC SERVICE COMPANY, Fairmont, W. Va., is rumored to have placed an order with The G. C. Kuhlman Car Company, Cleveland, Ohio, for ten cars.

INTERNATIONAL RAILWAY, Buffalo, N. Y., is rebuilding eighteen double-end, double-truck cars. They are to be equipped with air brake and safety car control devices, and each car is to have selective door operation.

LACKAWANNA & WYOMING VALLEY RAILROAD, Scranton, Pa., is reported to have ordered four 75,000-lb. interurban type cars from Osgood Bradley Car Company, Worcester, Mass.

**TRACK AND LINE**

INTERNATIONAL RAILWAY, Buffalo, N. Y., announces that track reconstruction and repaving involving an agree-

gate expenditure of \$375,000 will be undertaken this year. The track reconstruction program covers a total distance of 4 miles divided between thirteen widely scattered sections of the city. The reconstruction work will start July 1.

LOS ANGELES RAILWAY, Los Angeles, Cal., is removing track on Vermont Avenue between Ninth and Tenth Streets preparatory to the cutting down of the grade.

READING TRANSIT COMPANY, Reading, Pa., will install a double-track branch-off and make other track changes at a total cost of approximately \$6,000.

**SHOPS AND BUILDINGS**

TWIN CITY MOTOR BUS COMPANY, Minneapolis, Minn., has let the contract for a \$50,000 addition to its Minneapolis garage to be put under way May 1. The addition will be 120x140 ft., one-story brick construction. It is being built because of need of space for new buses bought during the year.

**TRADE NOTES**

GRISWOLD SAFETY SIGNAL COMPANY, Minneapolis, Minn., will expand its business by erecting a one and two-story \$50,000 building at Linden Avenue and Seventeenth Street, and increasing its capitalization from \$250,000 to \$1,000,000, and adding railroad grade crossing warning signals. The company was organized in 1923 by Frank W. Griswold and manufactures "stop" and "go" automatic signals and "slow" warning posts.





# Perfect



Yes, 100% *perfect* control of cars is maintained at all times if equipped with "Peacock" Staffless Brakes.

The stop will be sure—certain—graduated—*perfect*. There is no doubt about their action—no failure.

It occupies about half the space, weighs less and gives three or four times the braking power of the ordinary hand brake.

Riding behind a "Peacock" is to ride with safety.

*Specify it on your new cars and cars to be rebuilt.*

**National Brake Company, Inc.**

890 Ellicott Square

Buffalo, N. Y.

*Canadian Representative*

Lyman Tube & Supply Co., Ltd., Montreal, Can.



The  
"Peacock"  
Staffless



**G**ENERAL'S success in tackling the toughest jobs has been the result of General's experience in supplying the big share of the truck and bus tire market. Applying factory experience to dealer service has always been the policy of General. The General dealer knows how to properly fit the tire to the job because he is familiar with the tire engineering problems that every operator faces.

THE GENERAL TIRE AND RUBBER COMPANY, AKRON, OHIO



*The*

*The  
Heavy Express  
Special*

Specially built to stand up under the load at express speed, the Heavy Express Special carries through on any job. Operators everywhere are swinging to it.

# GENERAL TIRE

—goes a long way to make friends

Luxury  
Economy  
Sturdiness

**Fitz John**



# Observation Type that Pulls Patronage.

The luxurious, comforting look of this bus is an invitation to travel.

It bespeaks riding joy—arrival rested and refreshed.

Of course it's a FITZJOHN Body—our 21-Passenger Observation Type.

It is as good as it looks—perfectly appointed—splendidly designed—sturdily built for long, profitable life.

Grille, canopy and other decorative features are of the finest type.

You know how inviting, appealing looks help business, also how sturdy construction cuts costs.

*Send for more information on this body.*

## FITZJOHN Manufacturing Company

*Exclusive Bus Body Builders*

MUSKEGON, MICHIGAN



One of the 100% Goodyear-equipped fleet of the Portland Electric Power Company, Portland, Oregon

**GOODYEAR**

Copyright 1928, by The Goodyear Tire & Rubber Co., Inc.

# GOODYEAR... one hundred per cent!

The number of bus lines that are equipped exclusively with Goodyear Pneumatic Cord Bus Tires is growing steadily.

As one operator after another gets through with tests and trials and experiments, the records of dependable, low-cost tire performance point to Goodyear—*one hundred per cent!*

A typical example of this complete reliance on Goodyear is supplied by the Portland Electric Power Company, of Portland, Oregon.

“We are pleased to state that we have used Goodyear Tires and service on our buses since October, 1924, with excellent results,” writes Mr. Thomas Pumfrey, Chief Engineer of Railways, “and our fleet of 41 buses is now equipped 100% with Goodyear Tires.

“They all have dual tires on the rear wheels, and the buses average 120,000 miles per month, carrying 448,000 passengers. Our average between tire failures has been 25,026 miles.

“Goodyear Service has been very satisfactory, and we have found Goodyear Sales and Service organization very fair.”

Goodyear Pneumatic Bus Tires deliver their superior grade of performance because of their special design and construction. They have the All-Weather tread for powerful traction and road-gripping safety in any going. They have the long-lasting strength provided by extra-elastic, extra-durable SUPER-TWIST cord. For uninterrupted revenue mileage at low tire-mile cost, equip 100% with Goodyear.

*For every Goodyear Cord Bus Tire there is an equally fine Goodyear Tube, built especially to the needs of bus service*

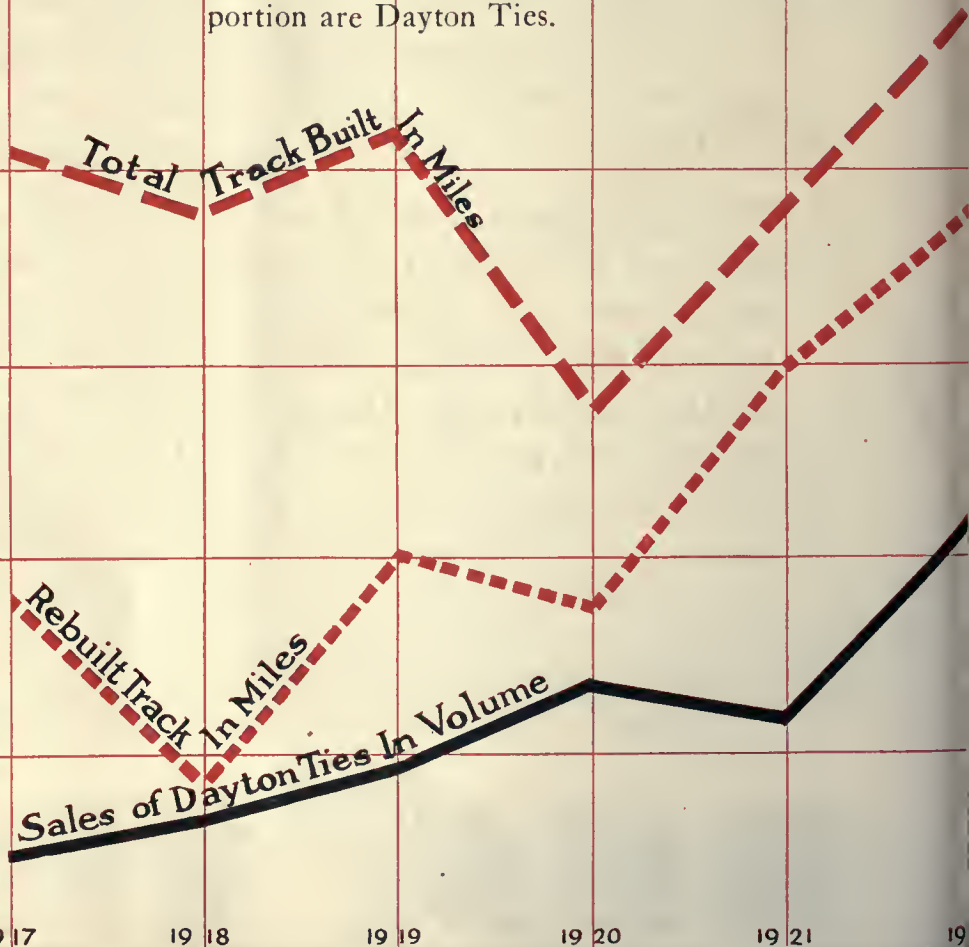
# BUS TIRES

# The Industry Dayton

The real gauge of recognition is the volume of a manufacturer's product the industry purchases.

The curves shown herewith, compiled from *Electric Railway Journal* records and from our own sales records indicates remarkable gains in the purchases of Dayton Ties over the past 11 years. They give conclusive evidence of a quality product, proved by sound economies.

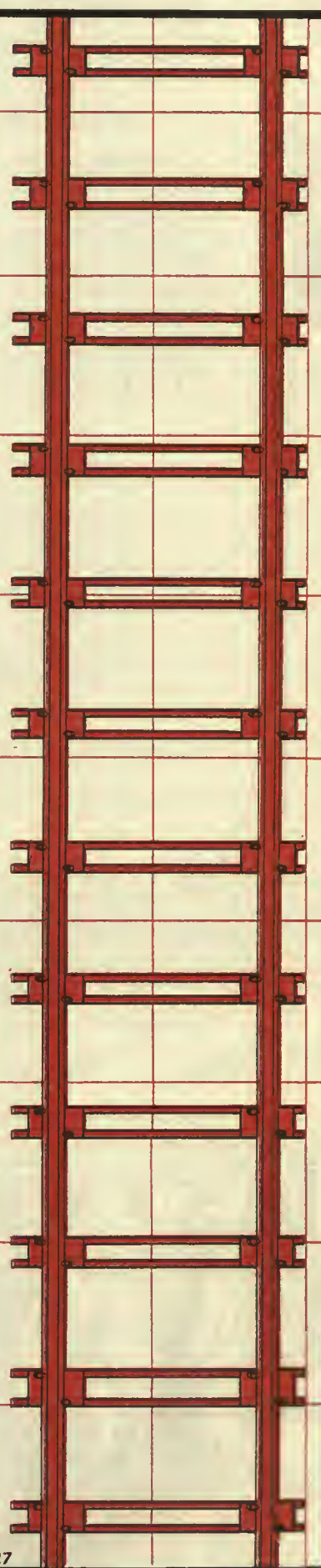
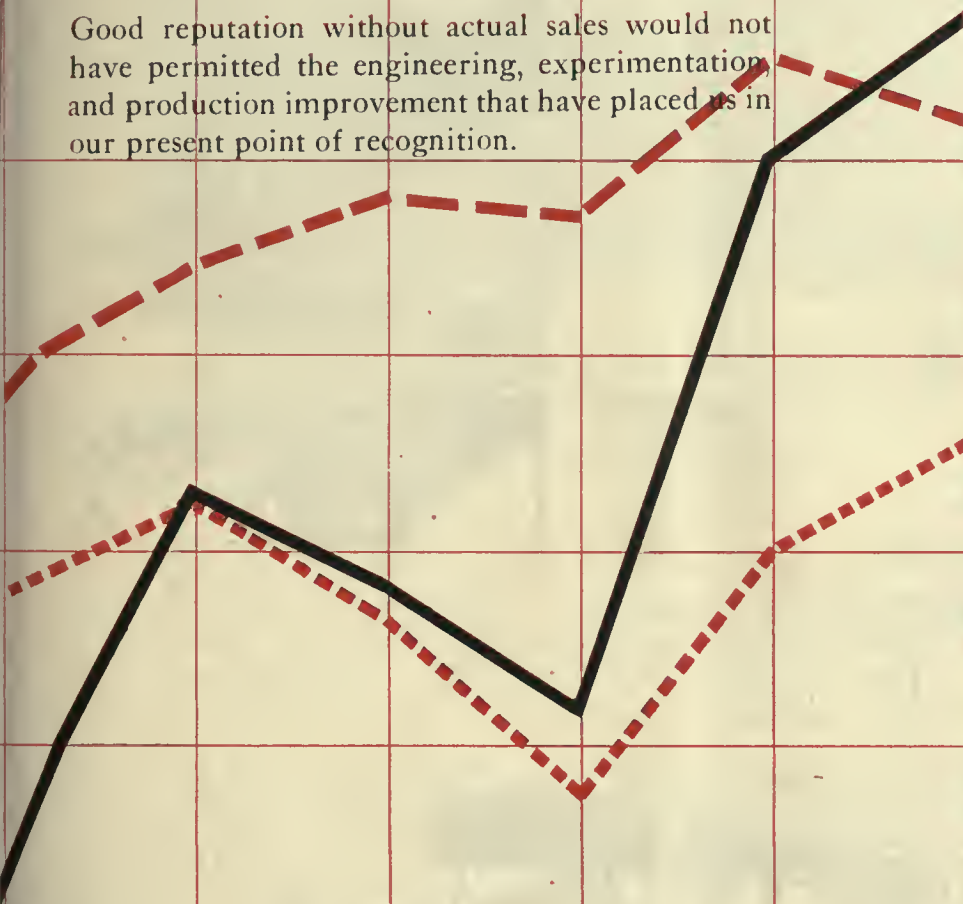
But these remarkable gains would mean little if they merely followed gains in the industry as a whole. They do not. They show that of total ties purchased in any given year, an ever greater proportion are Dayton Ties.



# Is Turning to Ties

We have long known that Dayton Ties were well and favorably known in the Electric Railway Industry.

Good reputation without actual sales would not have permitted the engineering, experimentation and production improvement that have placed us in our present point of recognition.



The Dayton Mechanical Tie Company  
DAYTON, OHIO

## Prepare for Spring and Summer Traffic

Improved road conditions that may be expected from now on are an aid to bus operators, but increasing traffic constitutes another problem. It brings in its wake intermittent starting and stopping, heavy loads, jammed highways.

Some of these conditions cannot be overcome. But your drivers can be assured of quick starting, smooth and rapid acceleration, and fullness of power by using

## RED CROWN Gasoline

in all buses. Red Crown Gasoline is all that a good gasoline should be. It has proved in repeated laboratory and road tests to be the most efficient and economical motor fuel for buses. More of it is being used by bus operators in the Middle West than any other brand.

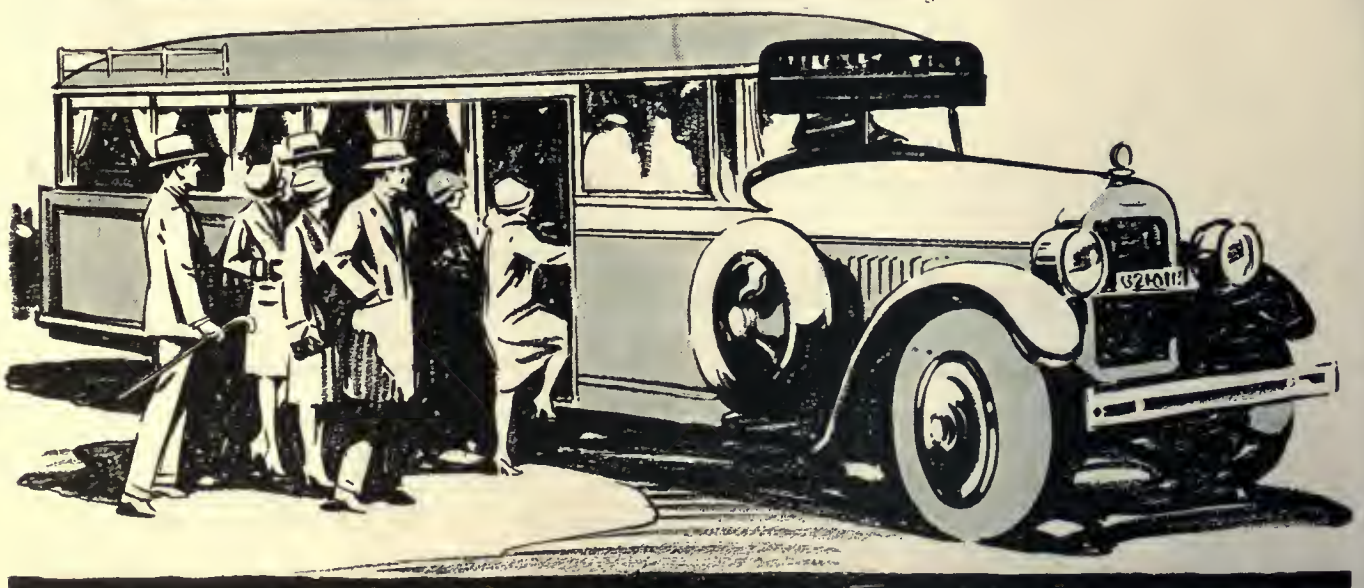
A representative thoroughly conversant with fuel and lubricating problems as applied to buses will be pleased to make a survey of your equipment, and offer helpful recommendations without obligation to you.

### STANDARD OIL COMPANY

(INDIANA)

910 South Michigan Ave.

Chicago, Illinois



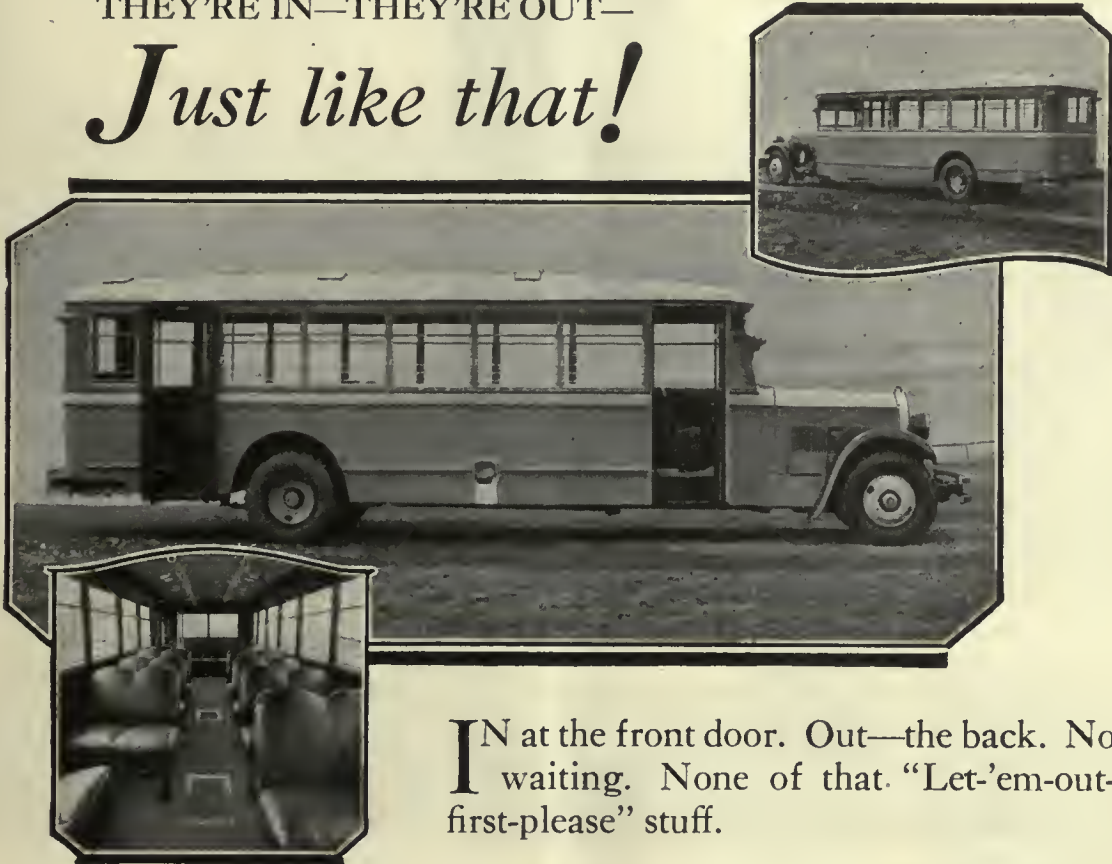


# LOADING & UNLOADING

*Quick as Closing a Door . . .*

THEY'RE IN—THEY'RE OUT—

*Just like that!*



**I**N at the front door. Out—the back. No waiting. None of that. “Let-’em-out-first-please” stuff.

A pay-enter type. Seats 29 passengers. Holds a lot more. Wide comfortable aisle for standees. No stooping for the six-footers.

Seats as restful as a davenport. Windows wide, clear and non-rattling. Plenty of ventilation. Lights non-glaring. Heating O. K.

Door at right front—two-piece Jack-knife type; actuated by National Pneumatic Air Engine. Right rear exit door is double fold or four-piece type—actuated by combination Pneumatic Air Engine with treadle step.

Bus cannot start unless both doors are properly closed. Emergency door at left rear also.

More information upon request. Write *today*. Learn more about this profit maker for your business.

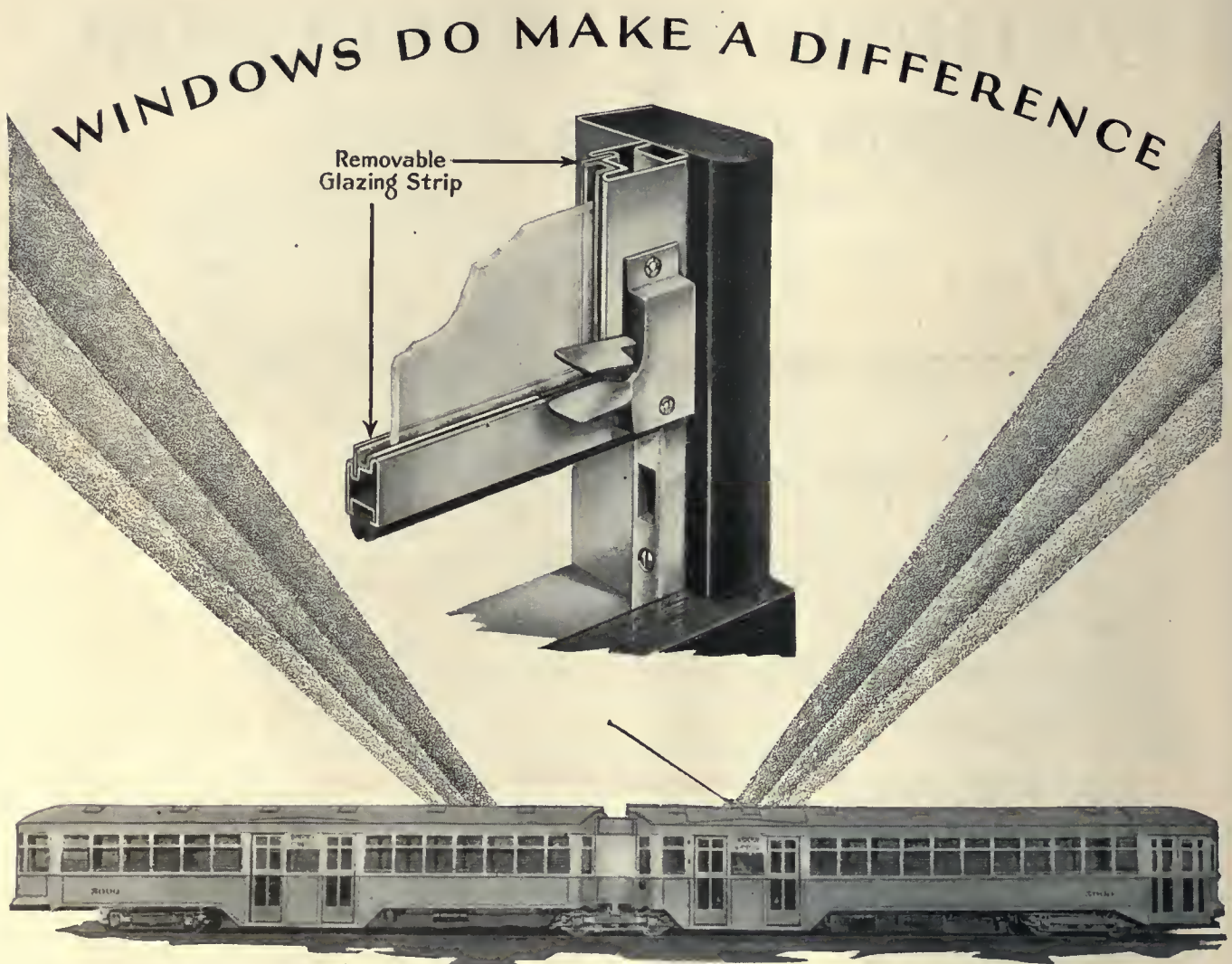
THE BENDER BODY COMPANY

W. 62nd and Denison



Cleveland, Ohio

# BENDER BODIES



## Broken Glass — can you replace it *at once*?

You cannot avoid broken window glass when your cars or motor coaches are in service. Your glass cost sheets tell the story of necessary replacements.

You *can* avoid car lay-up in the shop... by replacing the glass at once.

With Edwards Metal Sash with Removable Glazing Strips, reglazing can be done in as short a time as two and one-half minutes... without removing sash from opening. It takes only a few seconds to remove the glazing strips. Replace the glass, slide the strips into place,

and the car or motor coach is ready for service. No need to pull it into the shop... no time lost.

This new feature is another proof of Edwards leadership in metal sash design and construction. To electric railway companies it means a saving of many dollars in time and labor.

Write for complete information.

O. M. EDWARDS CO.

New York Syracuse, N. Y. Chicago

*Canadian Representatives:*

Lyman Tube & Supply Co., Ltd., Montreal  
and Toronto

*Illustrated above:  
New Cleveland Railway  
Co. Articulated Car using  
Edwards Metal Sash with  
Removable Glazing Strips.*



# Edwards Metal Sash

2400 Miles

\$17.00 worth of Business in 14 minutes



**C** An Advertisement for Bell Long Distance Telephone Service

A PENNSYLVANIA cement company called by Long Distance and secured a 30-ton order from a town in New York. Telephone charges \$1.95. A 24-ton order from a Maryland town; charges \$2.50. A 20-ton order from a Pennsylvania town; charges 75 cents. And a 15-ton order from a town in Virginia; charges \$3.50. . . . Twenty-four hundred miles were "traveled"—there and back. Total orders secured, \$1700. Total charges, \$8.70. Talking time, 14 minutes.

So many businesses have found Long Distance indispensable in sales work that the "key town" plan has been developed as a further assistance and saving. By this plan key towns are selected. Each one of these is central

to all of the towns in its trade territory. From the key towns in the various territories, the representatives cover the other towns by telephone, in minimum time and at low cost.

To facilitate the use of the key town sales plan, interested firms may arrange for credit identification cards to be issued to their traveling representatives.

Long distance telephone service can be custom-made to fit your business. Surprising how much long distance calls will do and how little they will cost. Ask the nearest Bell business office about the key town plan. . . . Calling by number takes less time. . . . . Number, please?



# There's a National brush plant near you

DUE to the fact that each brush order is a special job calling for individual manufacturing processes, we have located Branch Offices and Factories in or close to the leading industrial centers of the country. These plants are supplied with stocks of the standard National grades of brush plates, and are equipped to manufacture these plates into finished brushes. Wherever possible, and except on large or special orders, your requirements are filled by the plant nearest you.

Each Branch Factory is under the supervision of factory trained experts, and the brushes produced are, of course, made to the same high standards of quality and workmanship as are those manufactured in the large finishing

plants at our main factories. The Branch Factory System is a great time saver and is especially valuable in cases of emergency when brushes are needed in a hurry.

To take full advantage of these manufacturing and service facilities, it is important to have in the Branch Office nearest you a Data Sheet for each of your electrical machines. On receipt of an order we then find full specifications on our copies of the Data Sheets covering your equipment, and can proceed to fill your order on the written, wired or telephoned advice to supply brushes for any machine or machines in your plant. The Data Sheet System is installed by us, entirely without cost to you.



**NATIONAL CARBON COMPANY, INC.**

Unit of Union Carbide  and Carbon Corporation

Carbon Sales Division

Cleveland, Ohio



San Francisco, Cal.

*Branch Offices and Factories*

CHICAGO, ILL.

PITTSBURGH, PA.

JERSEY CITY, N. J.

BIRMINGHAM, ALA.



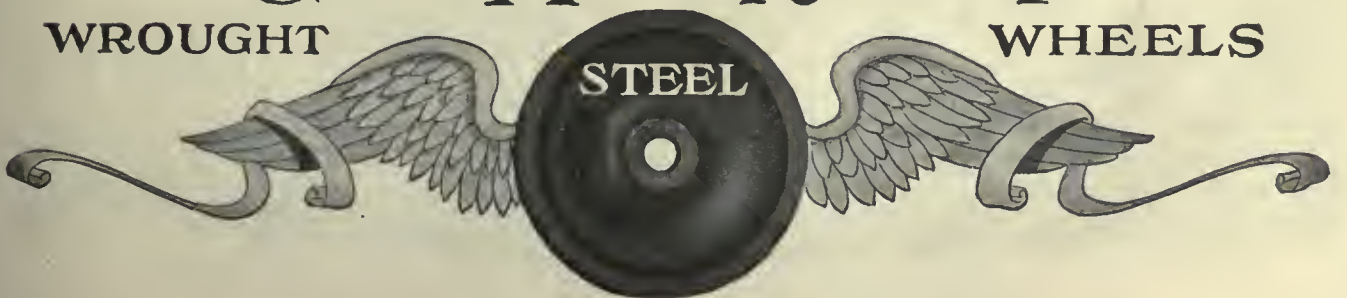
**Here We ROLL IN  
The Mileage Gary Wheels ROLL OUT**

WROUGHT STEEL WHEELS are doubly efficient wheels because they combine the advantages of rolling with those of forging. A ten-thousand-ton hydraulic press forges out defects; a remarkably efficient rolling mill rolls in multiplied mileage. . . . . In the rolling operation seven powerful rolls act in unison on the rim and web. As the wheel block revolves, a portion of the metal is forced from the web into the rim; tread and flange are formed to proper contour; the width of the rim is accurately controlled while its structure undergoes a refining process that reflects itself in long, steady and low-cost mileage

*The co-operation of Gary wheel engineers is at your service.*

**Illinois Steel Company**  
General Offices: 208 South La Salle Street  
Chicago, Illinois

**G A R Y**  
**WROUGHT STEEL WHEELS**



June 18, 1927

ELECTRIC RAILWAY JOURNAL

1094a

# 5 out of 7

## Regularly use "TOOL STEEL" Gears and Pinions

In the Electric Railway Journal, Maintenance Competition, May 21, 1927, seven articles were submitted from men in Philadelphia, Chattanooga, Atlanta, Washington, New Orleans, Birmingham, and Portland, Maine. Presumably these companies are alert in an effort to keep down maintenance costs.

**5 out of 7** of these companies regularly use "Tool Steel" gears and pinions,

and

**3 of the 7** companies, when buying new equipment, have specified "Tool Steel" gears and pinions on their new motors.

also

In the April contest (April 16th issue of Electric Railway Journal) 5 out of 6 were submitted by "Tool Steel" gear and pinion regular users.

"Tool Steel" gears and pinions reduce maintenance costs; if you take almost any classification of the "Live Wires" in the industry you will find that the great majority keep down their maintenance costs with "Tool Steel" gearing.

The Tool Steel Gear & Pinion Co.  
CINCINNATI, OHIO

Here's the monthly record of Total rolling Stock Articles and users of "Tool Steel" gears

April	5 out of	6
May	5 out of	7
June	7 out of	8
July	4 out of	5
Aug.	6 out of	8
Total		27 out of 34

# 79%

Out of 34 Contestant articles, 27 came from Companies regularly using "Tool Steel" Gears and Pinions

THE FIRST CAPITAL PRIZE WINNER IS A "TOOL STEEL" GEAR USER



The Standard of Quality

# TOOL-STEEL QUALITY GEARS AND PINIONS



## These are the things that Win and hold patronage

**W**IDE doors and low steps leading to an interior as spacious and free from obstructions as that of the most modern rail vehicle.

Room for a six-foot man to stand without taking his hat off.

Seats that are wide and comfortable.

No awkward "bulges" in the floor. No seats arranged in unnatural positions.

Windows spaced so that every passenger gets an unobstructed view.

Sash that opens wide and easily.

Hand-holds that call for no stretching or straining, and push-buttons that come to hand naturally.

No engine fumes, no vibration, and no noise.

These are the things in a Versare Highway Unit that win and hold patronage.



# Versare

# Making it easy for people to and for you to make a profit

**C**ERTAINLY you are interested in inducing more people in your community to use your rail and highway services regularly. You want to encourage the short-haul riders. You want to appeal to the "automobile commuters."

In the Six Wheel Highway Unit Versare offers you very tangible "talking points."

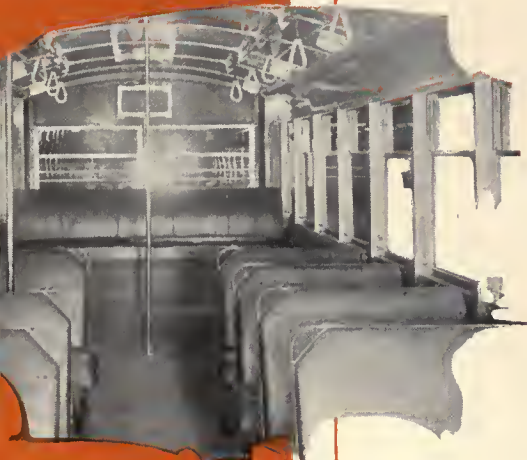
Comfort features, such as those listed on the front page of this advertisement.

Convenience features, such as the "circulating load," with separate entrance and exit doors, wide aisles and few stanchions.

Safety features, such as the triple air, mechanical and electric braking systems, no tendency to skid, ample speed and pick up to maneuver in modern traffic, and almost effortless driving.

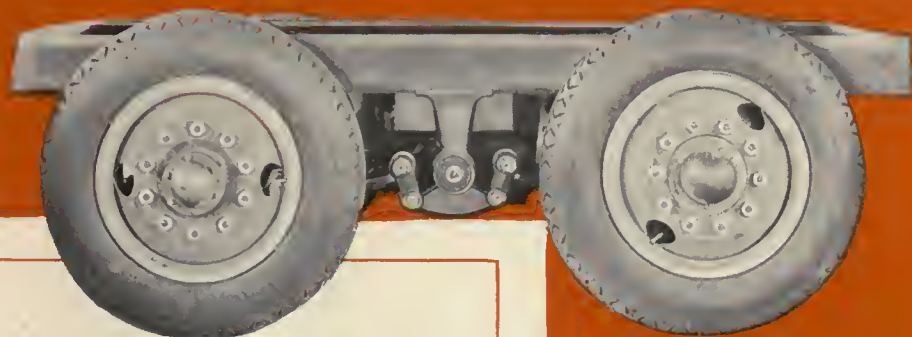
What is more, Versare offers you these things in a vehicle designed specifically to meet the conditions of operation under railway management on regular schedules, and in city or inter-urban service.

In half an hour's conference and a short demonstration we can show you the reasons why maintenance, depreciation and operating costs on the Versare Six Wheel Highway Unit are so low as to set an entirely new standard.



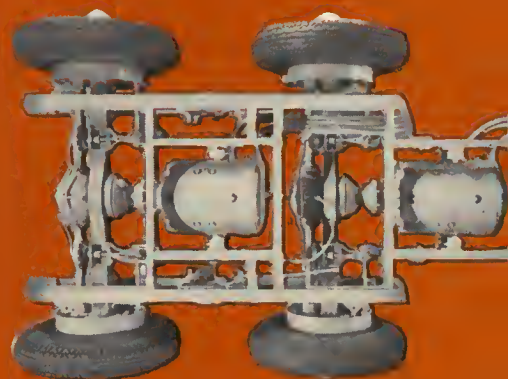


# ride .....



## General Specifications

- Engine:** Heavy duty 6 cylinder 125 hp.
- Electrical Equipment:** Versare-Westinghouse Type 177 generator; two Versare-Westinghouse 33 hp. vehicle type motors; Westinghouse standard vehicle control equipment.
- Brakes:** Westinghouse Air on four wheels. Mechanical hand brakes on two wheels. Resistor for electric braking in emergency.
- Axles:** Versare-Eaton, both front and rear. Patented Versare Equalizer on rear truck.
- Wheels:** Van Type 728.
- Body:** Duralumin truss construction.
- Doors:** Front, 36 in. duplex outward folding. Rear, 29 in. dual duplex outward folding with or without Automatic Treadle control.
- Length:** 28 ft. } overall. Wheel-180 in.  
29 ft. 11 in. } base 195 in.
- Breadth:** 8 ft. overall. Aisle width 21 in. at seat base. 24 in. at seat back.
- Height:** 9 ft. overall. Headroom 6 ft. 6 in.
- Turning Circle:** 56 ft.  
59 ft.



# Each Versare installation meets conditions exactly in a given locality.



**V**ERSARE Highway Units for use on your property will not necessarily be identical with those now operating in New York, Albany, Boston or Montreal.

Perhaps you need more luxurious upholstery, a different type of door-operating mechanism, a slightly different power plant for higher speeds or particularly hilly country.

In one case we are building Versare Highway Units for all-electric drive,—an advanced type of “trackless trolley.”

It is our aim to deliver vehicles that will fulfill all our claims and perform efficiently under any given conditions. Our engineers are ready to consult with any interested railway executive with this end in view.

**Versare Corporation**  
Albany, N. Y.



# REVENUE Reaches to Rail Bonds



Type  
ATF-2  
Arc Weld Bond

ALL Erico Rail Bonds, regardless of type, are distinguished by ease of application, by leech-like adherence to the rail, by reducing power cost and raising voltage to normal.

The advantages are revealed in lower maintenance costs for you; faster schedules and better lights for patrons.

It seems a far cry from rail bonds to riders, yet revenue reaches clear down to rail bonds.

If you are one of the companies that don't use Erico Bonds—most electric railways do—now is the time to start eliminating one source of worry.

Investigate. Get the details. Address—

## Type ATF-2 Arc Weld Bond

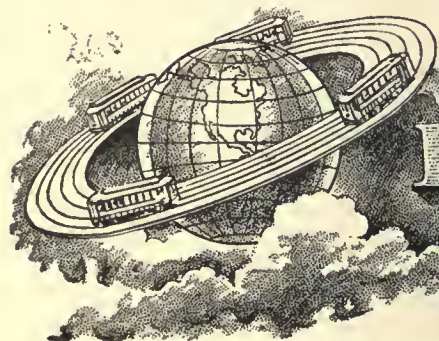
Extra heavy steel terminals permit use of large welding rod—big copper "U" loop gives great flexibility—stranded copper cable eliminates destructive vibration—great strength in the weld assures permanent terminal contact. Quick installation at low cost. Try them.

The  
Electric  
Railway  
Improvement  
Co.

2070 E. 61st Place,  
Cleveland, Ohio



**J**UST as the electric railway companies have to compile and be guided by exhaustive statistics as to peak loads, traffic densities, costs per mile, and so forth, we must constantly keep ourselves informed as to purchasing power, density of population and all vital market information in order to maintain our service as an active asset of your service.



**Barron G. Collier**

INCORPORATED

CANDLER BLDG. NEW YORK



View of the Miami Causeway day following the Florida Hurricane. Observe all Elreco Poles are standing.

**O**F several thousand Elreco Poles installed in Miami at the time of the famous hurricane not one was lost. Striking evidence of Elreco strength and stability!

Their well-known strength was only one factor that led to Elreco installation. Beauty, of course, was a consideration, but strength plus economy was the fundamental reason why they were installed.

Light in weight, accessible, adaptable—span and trolley wires, lighting wires, lighting units, even traffic signals may be hung on Elreco Poles.

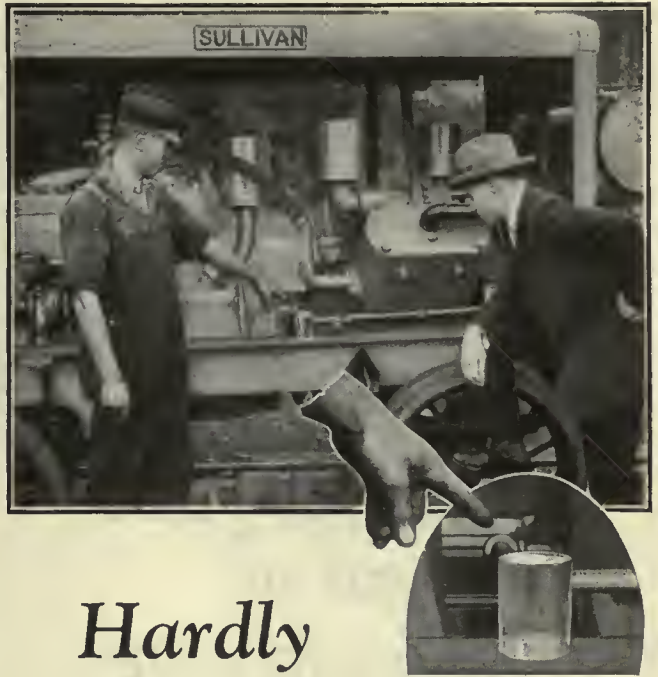
Couple these advantages with the installation and upkeep of three or four companies using one pole and it is readily seen why Elreco Tubular Steel Poles are a four-in-one cost reducing installation.

*We can save you money. Write—*

**THE ELECTRIC RAILWAY  
EQUIPMENT COMPANY**

2900 Cormany Ave.  
Cincinnati, Ohio

30 Church St.  
New York



*Hardly  
a Ripple!*

Full Speed, 800 R.  
P. M. but not  
a Drop  
Spills

**Now Sullivan gives you  
“Vibrationless” Compressors**

Vibrationless operation of your portable compressor means trouble-free service. It means dependable air power, freedom from delays, and protection for your profits—to say nothing of long life for your compressor.

And now in the portable compressor, as in the high grade automobile, vibration has been reduced to almost zero.

The picture shows a stock Sullivan 310-ft. capacity portable, running at full speed. A glass of water filled to the brim is standing on the frame. The wheels are not blocked, and the compressor is not braced in any way. Yet the surface of the water barely ripples, and not a drop is spilled.

*There are reasons why Sullivan Compressors are vibrationless.  
Send the coupon for information.*



**Sullivan Machinery Company**  
150 S. Michigan Ave., Chicago, Ill.

**SULLIVAN**

Send me free Catalog describing Sullivan Vibrationless Compressors.

Name .....

Street .....

City ..... State .....

Occupation .....

**Sullivan Machinery Company**  
150 S. Michigan Ave., Chicago, Ill.

*Send this Coupon*  
There are reasons why Sullivan Portable Compressors are vibrationless. Send for Catalog 3283-F.

# HOW PROCESSED

*takes the guess out of welding wire*



Every type of welding work has certain individual requirements. All Page Welding Wire and Electrodes are processed by special Page methods to meet the exact requirements of the type of work for which they are recommended.

Each piece is plainly stamped with an identification mark and an actual shop test made to prove its performance "on the job."



The result is welder's time saved, better work and lower costs. Prove this for yourself with a sample. Your name and address bring it.



PAGE STEEL AND WIRE COMPANY  
Bridgeport, Connecticut

District Offices: Chicago New York Pittsburgh San Francisco  
An Associate Company of the American Chain Company, Incorporated,  
Bridgeport, Conn.

## PAGE-ARMCO PROCESSED

### Welding Wire and Electrodes

### Check

Car movements at time points with Nachod Automatic Headway Recorders. The cars mark their own time on the chart — an easily readable record, easily filed for reference.

The chart shows whether the car is early or late, points out irregularities in the schedule. The careful manager has a complete and accurate record.

**Automatic Block Signals and Highway Crossing Signals** to meet every operating requirement. We shall gladly submit recommendations for complete systems.

**Nachod Spells Safety**

*Send for catalogs.*

Nachod & United States Signal Co., Inc.  
4777 Louisville Ave., Louisville, Kentucky

## Griffin Wheel Company

410 North Michigan Ave.  
Chicago, Ill.

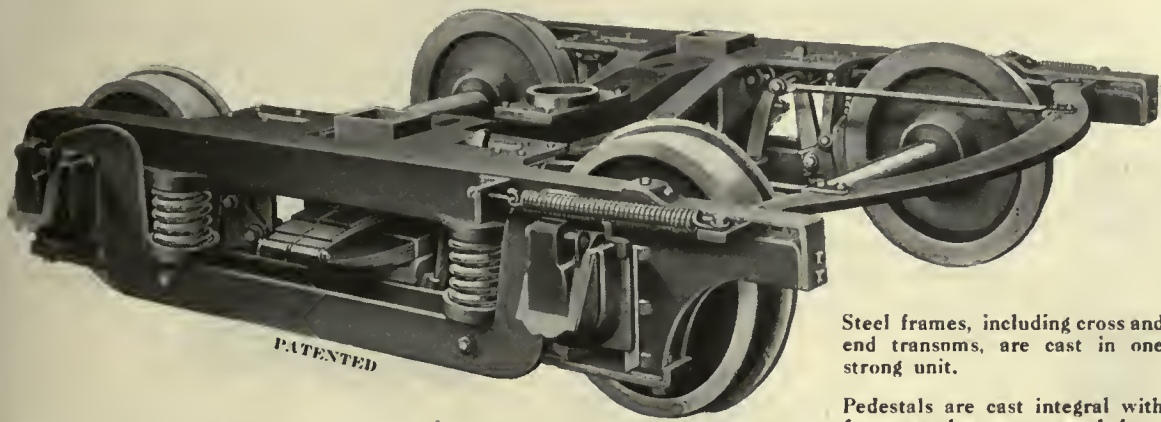
## Griffin Wheels

with  
Chilled Rims  
and

Chilled Back of Flanges  
For Street and Interurban  
Railways

FOUNDRIES:

- |           |                |             |
|-----------|----------------|-------------|
| Chicago   | Boston         | St. Paul    |
| Detroit   | Kansas City    | Los Angeles |
| Denver    | Council Bluffs | Tacoma      |
| Cleveland | Salt Lake City | Cincinnati  |



Steel frames, including cross and end transoms, are cast in one strong unit.

Pedestals are cast integral with frame, and are protected from wear by renewable hardened spring steel liners.

## Commonwealth Motor Trucks

*for Street Railway Service*

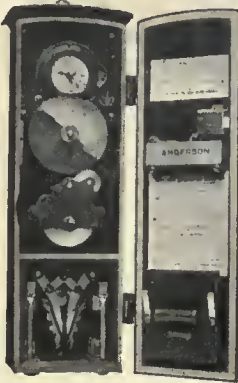
like Commonwealth Trucks for high speed interurban service, are designed by engineers familiar with the structural requirements for maximum service at minimum cost for maintenance. And they have been long accepted as standard by many leading railways.

COMMONWEALTH STEEL COMPANY  
Granite City, Illinois

## More Mileage per Motor Bearing



**-NORM-  
HOFFMANN**  
BEARINGS CORPORATION  
Stamford - Connecticut  
PRECISION BALL, ROLLER AND THRUST BEARINGS



You know the Story  
on Time Switches

That there isn't any question as to the reliability of the most widely used Time Switch.

That "tryouts" aren't necessary with a Switch that you know has been in successful use for over twenty years.

And that this Time Switch is built by Anderson from beginning to end at their factory in Boston.

Bulletin  
No. 37  
describes  
and  
illustrates  
these  
Time  
Switches

**Albert & J. M. Anderson Mfg. Co.**  
289-305 A St., Boston, Mass.

NEW YORK CHICAGO PHILADELPHIA LONDON

**Greater Service  
Per Dollar Invested**



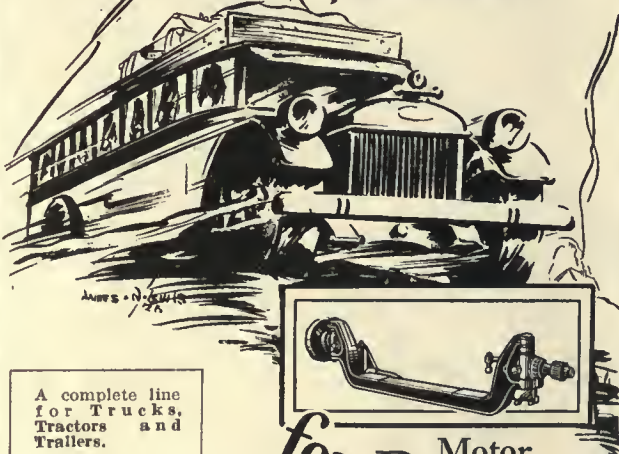
**"Tiger" Bronze Axle and  
Armature Bearings**

More-Jones "Tiger" Bronze castings for axle and armature bearing service was one of our early achievements. This is probably the most widely known bronze on the market. It has stood the test of time. There is nothing better for long, efficient and most economical results. Let us quote you.

**National Bearing Metals  
Corporation**  
New York, N. Y.      Pittsburgh, Pa.  
Jersey City, N. J.      Meadville, Pa.  
St. Louis, Mo.  
Portsmouth, Va.

**MORE-JONES  
QUALITY PRODUCTS**

**SHULER  
FRONT  
AXLES**



A complete line  
for Trucks,  
Tractors and  
Trailers.

*for* **Motor  
BUSSES**

**SHULER AXLE COMPANY**

Louisville

Incorporated

Kentucky

Member of Motor Truck Industries Inc. of America



**Complete satisfaction**

Operating perfectly and requiring minimum attention for maintenance and lubrication, Earll Catchers and Retrievers give genuinely satisfactory results. Their refinement of design, and mechanical superiority are summarized in the following five features, peculiar to Earll construction.

- No-wear Check Pawl
- Free-Winding Tension Spring
- Ratchet Wind
- Emergency Release
- Perfect Automatic Lubrication

**Earll Catchers and Retrievers**

**C. I. EARLL, York, Pa.**

Canadian Agents:  
Railway & Power Engineering Corp., Ltd., Toronto, Ont.  
In All Other Foreign Countries:  
International General Electric Co., Schenectady, N. Y.



# ROLLED STEEL WHEELS STEEL AXLES STEEL SPRINGS ARMATURE SHAFTS



## STANDARD STEEL

WORKS COMPANY  
PHILADELPHIA, PA.

BRANCH OFFICES:  
Portland  
Richmond

WORKS: BURNHAM, PA.

Chicago  
St. Louis

New York  
Houston

San Francisco  
St. Paul

Pittsburgh  
Mexico City



### Drip Points for Added Efficiency

They prevent creeping moisture and quickly drain the petticoat in wet weather, keeping the inner area dry.

The Above Insulator—No. 72—Voltages—Test—Dry 64,000  
Wet 31,400, Line 10,000.

Our engineers are always ready to help you on your glass insulator problem. Write for catalog.

Hemingray Glass Company  
Muncie, Ind.

Est. 1848—Inc. 1870



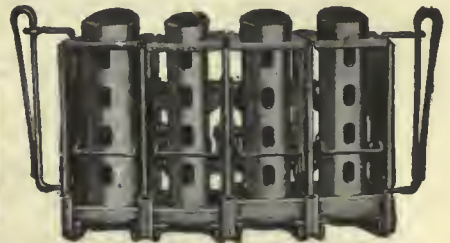
### JOHNSON FARE COLLECTING SYSTEMS



Johnson Electric Fare Boxes and overhead registers make possible the instantaneous registering and counting of every fare. Revenues are increased 1 1/2 to 5% and the efficiency of one-man operation is materially increased. Over 4000 already in use.

When more than two coins are used as fare, the Type D Johnson Fare Box is the best manually operated registration system. Over 50,000 in use.

Johnson Change-Makers are designed to function with odd fare and metal tickets selling at fractional rates. It is possible to use each barrel separately or in groups to meet local conditions. Each barrel can be adjusted to eject from one to five coins or one to six tickets.



Johnson Fare Box Co.

4619 Ravenswood Ave., Chicago, Ill.

# Bankers and Engineers

## Ford, Bacon & Davis Incorporated Engineers

115 Broadway, New York  
PHILADELPHIA CHICAGO SAN FRANCISCO

## The J. G. White Engineering Corporation

Engineers—Constructors  
Oil Refineries and Pipe Lines, Steam and Water Power Plants, Transmission  
Systems, Hotels, Apartments, Office and Industrial Buildings, Railroads.  
43 Exchange Place New York

## STONE & WEBSTER

Incorporated  
Design and Construction  
Examinations Reports Appraisals  
Industrial and Public Service Properties  
NEW YORK BOSTON CHICAGO

## THE BEELER ORGANIZATION

Transportation, Traffic, Operating Surveys  
Better Service—Financial Reports  
Appraisals—Management  
52 Vanderbilt Ave. New York

## SANDERSON & PORTER ENGINEERS

PUBLIC UTILITIES & INDUSTRIALS  
Design Construction Management  
Examinations Reports Valuations  
CHICAGO NEW YORK SAN FRANCISCO

## ENGELHARDT W. HOLST

Consulting Engineers  
Appraisals Reports Rates Service Investigation  
Studies on Financial and Physical Rehabilitation  
Reorganization Operation Management  
683 Atlantic Ave., BOSTON, MASS.

## ALBERT S. RICHEY ELECTRIC RAILWAY ENGINEER

WORCESTER, MASSACHUSETTS  
REPORTS—APPRAISALS—RATES—OPERATION—SERVICE

## WALTER JACKSON Consultant on Fares and Motor Buses

The Weekly and Sunday Pass—Differential  
Fares—Ride Selling  
Holbrook Hall 5-W-3  
160 Gramatan Ave., Mt. Vernon, N. Y.

## A. L. DRUM & COMPANY

Consulting and Constructing Engineers  
VALUATION AND FINANCIAL REPORTS  
RATE STUDIES FOR PRESENTATION TO PUBLIC SERVICE  
COMMISSIONS  
CONSTRUCTION AND MANAGEMENT OF  
ELECTRIC RAILWAYS  
230 South Clark Street, Chicago, Ill.

## DAY & ZIMMERMANN, INC. ENGINEERS

DESIGN - CONSTRUCTION - REPORTS  
VALUATIONS - MANAGEMENT  
NEW YORK PHILADELPHIA CHICAGO

## KELKER, DeLEUW & CO.

CONSULTING ENGINEERS  
REPORTS ON  
Operating Problems Valuations Traffic Surveys  
111 W. Washington Street, Chicago, Ill.

## STEVENS & WOOD

INCORPORATED  
ENGINEERS AND CONSTRUCTORS  
120 BROADWAY, NEW YORK  
ENGINEERING CONSTRUCTION YOUNGSTOWN, O. CHICAGO, ILL. FINANCING MANAGEMENT

## J. ROWLAND BIBBINS

Engineer—2301 Connecticut Ave., N.W., Washington, D. C.  
TRANSPORTATION SURVEYS  
Organized Traffic Relief and Transit Development  
Co-ordinating Motor Transport, Railroad and City  
Plans, Service, Routing, Valuation, Economic Studies  
EXPERIENCE IN 20 CITIES

## HEMPHILL & WELLS

CONSULTING ENGINEERS  
Gardner F. Wells Albert W. Hemphill  
APPRAISALS  
INVESTIGATIONS COVERING  
Reorganization Management Operation Construction  
43 Cedar Street, New York City

## E. H. FAILE & CO.

Designers of  
Garages—Service Buildings—Terminals  
441 LEXINGTON AVE. NEW YORK

## McCLELLAN & JUNKERSFELD

Incorporated  
ENGINEERING AND CONSTRUCTION  
Examinations—Reports—Valuations  
Transportation Problems—Power Developments  
68 Trinity Place, New York  
Chicago St. Louis

# THE BABCOCK & WILCOX COMPANY

85 LIBERTY STREET, NEW YORK

Builders since 1868 of  
Water Tube Boilers  
of continuing reliability

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



WORKS  
Bayonne, N. J.  
Barberton, Ohio

BRANCH OFFICES

ATLANTA, Candler Building  
BOSTON, 80 Federal Street  
CHICAGO, Marquette Building  
CINCINNATI, Traction Building  
CLEVELAND, Guardian Building  
DALLAS, TEXAS, Magnolia Building  
DENVER, 444 Seventeenth Street  
DETROIT, Ford Building  
HOUSTON, TEXAS, Electric Building  
LOS ANGELES, Central Building  
NEW ORLEANS, 344 Camp Street

BRANCH OFFICES

PHILADELPHIA, Packard Building  
PHOENIX, ARIZ., Heard Building  
PITTSBURGH, Farmers Deposit Bank Building  
PORTLAND, ORE., Falling Building  
SALT LAKE CITY, Kearns Building  
SAN FRANCISCO, Sheldon Building  
SEATTLE, L. C. Smith Building  
HONOLULU, T. H., Castle & Cooke Building  
HAVANA, CUBA, Calle de Aguiar 104  
SAN JUAN, PORTO RICO, Royal Bank Building

C. B. BUCHANAN President    W. H. PRICE, JR. Sec'y-Treas.    JOHN F. LAYNG Vice-President

**BUCHANAN & LAYNG CORPORATION**  
*Engineering and Management, Construction  
Financial Reports, Traffic Surveys  
and Equipment Maintenance*

BALTIMORE 1004 Citizens National Bank Bldg.    Phone: Hanover: 2142    NEW YORK 49 Wall Street

**Hale and Kilburn SEATS**

Better Quality Seats For Cars and Buses    Hale-Kilburn Co. 1800 Lehigh Ave., Philadelphia, Pa.

**TRAFFIC CONSULTANT**  
Freight Rate, Tariff and Traffic Analyses;  
Advisory Freight Traffic Assistance  
on Special or Monthly Basis;  
Preparation of Cases before Interstate Commerce  
Commission and State Commissions.

**HALSEY MCGOVERN**  
Mills Bldg., 17th and Pa. Ave., Washington, D. C.

**GOLD CAR HEATING & LIGHTING CO.**  
220 36th St., Brooklyn, N. Y.

ELECTRIC HEATERS WITH OPEN COIL OR ENCLOSED ELEMENTS  
THERMOSTAT CONTROL—VENTILATORS

WRITE FOR NEW CATALOGUE

**THE P. EDWARD WISH SERVICE**  
50 Church St. NEW YORK    Street Railway Inspection DETECTIVES    131 State St. BOSTON

**RAMAPO AJAX CORPORATION**

EIGHT WORKS: RAMAPO, MAX-ELLERY, HILLBURN, NEW YORK, MAGNOLA FALLS, N.Y., CHICAGO, ILLINOIS, EAST ST. LOUIS, ILL., FRESNO, CALIFORNIA, SLEETON, WISCONSIN, LOS ANGELES, CALIF., MAGNOLA FALLS, N.Y., CANADA.

RAMAPO AUTOMATIC RETURN SWITCH STANDS FOR PASSING SIDINGS  
TEE RAIL SPECIAL WORK  
MANGANESE WORK A SPECIALTY  
SALES OFFICES AT ALL WORKS  
Main Office, HILLBURN, N.Y.

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

**CREOSOTED**  
Railroad Cross-ties; Switch-ties; Bridge Timbers; Construction Timbers; Mine Timbers; Lumber; Piling; Poles; Posts and other Forest Products

**J. F. Prettyman & Sons**  
Wood Preserving Plant  
Charleston, S. C.

**BELL CEDAR POLES**  
NORTHERN    WESTERN

BUTT TREATING ALL GRADES    TIES

**BELL LUMBER CO., Minneapolis, Minn.**

**ILLINOIS MOTIVE EQUIPMENT COMPANY**  
J. D. Elsom, President  
General Sales Agent—The Air Rectifier  
Districts Representatives  
Johnson Fare Box; McCloskey Bomb Shell Torch;  
Cinch Vertical Swipe; Fyr-Fly Spot Light

35 E. Wacker Drive Chicago, Illinois

**ROEBLING**  
Electrical Wires & Cables

John A. Roebling's Sons Co. Trenton, N. J.

**UNA**  
RAIL JOINTS  
DYNAMOTORS  
WELDING ROD

UNA Welding & Bonding Co.  
Cleveland, Ohio.

Efficient Bus Heating  
with  
**The N-L Venti-Duct Heater**

**THE NICHOLS-LINTERN CO.**  
7960 Lorain Ave. Cleveland, Ohio

## Bethlehem Products for Electric Railways

Tee and Girder Rails; Machine Fitted Joints; Splice Bars; Hard Center Frogs; Hard Center Mates; Rolled Alloy Steel Crossings; Abbott and Center Rib Base Plates; Rolled Steel Wheels and Forged Axles; Tie Rods; Bolts; Tie Plates and Pole Line Material.

*Catalog Sent on Request*

BETHLEHEM STEEL COMPANY, Bethlehem, Pa.

# BETHLEHEM

## TRACKWORK

Built to withstand the severest service,

*Wharton Tisco Manganese Steel Trackwork* by its quality and long life, has ever proven well worth its price.

WM. WHARTON JR. & CO., Inc.  
EASTON, PA.

*"The Standard for Rubber Insulation"*

## INSULATED WIRES and CABLES

*"Okonite," "Manson," and Dundee "A" "B" Tapes*

*Send for Handbook*

The Okonite Company

The Okonite-Callender Cable Company, Inc.

Factories, PASSAIC, N. J.

PATERSON, N. J.

Sales Offices: New York Chicago Pittsburgh St. Louis Atlanta  
Birmingham San Francisco Los Angeles Seattle

Pettingell-Andrews Co., Boston, Mass.

F. D. Lawrence Electric Co., Cincinnati, O.

Novelty Electric Co., Phila., Pa.

Can. Rep.: Engineering Materials Limited, Montreal.

Cuban Rep.: Victor G. Mendoza Co., Havana.



## TAYLOR Coil and Elliptic SPRINGS

insure easy riding cars  
and reduce maintenance

**TAYLOR ELECTRIC TRUCK CO.**  
TROY, N. Y., U. S. A.



## Boyerized Parts:

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

Can be purchased through the following representatives:

- F. F. Bodler,  
903 Monadnock Bldg., San Francisco, Cal.  
W. F. McKenney,  
54 First Street, Portland, Oregon.  
J. H. Denton,  
1329 Broadway, New York City, N. Y.  
A. W. Arlin,  
519 Delta Bldg., Los Angeles, Cal.

**Bemis Car Truck Company**  
Springfield, Mass.

## The DIFFERENTIAL CAR



*Standard on  
60 Railways for*

- Track Maintenance
- Track Construction
- Ash Disposal
- Coal Hauling
- Concrete Materials
- Waste Handling
- Excavated Materials
- Hauling Cross Ties
- Snow Disposal

*Use These Labor Savers*

- Differential Crane Car
- Clark Concrete Breaker
- Differential 3-way Auto Truck Body
- Differential Car Wheel Truck and Tractor

**THE DIFFERENTIAL STEEL CAR CO., Findlay, O.**

The Most Successful Men in the Electric Railway  
Industry read the

## ELECTRIC RAILWAY JOURNAL

Every Week



## International Registers

Made in single and double types to meet requirements of service. For hand or foot, mechanical or electric operation. Counters, car fittings, conductors' punches.

Double Register  
Type R-11

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

# SEARCHLIGHT SECTION

USED EQUIPMENT & NEW—BUSINESS OPPORTUNITIES

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

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

**DISPLAYED—RATE PER INCH:**  
 1 to 3 inches.....\$1.50 an inch  
 4 to 7 inches..... 4.30 an inch  
 8 to 14 inches..... 4.10 an inch  
 Rates for larger spaces, or yearly rates, on request.  
 In advertising work is measured vertically on one column, 3 columns—30 inches—to a page.

## Searchlight can help you—

**H**UNDREDS of miscellaneous business problems pertaining to Electric Railway Operation can be quickly and easily solved through the use of the Searchlight Section of this publication.

The Searchlight Section is the classified advertising section for giving publicity to all kinds of business wants of interest to other men in the field. It is the weekly meeting place of the man with a miscellaneous business need and the men who can fill that need.

When you want additional employees, want to buy or sell used or surplus Railway equipment, seek additional capital or have other miscellaneous business wants—advertise them in the Searchlight Section for quick, profitable results!

Think "SEARCHLIGHT" first

### POSITIONS VACANT

VACANCY for qualified man with full knowledge of motor coach mechanics, supervising ability, maintenance methods, etc. Write, giving full particulars as to experience, qualifications, age, salary, etc. P-105, Electric Railway Journal, Tenth Ave. at 36th St., New York.

### POSITIONS WANTED

EQUIPMENT superintendent, experienced and successful on maintenance of electric car and bus equipment, desires to change, can get you the desired results; references. PW-106, Electric Railway Journal, 7 South Dearborn St., Chicago, Ill.

SUPERINTENDENT transportation; well known in electric railway field, with broad experience, successful record city, interurban railways and buses, available short notice, correspondence invited. Fine references, PW-103, Electric Railway Journal, Guardian Bldg., Cleveland, Ohio.

WANTED—Position as manager, general superintendent or M. M. of electric railways. Can qualify in every way. PW-99, Electric Railway Journal, Guardian Bldg., Cleveland, Ohio.

### TO HELP YOU

GET WHATEVER YOU NEED

"Searchlight" Advertising

**NEW AND RELAYING RAILS**

Tie Plates  
 —Switches—Frogs  
 —Portable Track  
 Finest Quality  
 Flat Cars—Locomotives  
 Quick Delivery Lowest Price

**HYMAN-MICHAELS CO.**  
 Peoples Gas Building  
 CHICAGO San Francisco  
 St. Louis

FOR SALE

### MOTORS

130 Westinghouse, Type 514-C.  
 Fine condition. Low price.

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

We buy entire  
 Railways and  
 Power Plants

**H. E. SALZBERG  
 COMPANY, Inc.**  
 225 Broadway New York City

We sell  
 Street Railway  
 and Power  
 equipment

# WHAT AND WHERE TO BUY

Equipment, Apparatus and Supplies Used by the Electric Railway Industry with Names of Manufacturers and Distributors Advertising in this Issue

This index is published as a convenience to the reader. Every care is taken to make it accurate, but *Electric Railway Journal* assumes no responsibility for errors or omissions.

- Advertising, Street Car**  
Collier Inc., Barron G.
- Air Brakes**  
General Electric Co.  
Westinghouse Air Brake Co.
- Anchors, Guy**  
Elec. Service Supplies Co.  
General Electric Co.  
Ohio Brass Co.  
Westinghouse E. & M. Co.
- Armature Shop Tools**  
Columbia Machine Wks.  
Elec. Service Supplies Co.
- Automatic Return Switch Stands**  
Ramapo Ajax Corp.
- Automatic Safety Switch Stands**  
Ramapo Ajax Corp.
- Axles**  
Bemis Car Truck Co.  
Bethlehem Steel Co.  
Brill Co., The J. G.  
Cincinnati Car Co.  
Illinois Steel Co.  
Standard Steel Works Co.  
Taylor Electric Truck Co.  
Westinghouse E. & M. Co.
- Axles, Front**  
Shuler Axle Co.
- Axles, Steel**  
Bethlehem Steel Co.
- Rabbit Metal**  
National Bearing Metals Corp.
- Badges and Buttons**  
Elec. Service Supplies Co.  
International Register Co.
- Batteries, Dry**  
National Carbon Co.  
Nichols-Lintern Co.
- Bearings, Anti-Friction**  
Hyatt Roller Bearing Co.
- Bearings, Ball**  
Norma-Hoffmann Bearings Corp.
- Bearings and Bearing Metals**  
Bemis Car Truck Co.  
Cincinnati Car Co.  
Columbia Machine Wks.  
National Bearing Metals Corp.  
Taylor Electric Truck Co.  
Westinghouse E. & M. Co.
- Bearings, Center and Roller Side**  
Cincinnati Car Co.  
Stueckl Co., A.
- Bearings, Roller and Ball**  
Hyatt Roller Bearing Co.  
Norma-Hoffmann Bearings Corp.
- Bells & Buzzers**  
Consolidated Car Heating Co.
- Bells and Gongs**  
Brill Co., The J. G.  
Cincinnati Car Co.  
Columbia Machine Wks.  
Elec. Service Supplies Co.
- Benders, Rail**  
Railway Trackwork Co.
- Blowers (Hand Portable)**  
Ideal Commutator Dresser Co.
- Bodies, Bus**  
Bender Body Co.  
Brill Co., The J. G.  
Cummings Car & Coach Co.  
Fitzjohn Mfg. Co.
- Body Material—Haskelite & Plymet**  
Haskelite Mfg. Corp.
- Bailers**  
Babcock & Wilcox Co.
- Bolts & Nuts, Track**  
Illinois Steel Co.
- Bond Testers**  
American Steel & Wire Co.  
Elec. Service Supplies Co.
- Bonding Apparatus**  
Amer. Steel & Wire Co.  
Electric Ry. Improvement Co.  
Elec. Service Supplies Co.  
Ohio Brass Co.  
Railway Trackwork Co.  
Una Welding & Bonding Co.
- Bonds, Rail**  
American Steel & Wire Co.  
Electric Ry. Improvement Co.  
Elec. Service Supplies Co.
- General Electric Co.**  
Ohio Brass Co.  
Page Steel & Wire Co.  
Railway Trackwork Co.  
Una Welding & Bonding Co.  
Westinghouse E. & M. Co.
- Brackets and Cross Arms (See also Poles, Ties, Posts, etc.)**  
Columbia Machine Wks.  
Electric Railway Equipment Co.  
Elec. Service Supplies Co.  
General Electric Co.  
Ohio Brass Co.
- Brake Adjusters**  
Brill Co., The J. G.  
Cincinnati Car Co.  
National Railway Appliance Westinghouse Traction Br. Co.
- Brake Shoes**  
Bemis Car Truck Co.  
Brill Co., The J. G.  
Taylor Electric Truck Co.
- Brake Testers**  
National Railway Appliance Co.
- Brakes, Brake Systems and Brake Parts**  
Bemis Car Truck Co.  
Brill Co., The J. G.  
Cincinnati Car Co.  
Columbia Machine Wks.  
General Electric Co.  
National Brake Co.  
Safety Car Devices Co.  
Taylor Electric Truck Co.  
Westinghouse Traction Brake Co.
- Brakes, Magnetic Rail**  
Cincinnati Car Co.
- Brushes, Carbon**  
General Electric Co.  
National Carbon Co.  
Westinghouse E. & M. Co.
- Brushes, Graphite**  
National Carbon Co.
- Brushes, Metal Graphite**  
National Carbon Co.
- Brushholders**  
Columbia Machine Wks.  
General Electric Co.
- Bulkheads**  
Haskelite Mfg. Corp.
- Bus Lighting**  
National Railway Appliance Co.
- Buses**  
Cummings Car & Coach Co.  
Twin Coach Corp.  
Versare Corp.
- Buses, Gas, Electric**  
General Electric Co.
- Boshings, Case Hardened and Manganese**  
Bemis Car Truck Co.  
Brill Co., The J. G.  
Cincinnati Car Co.  
Columbia Machine Wks.
- Cables (See Wires and Cables)**  
Camble Tapes, Yellow and Black Varnished  
General Electric Co.  
Irvington Varnish & Ins. Co.  
Mica Insulator Co.
- Carbon Brushes (See Brushes, Carbon)**
- Carbon Paste, Welding**  
National Carbon Co.
- Carbon Plates, Welding**  
National Carbon Co.
- Carbon Rods, Welding**  
National Carbon Co.
- Car Lighting Fixtures**  
Elec. Service Supplies Co.
- Car Panel Safety Switches**  
Consolidated Car Heating Co.  
Westinghouse E. & M. Co.
- Car Steps, Safety**  
Cincinnati Car Co.
- Car Wheels, Rolled Steel**  
Bethlehem Steel Co.
- Cars, Dump**  
Brill Co., The J. G.  
Differential Steel Car Co.
- Cars, Gas-Electric**  
Brill Co., The J. G.  
General Electric Co.  
Westinghouse Elec. & Mfg.
- Cars, Gas, Rail**  
Brill Co., The J. G.
- Cars, Passenger, Freight, Express, etc.**  
Amer. Car Co.  
Brill Co., The J. G.  
Cincinnati Car Co.  
Cummings Car & Coach Co.  
Kuhlman Car Co., G. C.  
Wason Mfg. Co.
- Cars, Self-Propelled**  
Brill Co., The J. G.
- Castings, Brass Composition or Copper**  
Anderson Mfg. Co., A. & J. M.  
Cincinnati Car Co.  
Columbia Machine Wks.  
National Bearing Metals Corp.
- Castings, Gray Iron and Steel**  
Bemis Car Truck Co.  
Columbia Machine Works & Standard Steel Works Co. Inc.  
Wm. Wharton, Jr. & Co.
- Castings, Malleable & Brass**  
Bemis Car Truck Co.  
Columbia Machine Wks.
- Catchers and Retrievers, Trolley**  
Earl, C. I.  
Elec. Service Supplies Co.  
Ohio Brass Co.
- Celling Car**  
Haskelite Mfg. Corp.
- Ceilings, Plywood Panels**  
Haskelite Mfg. Corp.
- Change Carriers**  
Cleveland Fare Box Co.  
Electric Service Supplies Co.
- Change Trays**  
Cincinnati Car Co.
- Circuit-Breakers**  
Anderson Mfg. Co., A. & J. M.  
General Electric Co.  
Westinghouse E. & M. Co.
- Clamps and Connectors for Wires and Cables**  
Columbia Machine Wks.  
Electric Railway Equipment  
Electric Ry. Improvement Co.  
Elec. Service Supplies Co.  
Ohio Brass Co.  
Westinghouse E. & M. Co.
- Cleaners and Scrapers, Track (See also Snow-Plows Sweepers and Brooms)**  
Brill Co., The J. G.  
Cincinnati Car Co.
- Coal and Ash Handling (See Conveying and Hoisting Machinery)**
- Coil Banding and Winding Machines**  
Columbia Machine Wks.  
Elec. Service Supplies Co.  
Westinghouse E. & M. Co.
- Coils, Armature and Field**  
Columbia Machine Wks.  
Economy Electric Devices Co.  
Elliott Thompson Electric Co.  
General Electric Co.  
Westinghouse E. & M. Co.
- Colls, Choke and Kieking**  
Elec. Service Supplies Co.  
General Electric Co.  
Westinghouse E. & M. Co.
- Coiln Changers**  
Illinois Motive Equipment Co.  
Johnson Fare Box Co.
- Coiln Counting Machines**  
Cleveland Fare Box Co.  
International Register Co.  
Johnson Fare Box Co.
- Coiln Sorting Machines**  
Cleveland Fare Box Co.  
Johnson Fare Box Co.
- Coiln Wrappers**  
Cleveland Fare Box Co.
- Commutator Cement**  
Ideal Commutator Dresser Co.
- Commutator Equipment**  
Ideal Commutator Dresser Co.
- Commutator Grinding Tools**  
Ideal Commutator Dresser Co.
- Commutator Mica Undercutter**  
Ideal Commutator Dresser Co.
- Commutators, Parts**  
General Electric Co.
- Commutator Slotters**  
Columbia Machine Wks.  
Elec. Service Supplies Co.  
Westinghouse E. & M. Co.
- Commutator Slotting Files**  
Ideal Commutator Dresser Co.
- Commutators or Parts**  
Columbia Machine Wks.  
General Electric Co.  
Westinghouse E. & M. Co.
- Compressors, Air**  
General Electric Co.  
Sullivan Machinery Co.  
Westinghouse Traction Br. Co.
- Compressors, Portable**  
Sullivan Machinery Co.
- Compressors, Gas**  
Sullivan Machinery Co.
- Condensers**  
Westinghouse E. & M. Co.
- Connectors, Solderless**  
Westinghouse E. & M. Co.
- Connectors, Trailer Car**  
Columbia Machine Wks.  
Consolidated Car Heating Co.  
Elec. Service Supplies Co.  
Ohio Brass Co.
- Controllers or Parts**  
Columbia Machine Wks.  
General Electric Co.  
Westinghouse E. & M. Co.
- Controler Regulators**  
Elec. Service Supplies Co.
- Controlling Systems**  
General Electric Co.  
Westinghouse E. & M. Co.
- Converters, Rotary**  
General Electric Co.  
Westinghouse E. & M. Co.
- Copper Wire**  
American Brass Co.  
American Steel & Wire Co.  
Anaconda Copper Mining Co.  
Page Steel & Wire Co.
- Copper Wire Instruments**  
Measuring, Testing and Recording  
American Brass Co.  
American Steel & Wire Co.  
Anaconda Copper Mining Co.
- Cord, Bell, Trolley, Register**  
American Steel & Wire Co.  
Brill Co., The J. G.  
Elec. Service Supplies Co.  
International Register Co.  
Roebling's Sons Co., J. A.
- Cord Connectors and Couplers**  
Elec. Service Supplies Co.
- Couplers, Car**  
Brill Co., The J. G.  
Cincinnati Car Co.  
Ohio Brass Co.  
Westinghouse Tr. Br. Co.
- Cowl Ventilators**  
Nichols-Lintern Co.
- Cranes, Hoist and Lift**  
Electric Service Supplies Co.
- Cross Arms (See Brackets)**
- Crossing Foundations**  
International Steel Tie Co.
- Crossing, Frog and Switch**  
Ramapo Ajax Corp.  
Wm. Wharton, Jr. & Co., Inc.
- Crossing Manganese**  
Bethlehem Steel Co.  
Ramapo Ajax Corp.  
Wm. Wharton, Jr. & Co., Inc.
- Crossings**  
Wm. Wharton Jr. & Co.  
Ramapo Ajax Corp.  
Inc.
- Crossings, Track (See Track Special Work)**
- Crossings, Trolley**  
General Electric Co.  
Ohio Brass Co.  
Westinghouse E. & M. Co.
- Curtains & Curtain Fixtures**  
Brill Co., The J. G.  
Edwards Co., Inc., O. M.
- Cutting Apparatus**  
Electric Railway Improvement Co.  
General Electric Co.  
Railway Trackwork Co.  
Una Welding & Bonding Co.  
Westinghouse E. & M. Co.
- Dealer's Machinery & Second Hand Equipment**  
Electric Equipment Co.  
Hyman Michaels Co.  
Salzberg Co., Inc., H. E.
- Derailing Devices (See also Track Work)**
- Derailing Switches**  
Ramapo Ajax Corp.
- Destination Signs**  
Columbia Machine Wks.  
Elec. Service Supplies Co.
- Detective Service**  
Wish-Service, P. Edward
- Door Operating Devices**  
Brill Co., The J. G.  
Cincinnati Car Co.  
Consolidated Car Heating Co.  
National Pneumatic Co., Inc.  
Safety Car Devices Co.
- Doors and Door Fixtures**  
Brill Co., The J. G.  
Cincinnati Car Co.  
Edwards Co., Inc., O. M.  
Hale-Kilburn Co.  
Safety Car Devices Co.
- Doors, Folding Vestibule**  
National Pneumatic Co.  
Safety Car Devices Co.
- Drills, Rock**  
Sullivan Machinery Co.
- Drills, Track**  
Amer. Steel & Wire Co.  
Elec. Service Supplies Co.  
Ohio Brass Co.
- Dryers, Sand**  
Elec. Service Supplies Co.  
Ohio Brass Co.  
Westinghouse E. & M. Co.
- Ears**  
Columbia Machine Wks.  
Electric Service Supplies Co.  
General Electric Co.  
Ohio Brass Co.  
Westinghouse E. & M. Co.
- Electric Grinders**  
Railway Trackwork Co.
- Electrical Wires and Cables**  
American Steel & Wire Co.  
Roebling's Sons Co., John A.
- Electrodes, Carbon**  
Railway Trackwork Co.  
Una Welding & Bonding Co.
- Electrodes, Steel**  
Railway Trackwork Co.  
Una Welding & Bonding Co.
- Engineers, Consulting, Contracting and Operating**  
Beeler, John A.  
Bibbins, Roland J.  
Buchanan & Layng Corp.  
Day & Zimmermann, Inc.  
A. L. Drum & Co.  
Faile & Co., E. H.  
Ford, Bacon & Davis  
Hemphill & Wells  
Holst, Engelhardt W.  
Jackson, Walter  
Kelker & DeLew  
McClellan & Junkersfeld  
McGovern, Halsey  
Richey, Albert S.  
Sanderson & Porter  
Stevens & Wood, Inc.  
Stone & Webster  
White Eng. Corp., The J. G.
- Engines, Gas, Oil or Steam**  
Westinghouse E. & M. Co.
- Exterior Side Panels**  
Haskelite Mfg. Corp.
- Fare Boxes**  
Cleveland Fare Box Co.  
Economy Electric Devices Co.  
Illinois Motive Equipment Co.  
Johnson Fare Box Co.  
Perey Mfg. Co., Inc.
- Fare Registers**  
Electric Service Sup. Co.  
Johnson Fare Box Co.

(Continued on page 52)



Use **AIMCO**  
REG. U.S. PAT. OFF.  
 Electric Railway  
 Automatic Signals  
 for Accessibility  
 and Reliability

EST. 1855 **AIMCO** INC. 1918  
**"American"**  
**INSULATING**  
**MACHINERY**  
**COMPANY**  
REG. U.S. PAT. OFF.

521 Huntington St.  
 Philadelphia, Pa. 1

## Lorain Special Trackwork Girder Rails

*Electrically Welded Joints*

THE LORAIN STEEL COMPANY

Johnstown, Pa.  
 Sales Offices:

Atlanta Chicago Cleveland New York  
 Philadelphia Pittsburgh Dallas  
*Pacific Coast Representative:*  
 United States Steel Products Company  
 Los Angeles Portland San Francisco Seattle  
*Export Representative:*  
 United States Steel Products Company, New York, N. Y.



# COLUMBIA

Railway Supplies and Equipment

Machine and  
 Sheet Metal Work

Forgings  
 Special Machinery  
 and Patterns

Grey Iron and  
 Brass Castings

Armature and  
 Field Coils.

The Columbia Machine Works and M. I. Co.

265 Chestnut St., corner Atlantic Ave.,  
 Brooklyn, New York



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

We solicit a test of TULC  
 on your equipment  
 The Universal Lubricating Co.

Cleveland, Ohio  
 Chicago Representatives: Jameson-Ross Company,  
 Straus Bldg.

## Kalamazoo Trolley Wheels

The value of Kalamazoo Trolley  
 Wheels and Harps has been  
 demonstrated by large and small  
 electric railway systems for a  
 period of thirty years. Being  
 exclusive manufacturers, with  
 no other lines to maintain, it is  
 through the high quality of our  
 product that we merit the large  
 patronage we now enjoy. With  
 the assurance that you pay no  
 premium for quality we will  
 appreciate your inquiries.



THE STAR BRASS WORKS  
 KALAMAZOO, MICH., U. S. A.

B. A. HEGEMAN, Jr. President H. A. HEGEMAN, First Vice-Pres. and Treas.  
 F. T. SARGENT, Secretary J. M. PRATT, Vice-Pres. in charge of sales

## National Railway Appliance Co.

Graybar Building, 420 Lexington Ave., New York

BRANCH OFFICES

Munsey Bldg., Washington, D. C. 100 Boylston St., Boston, Mass.  
 Hegeman-Castle Corporation, Railway Exchange Building, Chicago, Ill.

### RAILWAY SUPPLIES

Tool Steel Gears and Pinions  
 Anglo-American Varnish Co.,  
 Varnishes, Enamels, etc.  
 National Hand Holds  
 Genesco Paint Oils  
 Dunham Hopper Door Device  
 Garland Ventilators  
 Walter Tractor Snow Plows  
 Feasible Drop Brake Staffs  
 Ft. Pitt Spring & Mfg. Co.,  
 Springs  
 Bell Register Fare Boxes

Flaxlimum Insulation  
 Economy Electric Devices Co.  
 Power Saving and Inspection  
 Meters  
 National Safety Devices Com-  
 pany's Whistle Blowers,  
 Gong Ringers and Brake  
 Hangers  
 Godward Gas Generators  
 Cowdry Automotive Brake  
 Testing Machine

# Arc Weld Rail Bonds

AND ALL OTHER TYPES

*Descriptive Catalogue Furnished*

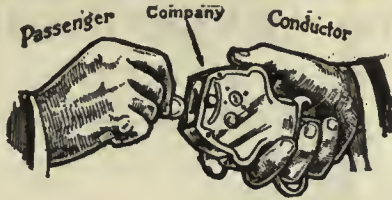
## American Steel & Wire Company

CHICAGO, NEW YORK, BOSTON, CLEVELAND, WORCESTER, PHILADELPHIA, PITTSBURGH, BUFFALO, DETROIT, CINCINNATI, BALTIMORE, WILKES-BARRE, ST. LOUIS, KANSAS CITY, ST. PAUL, OKLAHOMA CITY, BIRMINGHAM, MEMPHIS, DALLAS, ATLANTA, DENVER, SALT LAKE CITY  
 EXPORT REPRESENTATIVE: U. S. STEEL PRODUCTS CO., NEW YORK  
 PACIFIC COAST REPRESENTATIVE: U. S. STEEL PRODUCTS COMPANY, SAN FRANCISCO, LOS ANGELES, PORTLAND, SEATTLE.

- Fences, Woven Wire and Fence Posts**  
Amer. Steel & Wire Co.
- Fenders and Wheel Guards**  
Brill Co., The J. G.  
Cincinnati Car Co.  
Star Brass Works
- Fibre and Fibre Tubing**  
Westinghouse E. & M. Co.
- Field Coils (See Coils)**
- Flashlights**  
National Carbon Co.
- Floodlights**  
Elec. Service Supplies Co.  
General Electric Co.
- Floor, Sub.**  
Haskelite Mfg. Corp.
- Floors**  
Haskelite Mfg. Corp.
- Forgings**  
Brill Co., The J. G.  
Carnegie Steel Co.  
Cincinnati Car Co.  
Columbia Machine Works  
Standard Steel Works Co.
- Frogs & Crossings, Tee Rail**  
Bethlehem Steel Co.  
Lorain Steel Co.  
Ramapo Ajax Corp.  
Wm. Wharton, Jr. & Co., Inc.
- Frogs, Track (See Track Work)**
- Frogs, Trolley**  
Electric Service Supplies Co.  
General Electric Co.  
Ohio Brass Co.  
Westinghouse E. & M. Co.
- Funnell Castings**  
Wm. Wharton, Jr. & Co., Inc.
- Fuses and Fuse Boxes**  
Columbia Machine Wks.  
Consolidated Car Heating Co.  
General Electric Co.  
Westinghouse E. & M. Co.
- Garage Equipment**  
Columbia Machine Works & M. I. Co.  
Westinghouse Tr. Br. Co.
- Gas Electric Drive for Buses & Trucks**  
General Electric Co.
- Gas Producers**  
Westinghouse E. & M. Co.
- Gasolins**  
Standard Oil Co.
- Gasoline Torches**  
Economy Electric Devices Co.
- Gates, Car**  
Brill Co., The J. G.  
Cincinnati Car Co.
- Gear Blanks**  
Bethlehem Steel Co.  
Carnegie Steel Co.  
Brill Co., The J. G.  
Standard Steel Works Co.
- Gear Cases**  
Columbia Machine Wks.  
Elec. Service Supplies Co.  
Westinghouse E. & M. Co.
- Gears and Pinions**  
Bemis Car Truck Co.  
Bethlehem Steel Co.  
Columbia Machine Wks.  
Electric Service Supplies Co.  
General Electric Co.  
National Railway Appliance Co.  
R. D. Nuttall Co.  
Tool Steel Gear & Pinion Co.
- Generators**  
General Electric Co.  
Westinghouse E. & M. Co.
- Glider Rails**  
Bethlehem Steel Co.  
Lorain Steel Co.
- Gongs (See Bells and Gongs)**
- Grinders and Grinding Supplies**  
Metal & Thermit Corp.  
Railway Trackwork Co.
- Grinders, Portable**  
Railway Trackwork Co.
- Grinders, Portable Electric**  
Railway Trackwork Co.
- Grinding Bricks and Wheels**  
Railway Trackwork Co.
- Ground Wires**  
Paga Steel & Wire Co.
- Guard Rail Clamps**  
Lorain Steel Co.  
Ramapo Ajax Corp.  
Wm. Wharton, Jr. & Co., Inc.
- Guard Rails, Tee Rail and Manganese**  
Ramapo Ajax Corp.  
Wm. Wharton, Jr. & Co., Inc.
- Guards, Trolley**  
Elec. Service Supplies Co.  
Ohio Brass Co.
- Harps, Trolley**  
Columbia Machine Works & M. I. Co.  
Elec. Service Supplies Co.
- General Electric Co.**  
National Bearing Metals Corp.  
Ohio Brass Co.  
R. D. Nuttall Co.  
Star Brass Works
- Headlights**  
Elec. Service Supplies Co.  
General Electric Co.  
Ohio Brass Co.
- Headlining**  
Columbia Machine Wks.  
Haskelite Mfg. Corp.
- Heaters, Bus**  
Nichols-Lintern Co.
- Heaters, Car (Electric)**  
Consolidated Car Heating Co.  
Economy Electric Devices Co.  
Gold Car Heating & Light-Co.  
Railway Utility Co.  
Smith Heater Co., Peter
- Heaters, Car, Hot Air and Water**  
Smith Heater Co., Peter
- Heaters, Car, Stove**  
Smith Heater Co., Peter
- Helmets—Welding**  
Railway Trackwork Co.  
Una Welding & Bonding Co.
- Hoists**  
Sullivan Machinery Co.
- Hose, Bridges**  
Ohio Brass Co.
- Hose, Pneumatic**  
Westinghouse Traction Brake Co.
- Instruments, Measuring, Testing and Recording**  
American Steel & Wire Co.  
Economy Electric Devices Co.  
General Electric Co.  
National Railway Appliance Co.  
Westinghouse E. & M. Co.
- Insulating Cloth, Paper and Tape**  
General Electric Co.  
Irvington Varnish & Ins. Co.  
Mica Insulator Co.  
Okonite Co.  
Okonite-Callender Cable Co., Inc.  
United States Rubber Co.  
Westinghouse E. & M. Co.
- Insulating Silk**  
Irvington Varnish & Ins. Co.
- Insulating Varnishes**  
Irvington Varnish & Ins. Co.
- Insulation (See also Paints)**  
Electric Railway Equipment Co.  
Electric Service Sup. Co.  
Irvington Varnish & Ins. Co.  
Mica Insulator Co.  
Okonite Co.  
Okonite-Callender Cable Co., Inc.  
United States Rubber Co.  
Westinghouse E. & M. Co.
- Insulation Slot**  
Irvington Varnish & Ins. Co.
- Insulator Pins**  
Elec. Service Supplies Co.  
Ohio Brass Co.
- Insulators (See also Line Material)**  
Electric Railway Equipment Co.  
Elec. Service Supplies Co.  
General Electric Co.  
Hemingray Glass Co.  
Irvington Varnish & Ins. Co.  
Ohio Brass Co.  
Westinghouse E. & M. Co.
- Interior Side Linings**  
Haskelite Mfg. Corp.
- Interurban Cars (See Cars Passenger, Freight Express etc.)**
- Jacks (See also Cranes, Hoists and Lifts)**  
Columbia Machine Wks.  
Elec. Service Supplies Co.
- Joints, Rail (See Rail Joints)**
- Journal Boxes**  
Bemis Car Truck Co.  
Brill Co., The J. G.  
Cincinnati Car Co.  
S. K. F. Industries, Inc.
- Lamps, Guards and Fixtures**  
Elec. Service Sup. Co.  
Westinghouse E. & M. Co.
- Lamps, Arc and Incandescent (See also Headlights)**  
General Electric Co.  
Westinghouse E. & M. Co.
- Lamps, Signal and Marker**  
Elec. Service Supplies Co.  
Nichols-Lintern Co.
- Lanterns, Classification**  
Nichols-Lintern Co.
- Letter Boards**  
Haskelite Mfg. Corp.  
Nichols-Lintern Co.  
Cincinnati Car Co.
- Lighting Fixtures, Interior**  
Electric Service Supplies
- Lightning Protection**  
Electric Service Sup. Co.  
General Electric Co.  
Westinghouse E. & M. Co.
- Line Material (See also Brackets, Insulators, Wires, etc.)**  
Electric Railway Equipment Co.  
Electric Service Sup. Co.  
General Electric Co.  
National Bearing Metals Corp.  
Ohio Brass Co.  
Westinghouse E. & M. Co.
- Locking Spring Boxes**  
Lorain Steel Co.  
Wm. Wharton, Jr. & Co., Inc.
- Locomotives, Electric**  
Cincinnati Car Co.  
Cummings Car & Coach Co.  
General Electric Co.  
St. Louis Car Co.  
Westinghouse E. & M. Co.
- Lubricating Engineers**  
Standard Oil Co.  
Universal Lubricating Co.
- Lubricants, Oil and Grease**  
Standard Oil Co.  
Universal Lubricating Co.
- Manganese Parts**  
Bemis Car Truck Co.
- Machinery, Insulating**  
Amer. Insulating Mach. Co.
- Manganese Steel Castings**  
Lorain Steel Co.  
Wm. Wharton, Jr. & Co., Inc.
- Manganese Steel Guard Rails**  
Ramapo Ajax Corp.  
Wm. Wharton, Jr. & Co., Inc.
- Manganese Steel, Special**  
Track Works  
Bethlehem Steel Co.  
Ramapo Ajax Corp.  
Wm. Wharton, Jr. & Co., Inc.
- Manganese Steel Switches**  
Frogs and Crossings  
Bethlehem Steel Co.  
Lorain Steel Co.  
Ramapo Ajax Corp.  
Wm. Wharton, Jr. & Co., Inc.
- Mica**  
Mica Insulator Co.
- Mirrors, Inside and Outside**  
Cincinnati Car Co.
- Motor Buses (See Buses)**
- Motors, Generators & Controls for Gas Electric Buses**  
General Electric Co.
- Motors, Electric**  
General Electric Co.  
Westinghouse E. & M. Co.
- Motorman's Seats**  
Brill Co., The J. G.  
Cincinnati Car Co.  
Electric Service Sup. Co.  
Hale-Kilburn Co.
- Nuts and Belts**  
Bemis Car Truck Co.  
Bethlehem Steel Co.  
Cincinnati Car Co.
- Omnibuses (See Buses)**
- Ovens**  
Young Bros.  
Oxy-Acetylene (See Cutting Apparatus)
- Packing**  
United States Rubber Co.  
Westinghouse Traction Brake Co.
- Paint Spraying Units**  
Binks Spray Equipment Co.
- Paints and Varnishes (Insulating)**  
Electric Service Sup. Co.  
Irvington Varnish & Ins. Co.  
Mica Insulator Co.
- Paints & Varnishes, Railway**  
National Ry. Appliance Co.
- Panels, Outside, Inside**  
Haskelite Mfg. Corp.
- Pavement Breakers**  
Sullivan Machinery Co.
- Pickups, Trolley Wire**  
Elec. Service Supplies Co.  
Ohio Brass Co.
- Pinion Pullers**  
Drew Elec. & Mfg. Co.  
Elec. Service Supplies Co.
- Pinions (See Gears)**
- Pins, Case Hardened, Wood and Iron**  
Bemis Car Truck Co.  
Ohio Brass Co.  
Westinghouse Tr. Brake Co.
- Pipe Fittings**  
Standard Steel Works Co.  
Westinghouse Tr. Brake Co.
- Planers (See Machine Tools)**
- Plates for Tee Rail Switches**  
Ramapo Ajax Corp.
- Pliers, Rubber Insulated**  
Electric Service Sup. Co.
- Plywood (Roofs, Headlining Floors, Interior Panels, Bulkheads, Truss Planks)**  
Haskelite Mfg. Corp.
- Pole Line Hardware**  
Bethlehem Steel Co.  
Electric Service Sup. Co.  
General Electric Co.  
Ohio Brass Co.
- Poles, Metal Street**  
Electric Railway Equipment Co.  
Truscon Steel Co.
- Poles, Ties, Posts, Piling and Lumber**  
Bell Lumber Co.  
J. F. Prettyman & Son  
Bell Lumber Co.
- Poles, Ties, Treated**  
Bell Lumber Co.
- Poles, Trolley**  
Bell Lumber Co.  
Electric Service Sup. Co.  
R. D. Nuttall Co.  
Truscon Steel Co.
- Poles, Tubular Steel**  
Electric Railway Equipment Co.  
Electric Service Sup. Co.  
Truscon Steel Co.
- Potheads**  
Okonite Co.  
Okonite-Callender Cable Co., Inc.
- Power Saving Devices**  
Economy Electric Devices Co.  
National Railway Appliance Co.
- Pressings, Special Steel**  
Cincinnati Car Co.
- Pressure Regulators**  
General Electric Co.  
Westinghouse E. & M. Co.  
Westinghouse Traction Brake Co.
- Pumps, Air Lift**  
Sullivan Machinery Co.
- Pumps, Vacuum**  
Sullivan Machinery Co.
- Punches, Ticket**  
International Register Co.
- Rail Braces and Fastenings**  
Ramapo Ajax Corp.
- Rail Grinders (See Grinders)**
- Rail Joints**  
Illinois Steel Co.  
Rail Joint Co., The
- Rail Joints—Welded**  
Lorain Steel Co.  
Metal & Thermit Corp.
- Rails, Steel**  
Bethlehem Steel Co.  
Illinois Steel Co.
- Rail Welding**  
Metal & Thermit Corp.  
Railway Trackwork Co.  
Una Welding & Bonding Co.
- Railway Safety Switches**  
Consolidated Car Heating Co.  
Westinghouse E. & M. Co.
- Rattan**  
Brill Co., The J. G.  
Cummings Car & Coach Co.  
Electric Service Sup. Co.  
Hale-Kilburn Co.
- Registers and Fittings**  
Brill Co., The J. G.  
Cincinnati Car Co.  
Electric Service Sup. Co.  
International Register Co.  
Morey Meters, Inc.
- Reinforcement, Concrete**  
Amer. Steel & Wire Co.  
Bethlehem Steel Co.  
Carnegie Steel Co.
- Repair Shop Appliances (See also Coil Banding and Winding Machines)**  
Elec. Service Supplies Co.
- Repair Work (See also Coils)**  
Westinghouse E. & M. Co.
- Replacers, Car**  
Cincinnati Car Co.  
Electric Service Sup. Co.
- Resistances**  
Consolidated Car Heating Co.  
General Electric Co.
- Resistance, Wire and Tube**  
American Steel & Wire Co.  
Westinghouse E. & M. Co.
- Retrievers, Trolley (See Catchers and Retrievers, Trolley)**
- Rheostats**  
General Electric Co.  
Mica Insulator Co.  
Westinghouse E. & M. Co.
- Roller Bearings**  
Hyatt Roller Bearing Co.
- Roofing, Car**  
Haskelite Mfg. Corp.
- Roofs, Car & Bus**  
Haskelite Mfg. Corp.
- Rubber Specialties of all Kinds**  
United States Rubber Co.
- Safety Control Devices**  
Safety Car Devices Co.
- Sanders, Track**  
Brill Co., The J. G.  
O. M. Edwards Co., Inc.  
Electric Service Sup. Co.  
Nichols-Lintern Co.  
Ohio Brass Co.
- Sash Fixtures, Car**  
Brill Co., The J. G.  
Edwards Co., Inc., O. M.  
Cincinnati Car Co.
- Sash, Metal, Car Window**  
Edwards Co., Inc., O. M.  
Hale-Kilburn Co.
- Scrapers, Track (See Cleaners and Scrapers, Track)**
- Screw Drivers, Rubber Insulated**  
Electric Service Sup. Co.
- Seating Materials**  
Brill Co., The J. G.  
Fitzjohn Mfg. Co.  
Hale-Kilburn Co.  
Haskelite Mfg. Corp.
- Seats, Bus**  
Brill Co., The J. G.  
Hale-Kilburn Co.
- Seats, Car (See also Rattan)**  
Brill Co., The J. G.  
Cincinnati Car Co.  
Hale-Kilburn Co.
- Second Hand Equipment**  
Electric Equipment Co.  
Hyman Michaels Co.  
Salzberg Co., Inc., H. E.
- Shades, Vestibule**  
Brill Co., The J. G.  
Cincinnati Car Co.
- Short Circuit Finders**  
Ideal Commutator Dresser Co.
- Shovels**  
Brill Co., The J. G.
- Shovels, Power**  
Brill Co., The J. G.
- Side Bearings (See Bearing Center and Side)**
- Signals, Car Starting**  
Consolidated Car Heating Co.  
Electric Service Sup. Co.  
National Pneumatic Co., Inc.
- Signals, Indicating**  
Nichols-Lintern Co.
- Signal Systems, Block**  
Electric Service Sup. Co.  
Nachod & U. S. Signal Co.
- Signal Systems, Highway Crossing**  
Nachod & U. S. Signal Co.
- Slack Adjusters (See Brake Adjusters)**
- Slag**  
Carnegie Steel Co.
- Sleet Wheels and Cutters**  
Anderson Mfg. Co., A. & J. M.  
Columbia Machine Wks.  
Cincinnati Car Co.  
Electric Ry. Improvement Co.  
Electric Railway Equipment Co.  
Electric Service Supplies Co.  
National Bearing Metals Corp.  
R. D. Nuttall Co.
- Smokestacks, Car**  
Nichols-Lintern Co.
- Snow Plows**  
National Railway Appliance Co.
- Snow-Plows, Sweepers and Brooms**  
Brill Co., J. G.  
Columbia Machine Wks.  
Cummings Car & Coach Co.
- Snow Sweeper, Rattan**  
Brill Co., J. G.
- Soldering and Brazing Apparatus (See Welding Processes and Apparatus)**
- Special Adhesive Papers**  
Irvington Varnish & Ins. Co.
- Special Trackwork**  
Bethlehem Steel Co.  
Wm. Wharton, Jr. & Co., Inc.  
Lorain Steel Co.
- Spikes**  
American Steel & Wire Co.  
Illinois Steel Co.
- Splicing Compounds**  
United States Rubber Co.  
Westinghouse E. & M. Co.
- Splicing Sleeves (See Clamps and Connectors)**
- Springs**  
National Railway Appliance Co.
- Springs, Car and Truck**  
Amer. Steel & Wire Co.  
Bemis Car Truck Co.  
Brill Co., The J. G.  
Cincinnati Car Co.  
Standard Steel Works Co.  
Taylor Electric Truck Co.



# Let the Passenger Audit



An instantaneous audit by the passenger of NICKELS, DIMES, QUARTERS, METAL TICKETS in various combinations.

PORTABLE—STATIONARY or ELECTRIC—Positive at-the-source protection for your revenue.

**Money-Meters, Inc.** (Successor to Rooke Automatic Register Co.)  
3209 Book Tower, Detroit, Mich.

## THE WORLD'S STANDARD

# "IRVINGTON"

Black and Yellow Varnished Silk, Varnished Cambric, Varnished Paper

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

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

Sales Representatives:

- Mitchell-Rand Mfg. Co., N. Y.
- E. M. Wolcott, Rochester
- I. W. Levine, Montreal
- A. L. Gillies, Toronto
- Prehler Brothers Inc., Chicago
- White Supply Co., St. Louis
- Clapp & LaMoree, Los Angeles
- Marlin Woodard, Seattle
- Consumers' Rubber Co., Cleveland

## "These 1928 Improved IDEAL COMMUTATOR RESURFACERS



give 25% more reason than ever before for adopting them."

Ideal Commutator Resurfacers have always been the fastest cutting, longest lived and most reliable dressers, and now they are 25% more efficient than ever.

85% Copper Grindings  
15% Resurfacer and Carbon Brush Grindings

Only Ideal Can Show This Efficiency

Use the coupon and ask for full details.

Ideal Commutator Dresser Co., 1019 Park Ave., Sycamore, Ill. 4-28  
Please send details of your 10-day FREE TRIAL offer.

Name ..... Position .....  
Company .....  
Address .....  
City and State .....

## FARE BOXES for BUSES



Let us tell you of this especially designed box for this class of service.

The Cleveland Fare Box Co.  
4900 Lexington Ave., Cleveland, O.  
Canadian Cleveland Fare Box Co., Ltd.  
Preston, Ontario

COIN COUNTING And Sorting Machines CHANGES CARRIERS Tokens

"Bates Poles Outlive the Band Issues that Buy Them"  
**BATES POLES AND STRUCTURES**

**Bates Expanded Steel Truss Co.**

General Offices and Plants  
EAST CHICAGO, INDIANA, U. S. A.

## HASKELITE ROOFS

Haskelite Manufacturing Corporation,  
133 West Washington Street, Chicago

## PLYMETL SIDE PANELS

## RAIL JOINTS

The Rail Joint Company  
165 Broadway, New York City

## RAILWAY UTILITY COMPANY

CAR COMFORT WITH HEATERS  
**UTILITY** REGULATORS  
VENTILATORS

2241-2247 Indiana St.  
Chicago, Ill.

Write for Catalogue

1328 Broadway  
New York, N. Y.



## STUCKI SIDE BEARINGS

A. STUCKI CO.  
Oliver Bldg.  
Pittsburgh, Pa.



## Gets Every Fare PEREY TURNSTILES or PASSIMETERS

Use them in your Prepayment Areas and Street Cars

Perey Manufacturing Co., Inc.  
101 Park Avenue, New York City



## Car Heating and Ventilating

—are no longer operating problems. We can show you how to take care of both with one equipment. The Peter Smith Forced Ventilation Hot Air Heater will save, in addition, 40% to 60% of the cost of any other car heating and ventilating system. Write for details.

The Peter Smith Heater Company  
6209 Hamilton Ave., Detroit, Mich.



## Rod, Wire and Cable Products

ANACONDA COPPER MINING COMPANY  
THE AMERICAN BRASS COMPANY  
General Offices - - 25 Broadway, New York

## ANACONDA TROLLEY WIRE

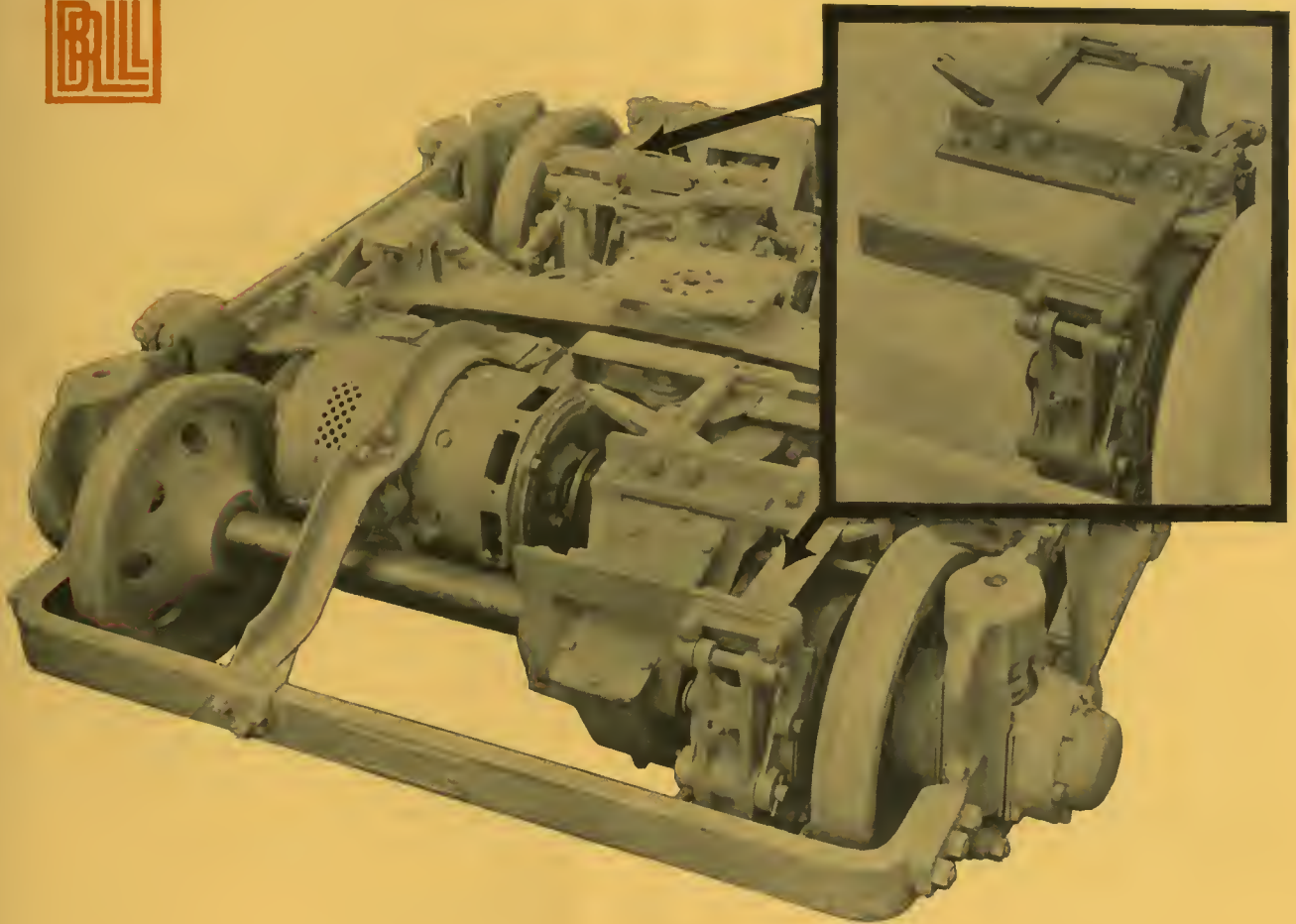
# ALPHABETICAL INDEX TO ADVERTISEMENTS

This index is published as a convenience to the reader. Every care is taken to make it accurate, but *Electric Railway Journal* assumes no responsibility for errors or omissions.

Page	Page	Page	Page
American Brass Co., The..... 53	Electric Railway Equipment Co. 41	Kelker, DeLuw & Co..... 46	Richey, Albert S..... 46
American Car Co..... Third Cover	Electric Railway Improvement Co., The..... 39	Kuhlman Car Co..... Third Cover	Roebling's Sons Co., John A..... 47
American Insulating Mach. Co. 51	Electric Service Supplies Co. 7		Salzberg Co., Inc., H. E..... 49
American Steel & Wire Co..... 51	Elliott-Thompson Electric Co., The..... Insert 664a	Lorain Steel Co., The..... 51	Safety Car Devices Co..... 8
American Telephone and Telegraph Co..... 33		McCardell Co., J. R..... Insert 664b	Sanderson & Porter..... 46
Anaconda Copper Mining Co..... 53	Faille & Co., E. H..... 46	McClellan & Junkersfeld..... 46	Searchlight Section..... 49
Anderson Mfg. Co., A. & J..... 44	Fitzjohn Mfg. Co..... 25	McGovern, Halsey..... 47	Shuler Axle Co..... 41
	Ford, Bacon & Davis, Inc..... 46	Metal-Thermit Corp..... 18	Smith Heater Co., Peter..... 30
	"For Sale" Ads..... 49	Mica Insulator Co..... Insert 664a	Standard Oil Co..... 53
		Money-Meters, Inc..... 53	Standard Steel Works Co..... 45
Babcock & Wilcox Co..... 47	General Tire & Rubber Co., The. 24		Star Brass Works..... 51
Bates Exp. Steel Truss Co..... 53	General Electric Co., 22 and Back Cover	Nachod and United States Signal Co., Inc..... 42	Stevens & Wood, Inc..... 46
Becler Organization, The..... 46	Gold Car Heating & Ltr. Co..... 47	National Bearing Metals Corp..... 44	Stone & Webster..... 46
Bell Lumber Co..... 47	Goodyear Tire & Rubber Co., The..... 26-27	National Brake Co., Inc..... 34	Stucki Co., A..... 53
Bemis Car Truck Co..... 48	Griffin Wheel Co..... 42	National Carbon Co..... 23	Sullivan Machinery Co..... 41
Bender Body Co., The..... 31		National Pneumatic Co..... 31	
Bethlehem Steel Co..... 48		National Railway Appliance Co. 51	Taylor Electric Truck Co..... 48
Bibbins, Rowland J..... 46		Nichols-Lintern Co., The..... 47	Tool Steel Gear & Pinion Co. 34b
Binks Spray Equipment Co., Insert 664b		Norma-Hoffmann Bearings Corp. 43	Truscon Steel Co..... Insert 664b
Brill Co., The J. G..... Third Cover		Nuttall Co., R. D..... Second Cover	Twin Coach Corp. Insert 11-12-13-14
Buchanan & Layng Corporation. 47			
		Ohio Brass Co..... 5	Una Welding & Bonding Co..... 47
Cincinnati Car Co..... 17	Hale & Kilburn Co..... 47	Okonite-Callender Cable Co., Inc. The..... 48	United States Rubber Co..... 21
Cleveland Fare Box Co., The..... 53	Haskelite Mfg. Corp..... 53	Okonite Co., The..... 48	Universal Lubricating Co..... 51
Collier, Inc., Barron G..... 40	"Help Wanted" Ads..... 49	Page Steel & Wire Co..... 42	
Columbia Machine Works & M. I. Co..... 51	Hemingray Glass Co..... 45	Peray Mfg. Co., Inc..... 53	Versare Corp..... Insert 35-36-37-38
Commonwealth Steel Co..... 43	Hemphill & Wells..... 46	Positions Wanted and Vacant..... 49	"Want" Ads..... 49
Consolidated Car Heating Co. 16	Holst Englehardt W..... 46	Prettyman & Sons, J. F..... 47	Wason Mfg. Co..... Third Cover
Cummings Car & Coach Co..... 10	Hyatt Roller Bearing Co..... 20		Westinghouse Electric & Mfg. Co. 4
	Hyman-Michaels..... 49	Rail Joint Co., The..... 53	Westinghouse Traction Brake Co. 9
Dayton Mechanical Tie Co..... 28-29	Ideal Commutator Dresser Co..... 53	Railway Track-work Co..... 6	Wharton, Jr. & Co., Wm..... 48
Day & Zimmermann, Inc..... 46	Illinois Motive Equipment Co..... 47	Railway Utility Co..... 53	"What and Where to Buy"..... 50-52-54
Differential Steel Car Co., The..... 48	Illinois Steel Co..... 34a	Ramapo-Ajax Co..... 47	White Engineering Corp., J. G..... 46
Drum & Co., A. L..... 46	International Register Co..... 48		Wish Service, The P. Edw..... 47
	International Steel Tie Co., Front Cover		Young Brothers Co..... Insert 664a
Earl, C. I..... 41	Irvington Varnish & Insulator Co..... 53		
Economy Electric Devices Co..... 19	Jackson, Walter..... 46		
Edwards Co., O. M..... 32	Johnson Fare Box Co..... 45		
Electric Equipment Co..... 49			

## WHAT AND WHERE TO BUY—Continued from page 52

<b>Sprinklers, Track and Road</b> Brill Co., The J. G. Cummings Car & Coach Co	<b>Telephones and Parts</b> Electric Service Sup. Co.	<b>Track, Special Work</b> Bethlehem Steel Co. Columbia Machine Wks. Ramapo Ajax Corp. Wm. Wharton, Jr. & Co., Inc.	<b>Tubing, Yellow and Black</b> Flexible Varnish Irvington Varnish & Ins. Co.	<b>Welding Wire</b> American Steel & Wire Co. Railway Trackwork Co. Roebling's Sons Co., J. A.
<b>Steel and Steel Products</b> American Steel & Wire Co. Illinois Steel Co.	<b>Telephone &amp; Telegraph Wire</b> American Telephone & Telegraph Co. American Steel & Wire Co. J. A. Roebblings Sons Co.	<b>Trackless Trolley Cars</b> Brill Co., The J. G. <b>Transfers (See Tickets)</b>	<b>Turbine, Steam</b> General Electric Co. Westinghouse E. & M. Co.	<b>Welding Wire and Rods</b> Page Steel & Wire Co. Railway Trackwork Co.
<b>Stops, Car</b> Brill Co., The J. G. Cincinnati Car Co.	<b>Testing Instruments (See Instruments, Electrical Measuring, Testing, etc.)</b>	<b>Transformers</b> General Electric Co. Westinghouse E. & M. Co.	<b>Turostiles</b> Electric Service Sup. Co. Peray Mfg. Co., Inc.	<b>Wheel Guards (See Fenders and Wheel Guards)</b>
<b>Stokers, Mechanical</b> Babcock & Wilcox Co. Westinghouse E. & M. Co.	<b>Thermostats</b> Consolidated Car Heating Co. Gold Car Heating & Lighting Co. Railway Utility Co. Smith Heater Co., Peter	<b>Treads Safety Stair Car Step</b> Cincinnati Car Co.	<b>Turntables</b> Electric Service Supplies Co.	<b>Wheel Presses (See Machine Tools)</b>
<b>Stones (Commutator)</b> Ideal Commutator Dresser Co.	<b>Ticket Choppers &amp; Destroyers</b> Electric Service Sup. Co.	<b>Tree, Wire</b> Okonite Co. Okonite-Callender Cable Co.	<b>Valves</b> Ohio Brass Co. Westinghouse Tr. Br. Co.	<b>Wheels, Car, Cast Iron</b> Griffin Wheel Co.
<b>Stop Signals</b> Nichols-Lintern Co.	<b>Ties, Mechanical</b> Dayton Mechanical Tie Co.	<b>Trolley Buses</b> National Bearing Metals Corp. R. D. Nuttall Co. Ohio Brass Co.	<b>Varnished Papers and Silks</b> Irvington Varnish & Ins. Co.	<b>Wheels, Car Steel &amp; Steel Tire</b> Bemis Car Truck Co. Illinois Steel Co. Standard Steel Works Co.
<b>Storage Batteries (See Batteries, Storage)</b>	<b>Tie Plates</b> Illinois Steel Co.	<b>Trolley Buses, Retrieving</b> R. D. Nuttall Co. Ohio Brass Co.	<b>Ventilators</b> National Ry. Appliance Co.	<b>Wheels, Trolley</b> Columbia Machine Wks. Electric Railway Equipment Co.
<b>Strain, Insulators</b> Anderson Mfg. Co., A. & J. M.	<b>Ties and Tie Rods, Steel</b> International Steel Tie Co.	<b>Trolley Material (Overhead)</b> Anderson Mfg. Co., A. & J. M. Electric Service Sup. Co. General Electric Co. National Bearing Metals Corp. Ohio Brass Co. Westinghouse E. & M. Co.	<b>Ventilators, Car</b> Brill Co., The J. G. Cincinnati Car Co. Consolidated Car Heating Co. Nichols-Lintern Co. Railway Utility Co.	<b>Wheels, Wrought Steel</b> Illinois Steel Co.
<b>Strand</b> American Steel & Wire Co. Roebblings Sons Co., J. A.	<b>Tires</b> General Tire & Rubber Co. Goodyear Tire & Rubber Co., The United States Rubber Co.	<b>Trolley Wheels (See Wheels, Trolley)</b>	<b>Vestibule Lintels</b> Haskelite Mfg. Corp.	<b>Whistles, Air</b> Lorain Steel Co. Metal & Thermit Corp. Railway Trackwork Co. Una Welding & Bonding Co.
<b>Street Cars (See Cars, Passenger, Freight, Express, etc.)</b>	<b>Tokens</b> Johnson Fare Box Co.	<b>Trolley Wheels (See Wheels, Trolley)</b>	<b>Welded Rail Joints</b> Electric Ry. Improvement Co. Lorain Steel Co., The Metal & Thermit Corp. Railway Trackwork Co. Una Welding & Bonding Co.	<b>Whistles, Brass</b> Ohio Brass Co. Westinghouse E. & M. Co. Westinghouse Traction Brake Co.
<b>Superheaters</b> Babcock & Wilcox Co.	<b>Tongue Switches</b> Wm. Wharton, Jr. & Co., Inc.	<b>Trolley Material (Overhead)</b> Anderson Mfg. Co., A. & J. M. Electric Service Sup. Co. General Electric Co. National Bearing Metals Corp. Ohio Brass Co. Westinghouse E. & M. Co.	<b>Welders, Portable Electric</b> Electric Ry. Improvement Co. General Electric Co. Ohio Brass Co. Railway Trackwork Co. Una Welding & Bonding Co. E. & M. Co.	<b>Window Guards &amp; Fittings</b> Cincinnati Car Co.
<b>Sweepers, Snow (See Snow Plows, Sweepers and Rooms)</b>	<b>Tool Steel</b> Bethlehem Steel Co. Carnegie Steel Co.	<b>Trolley Material (Overhead)</b> Anderson Mfg. Co., A. & J. M. Electric Service Sup. Co. General Electric Co. National Bearing Metals Corp. Ohio Brass Co. Westinghouse E. & M. Co.	<b>Welding Processes and Apparatus</b> Electric Ry. Improvement Co. Metal & Thermit Corp. Ohio Brass Co. Railway Trackwork Co. Una Welding & Bonding Co. Westinghouse E. & M. Co.	<b>Wire Connectors (Solderless &amp; Tapeless)</b> Ideal Commutator Dresser Co.
<b>Switch Stands and Fixtures</b> Ramapo Ajax Corp.	<b>Tools, Track &amp; Miscellaneous</b> Amer. Steel & Wire Co. Columbia Machine Wks. Electric Service Sup. Co. Railway Trackwork Co.	<b>Trolley Material (Overhead)</b> Anderson Mfg. Co., A. & J. M. Electric Service Sup. Co. General Electric Co. National Bearing Metals Corp. Ohio Brass Co. Westinghouse E. & M. Co.	<b>Welding Processes and Apparatus</b> Electric Ry. Improvement Co. Metal & Thermit Corp. Ohio Brass Co. Railway Trackwork Co. Una Welding & Bonding Co. Westinghouse E. & M. Co.	<b>Wire Splicing Plyers</b> Ideal Commutator Dresser Co.
<b>Switches</b> General Electric Co. Switches, Selertor Nichols-Lintern Co.	<b>Torches, Acetylene (See Cutting Apparatus)</b>	<b>Trolley Material (Overhead)</b> Anderson Mfg. Co., A. & J. M. Electric Service Sup. Co. General Electric Co. National Bearing Metals Corp. Ohio Brass Co. Westinghouse E. & M. Co.	<b>Welding Processes and Apparatus</b> Electric Ry. Improvement Co. Metal & Thermit Corp. Ohio Brass Co. Railway Trackwork Co. Una Welding & Bonding Co. Westinghouse E. & M. Co.	<b>Wire, Copper Covered Steel</b> Page Steel & Wire Co.
<b>Switches and Switchboards</b> Consolidated Car Heating Co. Electric Service Sup. Co. Westinghouse E. & M. Co.	<b>Tower Wagons &amp; Auto Trucks</b> McCardell Co., J. R.	<b>Trolley Material (Overhead)</b> Anderson Mfg. Co., A. & J. M. Electric Service Sup. Co. General Electric Co. National Bearing Metals Corp. Ohio Brass Co. Westinghouse E. & M. Co.	<b>Welding Processes and Apparatus</b> Electric Ry. Improvement Co. Metal & Thermit Corp. Ohio Brass Co. Railway Trackwork Co. Una Welding & Bonding Co. Westinghouse E. & M. Co.	<b>Wire Rope</b> Amer. Steel & Wire Co. Roebling's Sons Co., J. A.
<b>Switches, Tee Rail</b> Ramapo Ajax Corp.	<b>Towers and Transmission Structures</b> Bates Exp. Steel Corp. Westinghouse E. & M. Co.	<b>Trolley Material (Overhead)</b> Anderson Mfg. Co., A. & J. M. Electric Service Sup. Co. General Electric Co. National Bearing Metals Corp. Ohio Brass Co. Westinghouse E. & M. Co.	<b>Welding Processes and Apparatus</b> Electric Ry. Improvement Co. Metal & Thermit Corp. Ohio Brass Co. Railway Trackwork Co. Una Welding & Bonding Co. Westinghouse E. & M. Co.	<b>Wires and Cables</b> American Brass Co. Amer. Steel & Wire Co. Anaconda Copper Min. Co. General Electric Co. Okonite Co. Okonite-Callender Cable Co. Page Steel & Wire Co. Roebling's Sons Co., J. A. Westinghouse E. & M. Co.
<b>Switches, Track (See Track Special Work)</b>	<b>Track Expanders</b> Metal & Thermit Corp. Railway Trackwork Co. Ramapo Ajax Corp. Una Welding & Bonding Co.	<b>Trolley Material (Overhead)</b> Anderson Mfg. Co., A. & J. M. Electric Service Sup. Co. General Electric Co. National Bearing Metals Corp. Ohio Brass Co. Westinghouse E. & M. Co.	<b>Welding Processes and Apparatus</b> Electric Ry. Improvement Co. Metal & Thermit Corp. Ohio Brass Co. Railway Trackwork Co. Una Welding & Bonding Co. Westinghouse E. & M. Co.	
<b>Tampers, Tie</b> Railway Trackwork Co.	<b>Track Expanders</b> Metal & Thermit Corp. Railway Trackwork Co. Ramapo Ajax Corp. Una Welding & Bonding Co.	<b>Trolley Material (Overhead)</b> Anderson Mfg. Co., A. & J. M. Electric Service Sup. Co. General Electric Co. National Bearing Metals Corp. Ohio Brass Co. Westinghouse E. & M. Co.	<b>Welding Processes and Apparatus</b> Electric Ry. Improvement Co. Metal & Thermit Corp. Ohio Brass Co. Railway Trackwork Co. Una Welding & Bonding Co. Westinghouse E. & M. Co.	
<b>Tapes and Cloths (See Insulating Cloth, Paper and Tane)</b>	<b>Track Expanders</b> Metal & Thermit Corp. Railway Trackwork Co. Ramapo Ajax Corp. Una Welding & Bonding Co.	<b>Trolley Material (Overhead)</b> Anderson Mfg. Co., A. & J. M. Electric Service Sup. Co. General Electric Co. National Bearing Metals Corp. Ohio Brass Co. Westinghouse E. & M. Co.	<b>Welding Processes and Apparatus</b> Electric Ry. Improvement Co. Metal & Thermit Corp. Ohio Brass Co. Railway Trackwork Co. Una Welding & Bonding Co. Westinghouse E. & M. Co.	
<b>Tee Rail Special Track Work</b> Bethlehem Steel Co. Lorain Steel Co. Ramapo Ajax Corp. Wm. Wharton, Jr. & Co., Inc.		<b>Trolley Material (Overhead)</b> Anderson Mfg. Co., A. & J. M. Electric Service Sup. Co. General Electric Co. National Bearing Metals Corp. Ohio Brass Co. Westinghouse E. & M. Co.	<b>Welding Processes and Apparatus</b> Electric Ry. Improvement Co. Metal & Thermit Corp. Ohio Brass Co. Railway Trackwork Co. Una Welding & Bonding Co. Westinghouse E. & M. Co.	



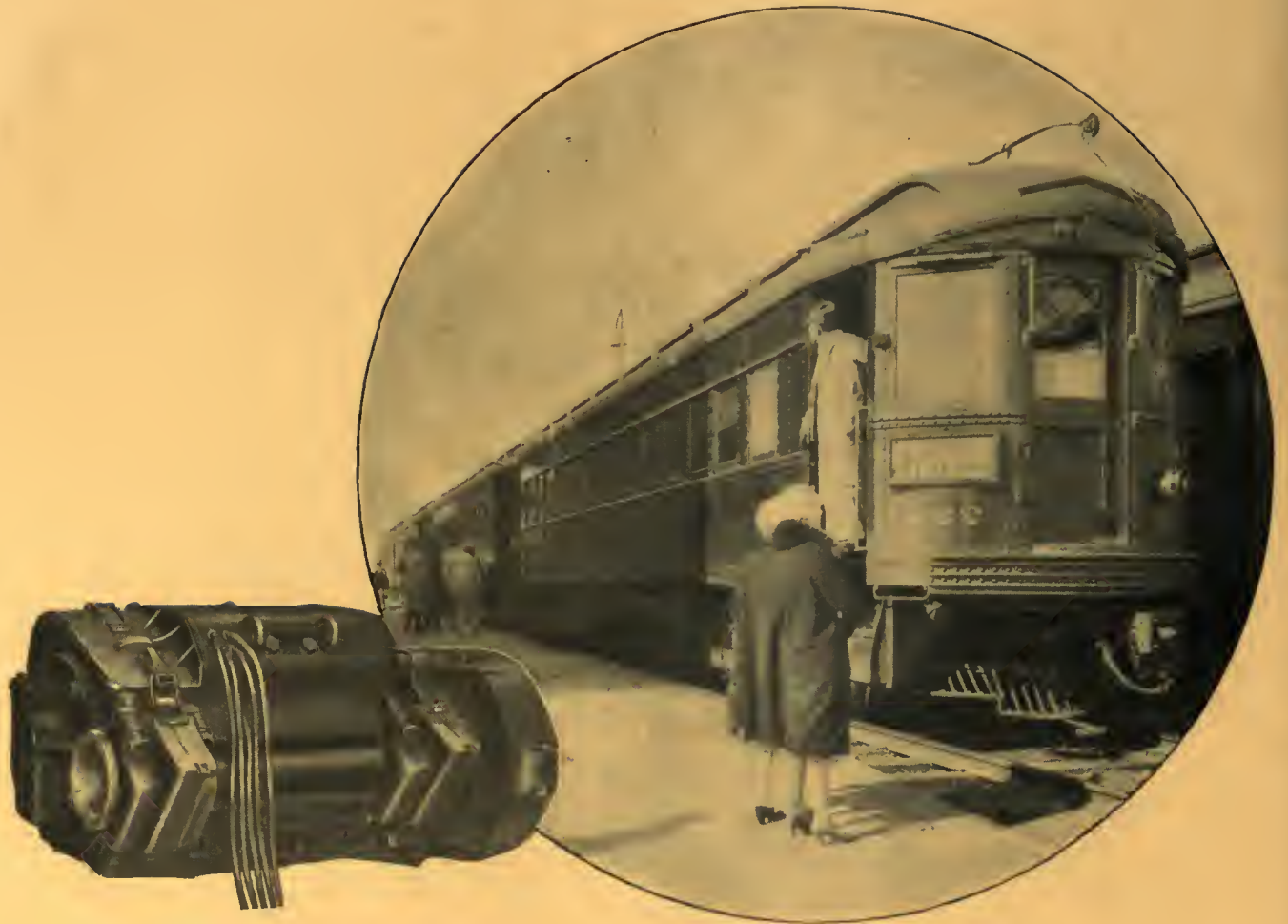
## Increased Brake Efficiency

The drum brakes of the Brill No. 277 EX Trucks are the external contracting shoe-type. Their positive action and even pressure of application has been thoroughly demonstrated even after continuous use.

When heat causes the expansion of the brake drums, the clearance between shoe and drum is decreased rather than increased. Thus continuous application of this type brake does not

diminish the effectiveness of its action. The elimination of many rigging parts reduces vibration noises while inspection and replacement of brake shoes can be accomplished with practically as much ease as with the ordinary type brake.

The external contracting shoe-type drum brake was developed to meet the requirements of the most modern Brill Car—the 1928 Model.



## Preference born of performance

The Chicago, Aurora & Elgin Railroad equipped its speedy and luxuriously appointed new cars with GE-254 motors and Type M control. The preference for this equipment was created by the performance of the same type of motors and control on 23 previously equipped cars.



If your cars are large and must run at high speeds, GE-254 motors will enable them to meet their schedules.

The C.A. & E. now has 150 GE-254 motors. Other railways which have given excellent service through the use of GE-254 motors include the Southern Pacific, with 96 motors; the N.Y., N.H. & H., with 71; the Milwaukee E.R. & L., with 62; the Northeastern, in England, with 44; the Wilkes-Barre & Hazelton, with 41; and many others.

330-64

# GENERAL ELECTRIC

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y., SALES OFFICES IN PRINCIPAL CITIES