

# ELECTRIC RAILWAY JOURNAL

“We’re sold on the idea of  
TRACK INSULATION,”

says V. R. POWELL



V. R. POWELL, General Manager of The People's Railway Company, Dayton, Ohio. Mr. Powell has been following street railway construction and operation problems for the past 25 years, and is well known in the industry. He was not only the pioneer in the use of track insulation in Dayton, but was also the first to install thermit welded rail joints

“**A**T the end of 1925 we had 3,368 feet of single track on the People's Railway lines in Dayton insulated with the CareyElastite System of Track Insulation,” says V. R. Powell, General Manager of the Company. “That we are sold on the idea is best proved by the fact that our 1926 construction program calls for the use of 4,894 feet of double track insulation.

“We do not believe we will be bothered with the expansion of the brick, as we have in the past where grouting filler has been used. The Carey filler apparently makes a waterproof joint between paving and rail, and is flexible enough to take up any expansion due to pavement.

“Although this filler has not been in service long enough really to tell a whole lot about its advantages, from our experience to date we believe it is much superior to anything ever used in the past. We have inspected track in Cincinnati where Carey Elastite System of Track Insulation was installed seven years ago—and at the same time we inspected some track installed at the same time without the filler. The track in which the filler was used was still completely insulated so far as moisture was concerned, while the paving in the track laid without the filler was broken down in many instances on both the outside and inside of the rails because of imperfect insulation.”

\* \* \* \* \*

Carey Elastite System of Track Insulation is an asphaltic compound substantially reinforced with asphalt-saturated felt. It is not affected by moisture or temperature changes, and will outlive the track itself. Can be fitted over splice-bars and bolt-heads simply by cutting it with a hatchet, and can easily be fitted to any shape or curve. A tap with a mallet sets the preformed strips in place.

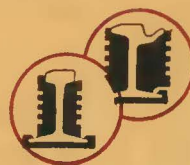
Write, today, for complete information.

THE PHILIP CAREY COMPANY, Lockland, Cincinnati, O.

A view of new construction on the tracks of The People's Railway Company, showing the Carey System of Track Insulation completely installed.



**Carey Elastite**  
TRADE MARK. REG'D. U.S. PATENT OFFICE



SYSTEM OF TRACK INSULATION

# A Profitable Business Policy— “The Public be Pleased”

**T**HE Philadelphia Rapid Transit Company provides parking space for patrons' automobiles on the outskirts of the city. A nominal charge covers all day parking and two tokens. Good business.

Twenty-seven new cars, gaily decked with flags and flowers, paraded the streets of Grand Rapids to celebrate better service. Good publicity.

Fifteen bright new cars in a single train crossed the country from St. Louis to Richmond, Va.—a testimonial to confidence in the future of trolley transportation.

Cleveland conducted a traffic survey



in down-town stores, to show that four-fifths of department store patronage rides the trolleys. . . . . These things to win public confidence.

There are hundreds of other instances of extraordinary service—extraordinary good-will. Many we read about; many others are never told in print. But the significant thing is the trend; the new spirit of service that inspires transportation men to provide newer, more comfortable cars and more convenient service; to attract public patronage and good-

will. The spectacular—the unusual services—are merely evidences of the sense of responsibility that is winning for modern trolley management the confidence and support of the public.

Trolley transportation is a necessity; it is the backbone of our city life. As the trolley company profits, the community prospers. Their interests are inseparable. In scores—even hundreds of cities, modern trolley service is attracting a growing, profitable patronage through a definite policy—“The Public Be Pleased” In hundreds of cities, modern cars and better service are bringing more business to the traction companies—business that comes not alone of necessity, but by choice. In hundreds of cities, trolley transportation is earning a profit—not only for itself, but for the community as a whole. “He Profits Most Who Serves Best” is indeed fundamental.

Westinghouse has contributed much to Electric Railway progress. Westinghouse advertising to the general public has helped to break down barriers of prejudice and indifference. Westinghouse research has made possible practical development of the tools of transportation to their present high efficiency. Westinghouse service to the industry is a service for you. You will find it profitable to discuss your problems with the Westinghouse representative.

Westinghouse Electric & Manufacturing Company  
East Pittsburgh Pennsylvania  
Sales Offices in All Principal Cities of  
the United States and Foreign Countries



# Westinghouse

MORRIS BUCK  
Managing Editor  
JOHN A. DEWHURST  
Associate Editor  
JOHN A. MILLER, Jr.  
Associate Editor  
CLARENCE W. SQUIER  
Associate Editor  
CARL W. STOCKS  
Associate Editor

# ELECTRIC RAILWAY JOURNAL

CHARLES GORDON, *Editor*

HENRY W. BLAKE  
Senior Editor  
GEORGE J. MAOMURRAY  
News Editor  
EDWIN F. THAYER  
Assistant Editor  
PAUL WOOTON  
Washington Correspondent  
ALEX McCALLUM  
Editorial Representative  
London, England

Vol. 68  
No. 11

## CONTENTS

Page:  
405-442

SEPTEMBER 11, 1926

Editorials .....	405
Paris Uses Bevel Gear Drive Exclusively.....	408
Four hundred and seventy-five cars of this type are used on order. More than four-fifths of the entire weight in spring-borne tests show these cars to be economical in operation.	
New Style Uniforms for P-O Men.....	412
Recording Apparatus Measures Car Noise.....	413
BY J. T. ROOD AND K. E. WOOLDRIDGE. Equipment based on radio principles developed at University of Wisconsin through electric railway fellowship of Wisconsin Utilities Association. Startling possibilities seen in comparative tests. Experiments were conducted on several Wisconsin street railways.	
100 Trains Are Moved Simultaneously by Long Island Railroad Each Morning .....	416
More Passengers in Milwaukee .....	416
Teaching Safety Lessons in Minnesota.....	416
Cleveland Railway Extends the Use of Automatic Substations .....	417
BY L. D. BALE. Experience with earlier equipment helped in layout of stations and building design. Standard 1,500-kw. converters are used throughout. Steel barriers isolate high-tension equipment. Reliability features entire design.	
Automatic Parcel System for Chicago.....	422
Maintenance Notes .....	423
Lubrication Basis for Gears and Pistons.....	423
Canvas Liners Reduce Brake Rigging Noise.....	423
Machining Steel Wheels Before Building Up.....	423
Using Oversize Steel Sleeves on Armature Shafts.....	424
Wheel Press Used to Straighten Bent Axles.....	424
Portable Slotter Used in Huntington.....	424
New Housings for Los Angeles Railway Motors.....	425
New Equipment Available .....	425
Vapor and Dust Proof Condulets.....	425
Power Reamer to Do Work of Old Hand Reamers.....	425
Direct-Current Time-Relay .....	425
Association News and Discussions.....	426
News of the Industry .....	427
Recent Bus Developments .....	434
Financial and Corporate .....	436
Book Reviews .....	439
Personal Mention .....	440
Manufactures and the Markets.....	441

## Valuable Cargo

IT IS SAID that "a single fact is worth a shipload of argument." On that basis the Annual Convention Number of ELECTRIC RAILWAY JOURNAL, to be published Sept. 25, will contain a highly valuable cargo. "Making Transportation Pay" is the subject. Theories and arguments are not used to tell how this should be done, but hard, cold facts presented by railway executives will show how it actually has been done.

On city and interurban railways, large and small, in the East, West, North and South—new cars and improved methods have paid and paid well. To every reader in the electric railway industry, the Annual Convention Number of ELECTRIC RAILWAY JOURNAL will carry new inspiration.

### McGRAW-HILL PUBLISHING COMPANY, INC.

Tenth Avenue at 36th Street, New York, N. Y.

JAMES H. MCGRAW, President  
JAMES H. MCGRAW, JR., V.-P. and Treas.  
MALCOLM MUNN, Vice-President  
EDWARD J. MEBBEN, Vice-President  
MASON BRITTON, Vice-President  
ENGAR KOBAK, Vice-President  
C. H. THOMPSON, Secretary

Cable Address: "Machinist, N. Y."

Publishers of  
*Engineering News-Record*  
*American Machinist*

Power  
*Chemical and Metallurgical Engineering*  
*Coal Age*

*Engineering and Mining Journal*

*Ingeniería Internacional*

*Bus Transportation*

*Electric Railway Journal*

*Electrical World*

*Industrial Engineer*

*Electrical Merchandising*

*Radio Retailing*

*Successful Methods*

*Journal of Electricity*

(Published in San Francisco)

*American Machinist—European Edition*

(Published in London)



WASHINGTON:  
Colorado Building  
CHICAGO:  
7 S. Dearborn Street  
PHILADELPHIA:  
16th and Parkway  
CLEVELAND:  
Guardian Building  
ST. LOUIS:  
Star Building  
SAN FRANCISCO:  
883 Mission Street  
LONDON:  
6 Bonville Street, London, E. C. 4  
Member Associated Business Papers, Inc.  
Member Audit Bureau of Circulations

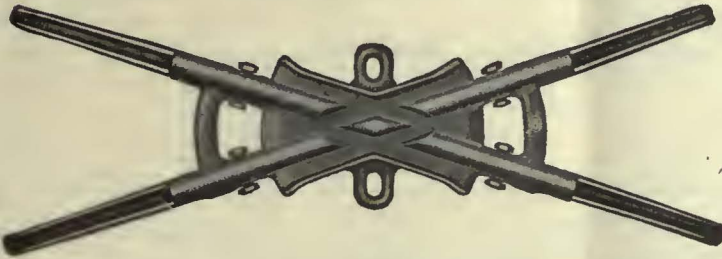
The annual subscription rate is \$4 in the United States, Canada, Mexico, Alaska, Hawaii, Philippines, Porto Rico, Canal Zone, Honduras, Cuba, Nicaragua, Peru, Colombia, Bolivia, Dominican Republic, Panama, El Salvador, Argentina, Brazil, Spain, Uruguay, Costa Rica, Ecuador, Guatemala, Chile and Paraguay. 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, 1926, 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.



# O-B Live Cross-Overs

For long life and delay-free operation



## Type DC Live Rigid Cross-Over

A LIBERAL cross section of metal, correctly distributed, combines maximum strength with light weight and insures uniform natural wear on the runners. Runners cross each other in a diamond shaped section at the center of the pan, permitting the trolley

wheel to ride smoothly and evenly from end to end without touching the pan. Ample side clearance is provided for the wheel flanges. O-B Cam Tips give a smooth approach and leave. Applicable for 23, 30, 33, 35 and 37 degree angles.



## Type E Live Adjustable Cross-Over

BALANCED design provides strength, light weight and long life. Natural wear is evenly distributed, avoiding any necessity for replacement before the cross-over has given the maximum in possible service. Malleable iron pan and cross runner castings

interlock and are held together without screws or bolts. Pull off holes are provided in the compression ring. Wires are held firmly in bottom of grooves and prevented from slipping by the cam action of renewable bronze tips. Installed without cutting the wires.



## Type C Insulated Cross-Over

AN ESPECIALLY selected and treated hickory gives the main insulating member maximum strength and long life with minimum weight. On either side of the cross runner, fibre runner pieces prevent the possibility of arcing between the two live members. The runner pieces, with their bronze arcing tips, are easily renewed while the cross-over is in service.

Galvanized iron parts are of Flecto, the rust-resisting, brittle-free, O-B Malleable. A smooth approach and leave are provided by O-B renewable bronze cam tips. The trolley wire is held firmly, without damage, by rocker clamp cams. Normally adjustable from 45 to 90 degrees. Lower angles may be obtained by slight alteration on the job. Installed without cutting the wires.

*O-B IS BOUGHT WHEN SERVICE IS SOUGHT*

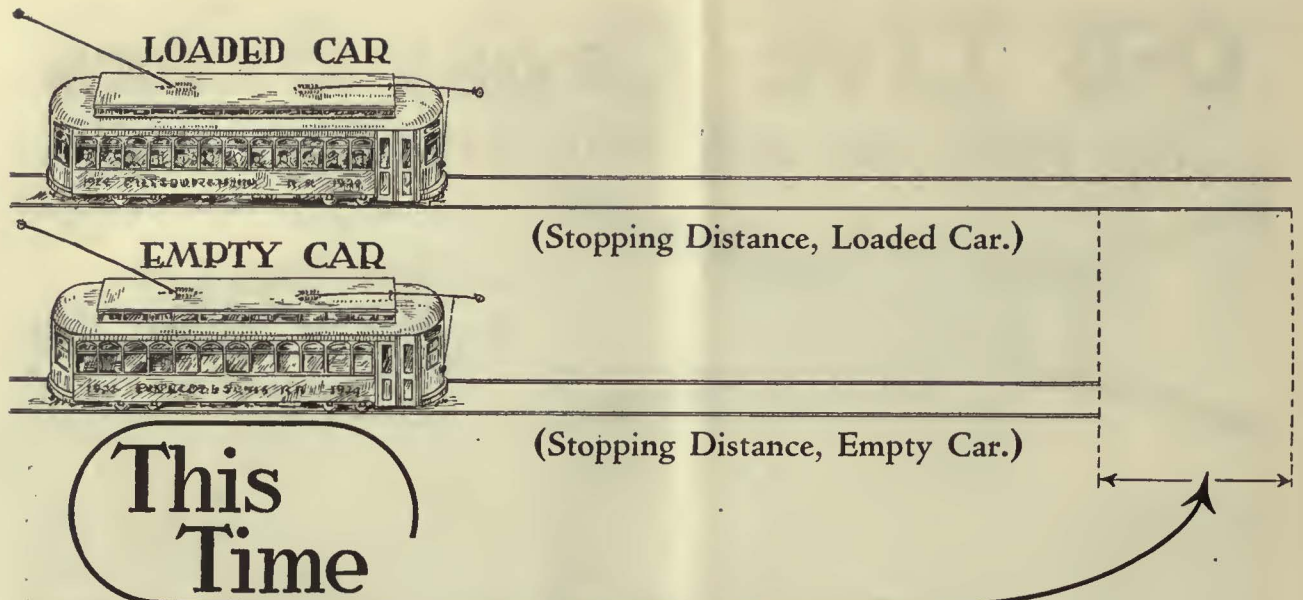
Ohio Brass Company, Mansfield, O.  
Dominion Insulator & Mfg. Co., Limited  
Niagara Falls, Canada

103 B

# Ohio Brass Co.



PORCELAIN  
INSULATORS  
LINE MATERIALS  
RAIL BONDS  
CAR EQUIPMENT  
MINING  
MATERIALS  
VALVES



## Can be Saved

Information regarding Westinghouse Variable Load Brakes may be obtained upon application to our nearest district office — Ask for Descriptive Catalogue T-2045.

WITH the ordinary form of air brake equipment the maximum retarding force is limited to that which is ample and permissible for an empty car, but which is inadequate to effect the proper degree of control on a loaded car—particularly if it has a high ratio of loaded to light weight—with the result that the stop is lengthened and more time is consumed.

But this time can be saved!

The Westinghouse Variable Load Brake, adapted specifically for modern light weight surface cars, eliminates the difference in retarding effect on empty and loaded cars—by an automatic adjustment of brake cylinder pressure with the changing load—and insures that stops will be as short under all conditions as would normally be possible only with an empty car.

The saving in time, effected by the uniformly shorter stops, is translated into faster schedule speeds just when time is most valuable—during those periods when there is a demand for quick transportation of large volumes of revenue-producing traffic.

Mass transportation can be accelerated to increase the profit and popularity of your service by the use of this modern brake on your modern cars.



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

# WESTINGHOUSE TRACTION BRAKES

## Relief from Paving Burdens

Three states and a number of municipalities have relieved electric railways from paving burdens, according to a recent Bulletin of the American Electric Railway Association. In most instances the relief granted was the cancellation of all paving and repaving requirements except the track foundation and damage to surface paving occasioned by operation of cars.

Companies thus relieved from surface paving can eliminate the question of tie and paving maintenance by installing *Steel Twin Tie Track—a permanent foundation*. Steel Twin Ties in concrete cost no more than most other track designs. Steel Twin Ties in concrete will outlast the rail. Steel Twin Ties and concrete require a minimum of maintenance during the life of the rail.

Write for detailed information on Steel Tie Track Construction, cost figures, and quotation today.

The International Steel Tie Company  
Cleveland, Ohio



# Steel Twin Tie Track



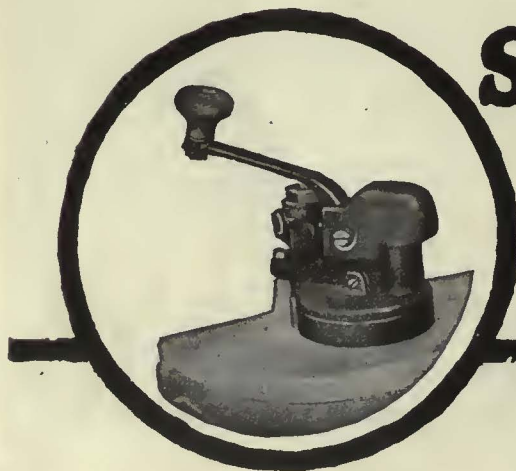
*This*  
**Property**  
 uses  
**nothing but**  
**Safety Cars!**

THE Pennsylvania-Ohio System, which provides transportation for the large industrial community of Youngstown, Ohio, and its environs, comprising a population of 200,000, is among the many traction properties that are now operating nothing but up-to-date rolling stock having modernized equipment.

All of its 175 revenue-producing cars, both the city and suburban types, are equipped with a full complement of protective and labor-saving devices for one-man operation—the complete Safety Car Control Equipment.

A better, safer, more profitable service is thus being rendered.

We make the Safety Car Devices that make the Safety Car.



**SAFETY CAR DEVICES CO.**  
 OF ST. LOUIS, MO.

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

CHICAGO SAN FRANCISCO NEW YORK WASHINGTON PITTSBURGH





Independence Hall—Philadelphia Floodlighted with Golden-Glow Projectors.

City Hall—Philadelphia Floodlighted—Many Golden Glow Projectors are used.

**P**HILADELPHIA has invited you to participate in her Sesqui-Centennial Exposition, commemorating one hundred and fifty years of glorious history and uninterrupted progress.

And the Electric Service Supplies Company, for many years one of Philadelphia's leading industrial concerns, welcomes you. A cordial invitation is extended to visit our manufacturing plant at 17th and Cambria Sts.,—North Philadelphia—the home of the famous Keystone line of Railway, Power and Industrial Electrical Equipment.



# ELECTRIC SERVICE SUPPLIES CO.

**PHILADELPHIA**  
17th and Cambria Sts.

**NEW YORK**  
50 Church St.

**CHICAGO**  
Illinois Merchants' Bank Bldg.

**PITTSBURGH**  
1123 Bessemer Building

**BOSTON**  
88 Broad St.  
**SCRANTON**  
316 N. Washington Ave.  
Lyman Tube & Supply Co., Ltd., Montreal, Toronto, Vancouver

**DETROIT**  
General Motors Bldg.

# Cambria

## rolled steel wheels

&



## forged steel axles

insure maximum mileage and safety  
in Electric Railway Service



**C**AMBRIA Rolled Steel Wheels are made by a combined forging and rolling process. The forging gives strength, toughness and density to the metal and the rolling establishes a grained structure which prevents breakage and crystallization.

CAMBRIA Forged Steel Axles are made from the finest selected stock and can be furnished rough-turned, heat treated, annealed or untreated.

Manufacturing experience and control of raw materials have enabled Bethlehem to maintain the splendid quality and wearability of Cambria Wheels and Axles. Maximum mileage and safety are insured with Cambria Wheels and Axles in Electric Railway Service.

**BETHLEHEM STEEL COMPANY, General Offices: BETHLEHEM, PA.**

General Sales Offices: 25 BROADWAY, NEW YORK CITY

District Offices:

New York  
Boston  
Philadelphia

Baltimore  
Washington  
Atlanta

Pittsburgh  
Buffalo

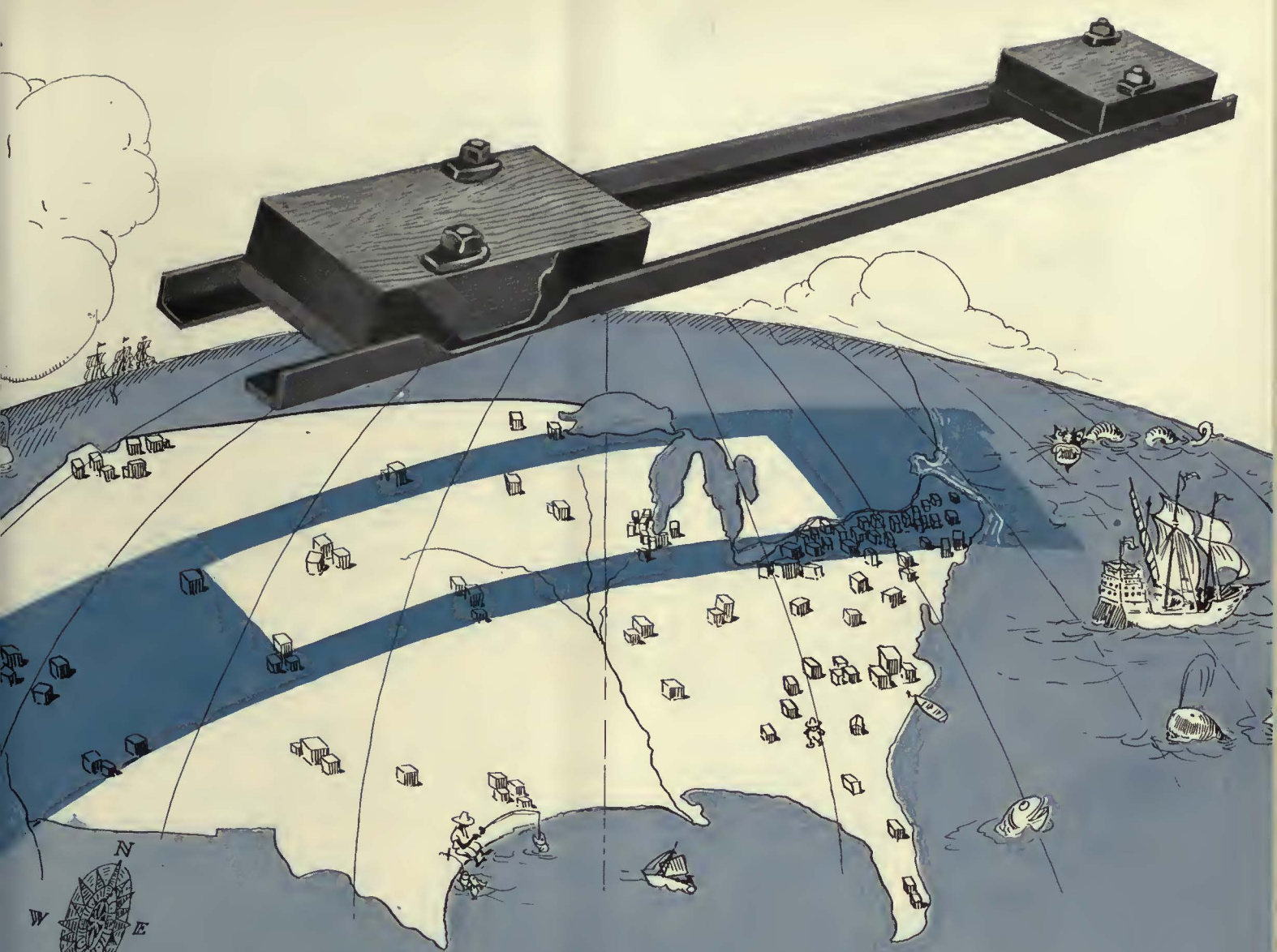
Cleveland  
Cincinnati

Detroit  
Chicago  
St. Louis

San Francisco  
Los Angeles

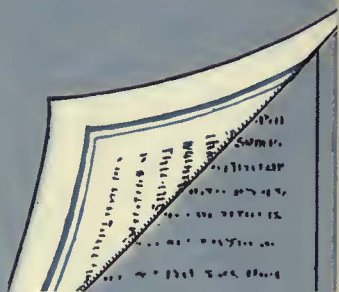
Seattle  
Portland

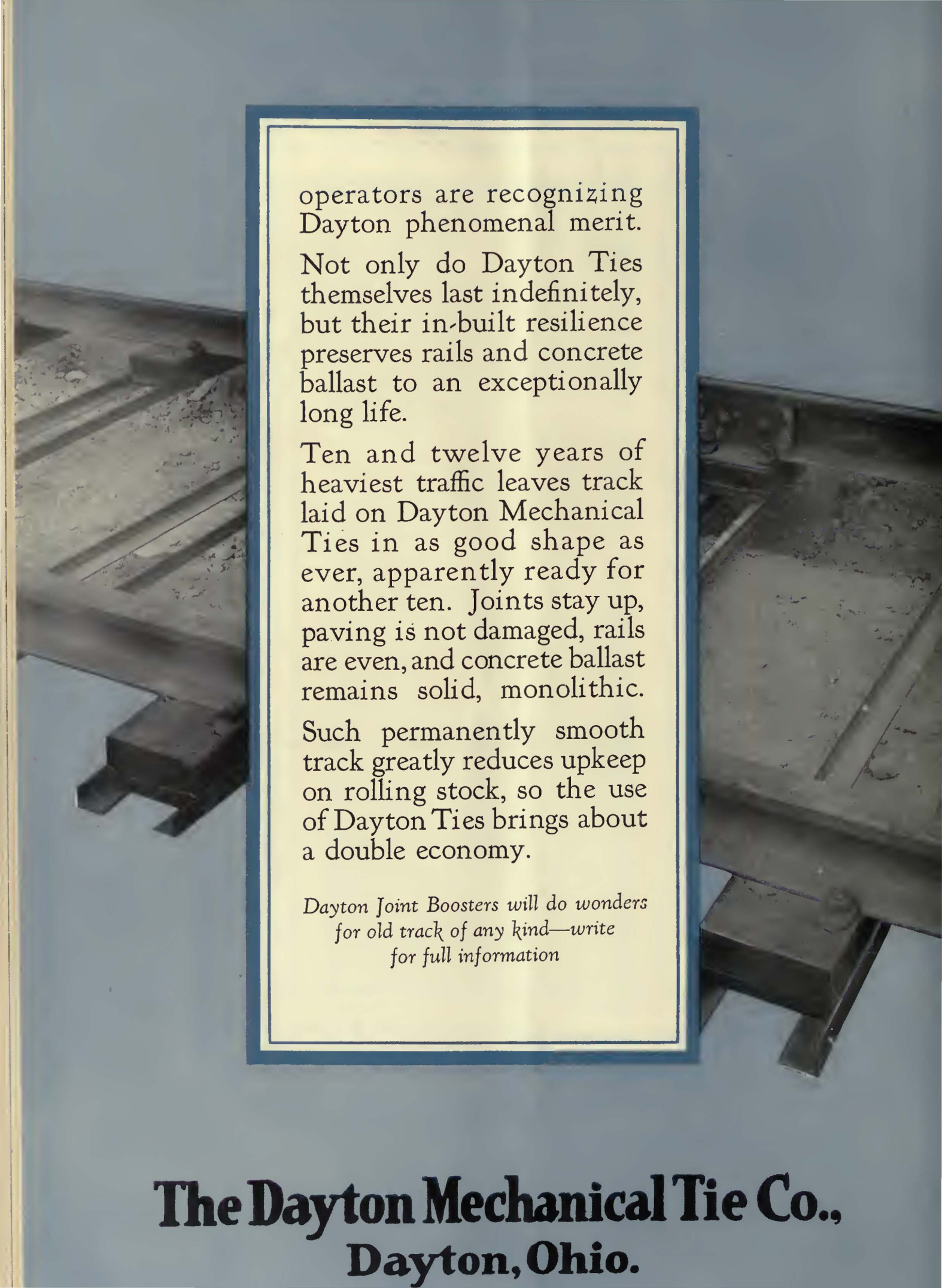
# BETHLEHEM



**Street Railways In**  
**127 Cities Now**  
**Use Dayton**  
**Mechanical**  
**Ties**

The 127 cities having installations of Dayton Mechanical Ties are spread not only all over the United States, but into Canada and foreign





operators are recognizing  
Dayton phenomenal merit.

Not only do Dayton Ties  
themselves last indefinitely,  
but their in-built resilience  
preserves rails and concrete  
ballast to an exceptionally  
long life.

Ten and twelve years of  
heaviest traffic leaves track  
laid on Dayton Mechanical  
Ties in as good shape as  
ever, apparently ready for  
another ten. Joints stay up,  
paving is not damaged, rails  
are even, and concrete ballast  
remains solid, monolithic.

Such permanently smooth  
track greatly reduces upkeep  
on rolling stock, so the use  
of Dayton Ties brings about  
a double economy.

*Dayton Joint Boosters will do wonders  
for old track of any kind—write  
for full information*

**The Dayton Mechanical Tie Co.,  
Dayton, Ohio.**



## Every City Has Peak Loads

Peak loads are not confined to the big cities these days. Rush hours are encountered in all towns and neighborhoods and their peak loads demand adoption of the *circulating load* for the efficient handling of rush hour traffic. The circulating load, in turn, demands the use of National Pneumatic Treadle Exit Doors—particularly in one-man service. More than 2,500 automatic treadle doors have, consequently, been installed on cars in all sections of the country.

### NATIONAL PNEUMATIC COMPANY

*Executive Office, 50 Church Street, New York*

*General Works, Rahway, New Jersey*

CHICAGO  
518 McCormick Building

MANUFACTURED IN  
TORONTO, CANADA, BY

PHILADELPHIA  
1010 Colonial Trust Building

Railway & Power Engineering Corp., Ltd.

# Why public preference favors the "balanced" car





ONE of the essential elements of Balanced Car Design, as interpreted by Cincinnati engineers, is a careful study of the requirements and preferences of the riding public.

If, for instance, the new car is for high-speed interurban service, it must not only be fast but *look fast*.

The trucks must insure easy riding at *high speed*.

Every detail of the interior must *balance* for utmost comfort on long trips. Trim and paint work to produce a restful color scheme. Deep cushioned seats and non-rattling windows to assure ease and relaxation during the ride. Ventilation and lighting to provide the utmost in travel comfort.

If on the other hand the car is for city service, there must be a still more careful *balance* of modern luxury with practical utility and economical maintenance.

Inviting appearance both inside and outside is essential. And to obtain this every element of design must *balance* in relation to the whole.

Cincinnati curved side construction for instance permits of wide aisles and seats, while at the same time providing greater clearance for passing vehicles. In addition, trim, floor covering, seats and the entire interior effect are *balanced* between attractiveness and utility.

This in short is the secret of the success of Cincinnati Balanced Lightweight New Cars—this and their proved ability to “stand up” under modern service conditions.

A twentieth century public has definitely shown its preference for such cars through the invariably satisfactory results which have attended their operation in all parts of the country.

Full details and operating data will be sent to interested executives on request.

THE CINCINNATI CAR COMPANY  
Cincinnati, Ohio

# CINCINNATI NEW CARS

*A step ahead  
of the modern trend*



The microscope, the balance, the test tube—all means of holding products to strict physical standards. And now comes the Graybar tag, marking electrical supplies held to an invisible standard—that of quality.

## *Now industry has a new standard to guide it*

Science gives to industry standards of measure and weight accurate to a hair. The Graybar tag gives to industry a standard of quality, inflexible and just as indispensable.

For the Graybar tag is the sign and symbol of the great Graybar Electric distributing organization. As such it is associated with a matured expe-

rience of 56 years (under the former title of Supply Dept., Western Electric); a vast array of 60,000 electrical items; and a strategically located group of distributing warehouses.

These, combined, make the Graybar tag a universal standard of satisfaction in all things electrical.

# Graybar

**ELECTRICAL SUPPLIES**

Successor to *Western Electric* Supply Dept.

Offices in 58 Principal Cities

Executive Offices: 100 East 42nd St., New York





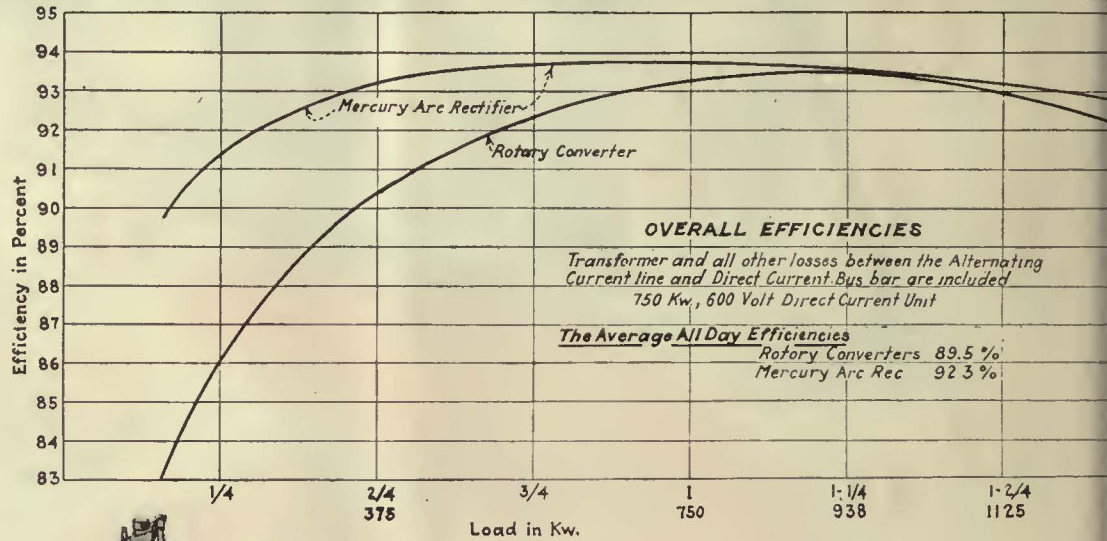
Everything a 6 should have *plus* Mack reputation

**Mack Trucks Inc.**

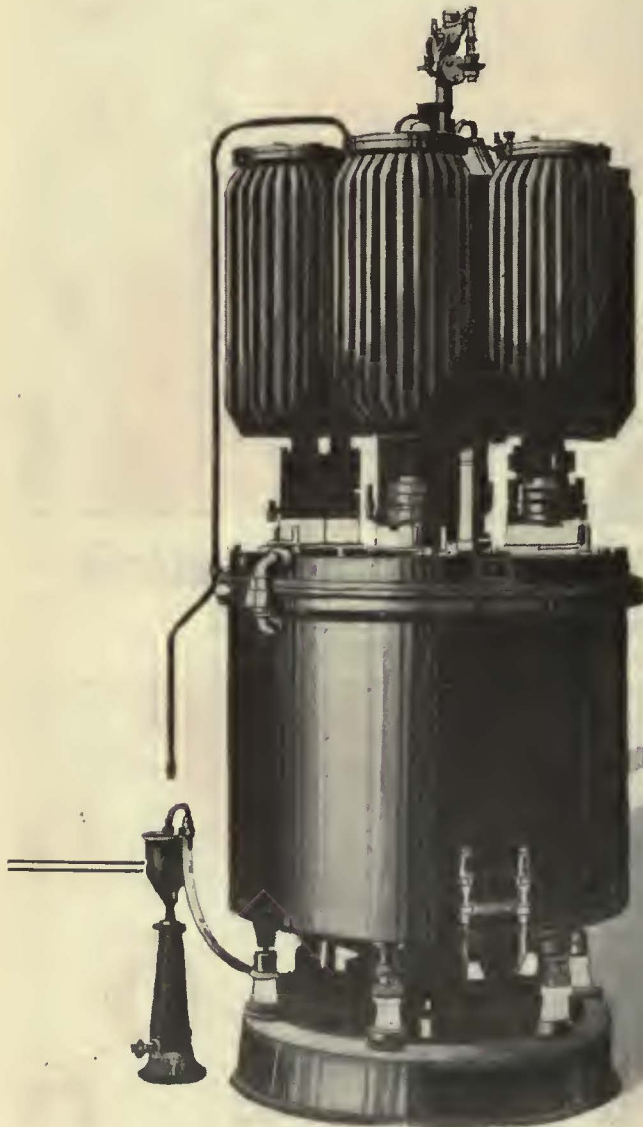
International Motor Company  
25 Broadway New York City



# American BROWN BOVERI



Steel enclosed—  
no glass parts





# Mercury-Arc Power Rectifiers

## 3. No Synchronizing!

Here we find one of the most important attributes of the mercury-arc power rectifier, from the point of view of the railway company operating automatic substations. No complicated apparatus and no skilled attendants. Remote control of mercury-arc rectifiers in parallel, involves no problems. Acting essentially as one-way valves, for electric current rectification, without rotating parts, there is nothing to synchronize or put in step when starting up or throwing on the line.

### Chief Advantages

1. Efficiency high over the whole working range.
2. Simple operation and minimum attention.
3. No synchronizing.
4. Very high momentary overload capacity and insensibility to short circuits.
5. Negligible maintenance.
6. Low weight. No special foundations.
7. Noiseless and vibrationless operation, consequently rectifier substations can be erected in densely populated localities.
8. New substations need only be of light construction. In many cases old houses can be converted, while the plant can often be erected in places that could not be considered for rotating machinery.

### Principal Products

Mercury-Arc Power Rectifiers  
(steel enclosed)

Electric Locomotives—for any  
system of current, high or  
low tensions

Complete equipment for rail-  
way electrification

Rotary Converters

Motor Generators

Diesel-Electric Locomotives

Mining Locomotives

Switches, Controllers and all  
Auxiliary Equipment

Automatic Regulators

Steam Turbo Generators for  
normal or high pressures  
and superheats

Oil Switches

Condensers and Auxiliaries

Relays

Turbo Compressors and Blowers

Electric Furnaces

Induction Regulators

Ships

Diesel Driven

Turbine Driven

Electrical Driven

Structural Steel Fabrication

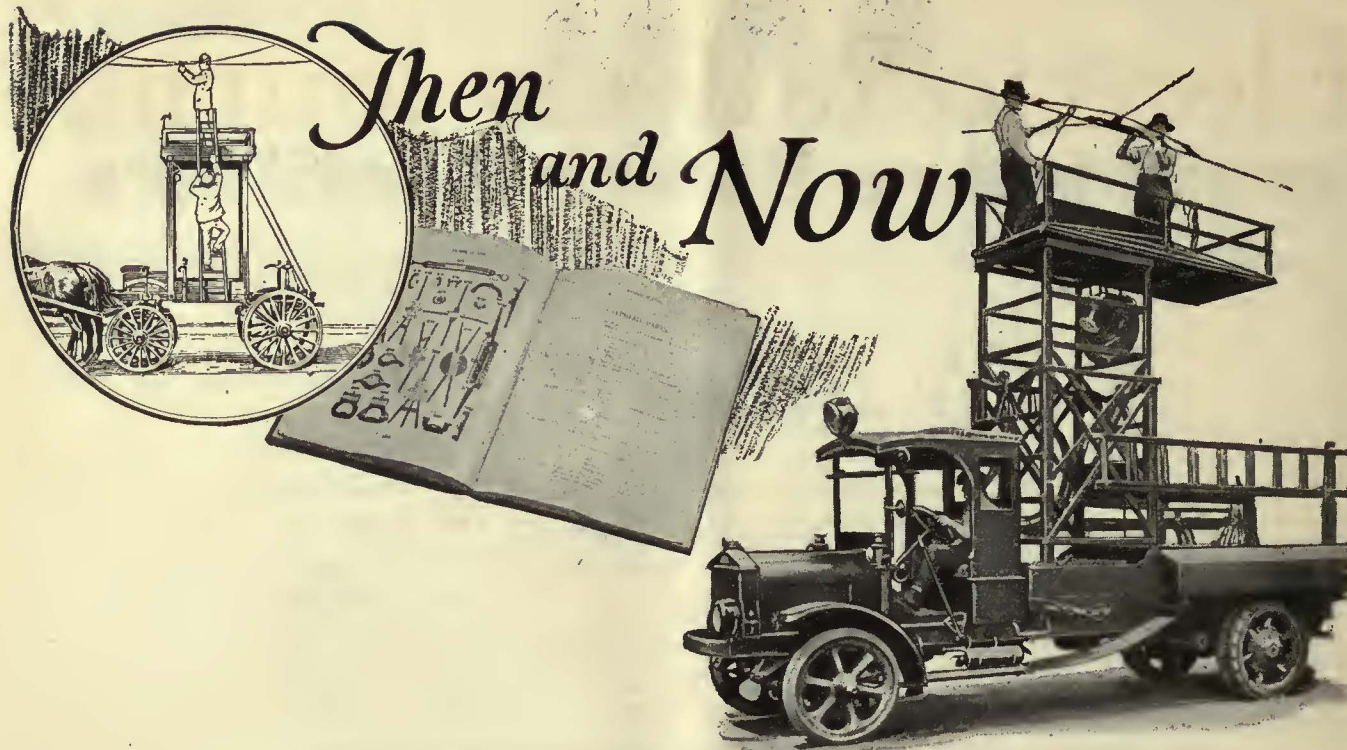
American Brown Boveri Electric Corporation

165 Broadway, New York, N. Y.

Camden, New Jersey

230 South Clark Street, Chicago, Illinois

# AMERICAN BROWN BOVERI



## G-E Line Material the choice

Even when horses drew "high wagons" to the scene of new construction or emergency repairs, General Electric Line Materials were the well-known standard.

The 1896 edition of the G-E Catalog, shown above, suggests interesting comparisons with present-day G-E line devices, which have had the benefit of constant development, improvement, and proper additions during all these years.

Today, the seeker for "quality first" turns to his latest G-E Railway Supply Catalog, where 150 pages are devoted to line material that is thoroughly modern.



In line with General Electric's constant endeavor to simplify and facilitate railway maintenance, G-E Line Material has been standardized in a manner that reduces the number of devices to a minimum. This reduces cost and simplifies stock keeping.



*For*  
**Modern Equipment Standards**

# GENERAL ELECTRIC

# Electric Railway Journal

*Consolidation of Street Railway Journal and Electric Railway Review*

Published by McGraw-Hill Publishing Company, Inc.

CHARLES GORDON, *Editor*

Volume 68

New York, Saturday, September 11, 1926

Number 11

## Automatic Control—

### A Triumph of Engineering

MANY engineers hold that there is no sequence of events in a mechanism so complicated that it cannot be controlled electrically, and in general from some remote point or by automatic devices.

The world marveled at the first automatic control of multiple-unit trains, by which one motorman could at will cause all the motors on each car to accelerate in unison. Today, that control seems absurdly simple when compared with the devices by which one man at a central point can not only start and stop the machines in an unlimited number of substations, but can get reports of every action taking place at each of these points when the equipment is operating automatically to take care of any set of conditions that may occur due to the load imposed on the stations—all without the intervention of human hands. The development of the mechanism by which these things are accomplished is one of the marvels of this engineering age.

The series of articles by L. D. Bale, superintendent of power the Cleveland Railway, shows how the engineers have conquered this most complicated problem so that, while the actions of the parts are extremely intricate, the one human being in charge need not bother with the detail but can concentrate his attention on the result sought. By so doing the reliability of the system has been increased manifold. Furthermore, this has been accomplished with a gain in efficiency of the system. Such a result is worthy the serious attention of all electric railway men, whether or not they understand all the details through which the accomplishment was made possible.

## A Street Car Exhibit and Its Significance

SIGNS all point toward a stimulated interest in car design development at the Cleveland convention. Space reservations by manufacturers and operating companies indicate that there will be brought together an exhibition of cars such as has never before been seen by the industry.

Manufacturers and operators have both been busy during the past year. There will be more cars shown than at any previous convention. But it is not in numbers alone that this exhibit will excel. The electric car is again making progress. There will be a feast of new ideas for railway men. Several interesting surprises are in store. At Cleveland there will be ample evidence that the industry is not headed for the scrap heap.

Out of this convention should come further interest in the replacement of obsolete cars. In Grand Rapids and

more recently in Memphis there has been definite proof of the wholesome effect of such a program on the general public attitude toward electric railway service. This transcends in its importance the immediate effect on riding and operating costs. It has proved to be an effective means of winning public interest and co-operation.

## Science and Engineering

### Needed in Car Development

NOISE measurement in electric railway car operation holds a multitude of possibilities. The equipment developed recently at the University of Wisconsin and the preliminary results obtained with it, as recounted in an article in this issue, show this. The reader undoubtedly will obtain the impression that much remains to be done both in development of the apparatus and in its use to determine and classify sources of noise. When this has been done, a new means of analysis will be available that should make radical improvements possible.

A moment's reflection on the application of science and engineering to car operation and construction leads one to the startling realization that such application has been conspicuous by its absence. Since the development of speed-time and energy curves, years ago, which led to a better understanding of railway motor performance, there has been little else than the practical application of practical methods. Of course improvements have been made in motor design. Substation equipment has been greatly developed, and to some extent new materials and new ideas have been adopted in electric car manufacture. But where has a searching analysis been made of the effect of different principles in car design, the effect of different types of cars on tracks and the counter effect of the tracks on cars, for the purpose of developing improvements?

Not long ago a railway operator admitted that he was vacillating between two policies in regard to car construction. At one time he believed that the high-grade interurbans must be operated by heavy cars that, due to their enormous weight, would damp out noise and vibrations. At other times he admitted that the economies of light-weight equipment and the easy riding qualities of this type of construction held a strong appeal. On this operator's property may be found new cars of both types. Upon what can this operator base his judgment? No one has determined by actual measurement whether or not a properly designed light-weight car could ride as easily as a heavy car. No one has determined how much less is the shock on both rolling stock and rails when cars of light weight are used.

The only criterion that exists with regard to noise

is opinion. Opinion is valuable but not always convincing. In a court of justice it seldom is accepted, save as a last recourse, and then with many qualifications. Facts are the basic evidence that carry weight. And facts based on the application of science and engineering are badly needed to help in the development of the electric car to the position that it should and must hold.

### Europeans Are Experimenting with Bevel Drive for Cars

**G**REAT interest should attach to the trials in Europe of bevel-gear drive for street railway cars. The general idea is not new, but the universal use of this kind of drive on automobiles has undoubtedly given an impetus to this form of construction. The construction of some 475 cars of this kind for Paris and others elsewhere in Europe shows that the application of this drive to street car propulsion has gone beyond the experimental stage. The differential form of axle construction, used with automobiles, has not been considered necessary in these cars. A solid axle is used for each pair of wheels.

The chief advantages claimed for bevel-gear drive for electric cars are: Reduction in total weight, amounting to from 15 to 20 per cent; a reduction in the unsprung weight of from 30 to 35 per cent; consequent reduced energy consumption and longer life of roadbed; better braking with reduced effort because the brake-shoes are applied to a drum on the motor shaft; reduction in height of car floor over the street level because of greater freedom in motor design.

It is somewhat notable that practically no change has been made in the position of the street car motor in this country during the last 40 years, or since Sprague first mounted it with journals on the axle. It may also seem strange that such a radical development should have been carried to the extent it has in Europe without more effort being made in this country to determine the possible advantages of this method of construction, in view of the far greater extent of the electric railway industry in this country than abroad.

The latter condition may be due, at least in part, to notable differences in manufacturing methods here and in Europe. These differences in some respects work to our advantage and in others to our disadvantage. They consist primarily in the practice here of manufacturing on a large scale with standardized parts as compared with the so-called "hand" manufacturing methods in Europe. Thus, for instance, an American achievement is the manufacture by machinery of millions of good watches which can be sold at a low price; Switzerland's achievement is the manufacture of a smaller number of hand-fitted, higher grade watches at a lower price than the similar grade of watch could be made in this country. The same principle applies in automobile manufacture here and abroad.

We do not know yet that the bevel drive for street cars is a permanent development. We do know, however, that if American electric railways are to utilize all of the possible improvements in their field, research work must be as active on this side of the Atlantic as on the other. It may be less easy here to change standard types of equipment, but at least we cannot afford to overlook the possibilities of radical improvements in design of electric railway equipment, such as the bevel drives for single-truck cars may be.

### Consider the Value, Not the Source, of Suggestions!

**T**WO notable articles were published recently in *ELECTRIC RAILWAY JOURNAL* recording contributions made by women employees to the progress of utility organizations. They are not the first of their kind, but each of them carries a message to officials and personnel. The subject which Mrs. Mary C. Best discussed in the issue of Aug. 28 and that which Alice Schuetze took for her text in the issue of Sept. 4 are dissimilar, but each of them made her points well. Mrs. Best's "What One Car Said to Another" offers much food for thought. It is true that the idea in the analogy which she used is not new, but the clarity with which she made her points in contrasting the old with the new commends her comments highly. Her remarks, it would seem, should afford valuable publicity material, particularly to the operators of one-man cars. Miss Schuetze's contribution was of another kind. It recalls that the hand which rocks the cradle still rules the world, and the author shows some of the few ways in which it is done. The point she makes is a good one, that even the women who leave the utility industry for marriage continue to carry with them a message from the utilities to their neighbors, their club members and their families. These, of course, are some of the utilitarian values behind what these women have said, but their remarks have value entirely aside from this—value that shows the amount of real imagination and thinking many of the carefully selected female employees are putting into their work. This is something that it is feared not all men, even in this day and generation, appraise at its full worth.

### Giving Away Other People's Money

**P**LATFORM men in the employ of the Cincinnati Street Railway have been insisting that they have their pound of flesh. And they have got it. They have got it through an arbitration award which will cost the company an additional \$300,000 a year. Under conciliation they could have had an award of an increase of 1 cent an hour, but this they rejected.

In insisting upon getting their pound of flesh—and the expression is used to connote the worst—the men acted deliberately. It was to be expected that they would, but hope springs eternal in the human breast, when the mind is not obsessed with the idea of getting all one can, that labor may some time display a spirit of mercy. This is said not because of gullibility with respect to the motives that prompt labor, but because here was an unusual case.

It is one thing to say that the finding has been made, that it was in accordance with the evidence, and that the conditions it imposes should be borne and borne with grace. It is even granted that each side goes into a case of this kind fortified to uphold its contention, and that it is to be presumed the side against which the award weighs has failed to sustain its contention. There are many more things that might be said in extenuation of the policy of accepting the finding and saying nothing about it. Despite all these things the thought persists that in this case the insistence of the men was ill-advised.

The circumstances in Cincinnati are peculiar. Less than a year ago the complicated arrangement was

unscrambled under which the local lines there were operated. Under the former arrangement, with economic conditions prevailing from which there was apparently no escape, a fare basis was reached that was onerous to the users of the service. Finally came the agreement under which the leasing arrangement between the Cincinnati Street Railway and the Cincinnati Traction Company was terminated and a new start made. That is all a matter of public record. In the present arbitration, the employees chose to disregard these things or not to heed them, and the two arbitrators who fixed the award, if they took the matter into account, must have minimized the effect of their findings on the company's ability to rehabilitate itself.

From the purely selfish point of view all this may be justified, but the feeling persists that Mr. McKnight was right when he said that "giving away other people's money may bring a pleasant thrill with it, but this does not justify awards that are economically unsound and hazardous." That is how the company arbitrator looked at it. That is how *ELECTRIC RAILWAY JOURNAL* looks at it. There may be some additional economies in operation which the company can put into effect, but despite this, the conclusion appears to be inescapable that the company's arbitrator was correct. So far as the men are concerned, they still have a chance to show that all is not self with them by rendering a super-service that may make it possible for the company to absorb some of the cost that the award has imposed. Under the circumstances, it will be a delicate test to which they will be exposed.

### Most Men Wake Up When Their Pocketbooks Are Touched

**M**OST people do not worry greatly about the troubles of others. Indeed, La Rochefoucauld has said: "In the adversity of our best friends we often find something which does not displease us."

It may be that this somewhat cynical observation explains in part the attitude of the public to the street railway companies in connection with fare questions, now happily largely in the past, as well as the more modern problem of street congestion. The increases in fares of a few years ago were admitted to be necessary to public and carrier by those who had given serious consideration to the subject, but despite this public interest they did not come in most cases as the result of popular demand. It was only when an impartial commission granted them as a matter of justice or when the public came to realize that without an increase in fare the cars would stop and the community would no longer have an essential means of transport that higher fares were established.

Much the same explanation can now be given of the public apathy in connection with the parking evil in busy streets. Railway companies and others who have given study to the subject realize that with the amount of traffic greatly increased the effective width of the street is being cut down by a quarter to a half because automobile and truck owners use the streets for storage purposes. Still the public continue in their easy-going methods, thinking that after all it is some one else's worry, and that they personally are not affected.

The only way to wake these people up is to explain to them their really vital interest in the matter. This plan is now being followed in New York City, where a recent traffic investigation has shown that the cost

per inhabitant for avoidable street congestion is at least \$33 a year.

This figure is based on a report of the Fifth Avenue Association issued some time ago. When put in concrete form it becomes a very strong argument with the average citizen for some reform. Window announcements on the New York Railways cars therefore bear the words, "Traffic Delays Cost You \$33 a Year," while the inside of the poster explains to the car rider how this figure is obtained.

The campaign for clearer streets is bound to be a long one, but it must be successful in the long run, as better conditions will benefit all.

### Chicago's House-to-House Passenger Canvass

**M**ORE attention than it apparently has received so far among electric railways is deserved by the house-to-house campaign conducted by the Chicago Rapid Transit Company. Counts have been made before among passengers of electric railways and canvassers have solicited from door to door in more than one instance, but the Chicago undertaking stands out as probably the most pretentious of its kind.

Figures of the canvass reproduced elsewhere in this issue are very interesting. Only 7 per cent of those interviewed were unfavorably disposed toward the company and about 1 per cent hostile. The reason for this hostility was deduced by the survey to show that the biggest factor was the personal service of the individual employee. That was mighty interesting. The company accordingly set about the work of spurring its men on to greater and greater effort, and the campaign was not only accepted with grace by the men but provoked enthusiasm to do even better than before.

More than a year ago the company staged its passenger partnership campaign, in the course of which about \$5,000,000 of stock was sold locally, mostly among the company's riders. That did much to cement the community of interest between the company and its patrons, fostered before that in many ways, particularly by advertising the facilities of the company and the service, to say nothing of the modernization of the system physically with respect to new cars, improved station facilities and other changes.

Of course, the disposition of the so-called intelligentsia among car riders everywhere to sneer at all such movements will probably persist despite the tangible evidences already discernible of the efforts being made still further to improve public relations, but the fact remains that the contacts previously made between the company and its patrons and those fostered by the more recent canvass have been strengthened.

As indicated before, there has been plenty of evidence on the part of the company of its willingness to improve the physical property. So the patrons apparently appreciate that they are benefiting no less than the security holders. The obligations of the two have, of course, always been mutual, but in the past the disposition too frequently has been for one or the other, and sometimes both, to lose sight of this. To sum up, the canvass recently made and the campaign conducted among its own men show that the Chicago company has been studying its market and studying it carefully with profit to its patrons. This means profit to itself, not all tangible, perhaps, but still profit—profit in its broadest sense.



Light-Weight Cars of This Type Are Widely Used by Société des Transports en Commun de la Région Parisienne

## Paris Uses Bevel Gear Drive Extensively

Four Hundred and Seventy-five Cars of This Type Are in Use or on Order—More than Four-fifths of Entire Weight Is Spring-Borne—Tests Show These Cars to Be Economical in Operation

**A** DEVELOPMENT extending rather rapidly in Europe, though practically unused in America, is the Cardan drive for electric railway cars. Previous articles in the JOURNAL have told about different installations with this drive, particularly in France and Switzerland. This lends interest to an extended article in the May 26 issue of *L'Industries des Voies Ferrées et des Transports Automobiles* which sums up the progress to date along this direction, particularly in Paris. Here the modern application of bevel gears to electric street cars seems to have begun with an experimental car built in 1921. Others of somewhat different construction followed and now 475 motor cars of the type known as "L" have been in use in Paris for about three years and eight cars of the same type have been in operation in Nice for a year or more. All were built under the patents of the Scemla Company (Société de Construction et d'Entretien de Matériel Industriel et Agricole) of Paris.

The abbreviation "L" stands for "light" because these cars are lighter in weight than the former standard equipment. The latest type "L" car, as used in Paris, is a four-wheel, center-entrance car with the following main dimensions and details:

- Wheelbase, 11 ft. 10 in.
- Seating capacity, 49 passengers.
- Complete weight empty, 28,380 lb.
- Weight per seated passenger, 580 lb.
- Weight of body (with motors and equipment) 20,900 lb.
- Unsprung weight, 4,180 lb.
- Deflection of spring support, 0.18 in. per 1,000 lb.

The car has a chassis on which the body is supported, as shown in the accompanying illustrations.

The chassis is made up entirely of rolled shapes to secure lightness, the longitudinal members being one piece connected by cross girders and large gusset plates.

All of its weight, however, is spring-supported on the axles through a system of horizontal and vertical springs, both semi-elliptic and helical.

The vertical spring support is obtained, as shown in an accompanying illustration, by semi-elliptic springs attached at their center to the journal box, while their ends support the car body and equipment through vertical helical springs. These latter take up small shocks from the track which cannot be absorbed by the large leaf springs. The total flexibility in a vertical direction

COMPARATIVE PERFORMANCE RECORDS WITH TYPE "L" CAR AND STANDARD CAR ON TRUCK

Condition of motor cars	"L" Type Motor Car			Motor Car on Truck Standard Type			Economy Gained by Type "L" Car	
	Weight Metric Tons	Energy Total Kw.-Hr.	Consumption Per Ton-Km. Watts	Weight Metric Tons	Energy Total Kw.-Hr.	Consumption Per Ton-Km. Watts	Per Cent.	Per Cent.
Motor car empty	13,180	9,520	63.5	15,500	11,300	64.0	15.7	0.78
Motor car loaded	16,060	10,720	58.7	18,250	12,320	59.3	13.0	1.01
Motor car and trailer.....	29,320	19,080	57.2	36,600	20,850	58.0	8.0	1.38

of these springs, as stated, is about 0.18 in. per 1,000 lb., or about double that of an ordinary motor car on standard trucks.

Transverse shocks, which occur while the car is rounding curves or passing over bad joints in the track, are absorbed by the resistance provided by the spring links connecting to the ends of the leaf springs and the chassis, as shown in the illustration. This system of spring support is so flexible that a single man can make the body of the car oscillate. This system of support is the same as used on many automobiles and has been found to give comfortable riding.



The driving equipment for each of the two axles consists essentially of the following four parts:

1. The driving equipment, consisting of the axle, the pedestal bearings and the bevel gear, these various parts being fully inclosed in a casing.

2. An electric motor, supported entirely on the chassis.

3. A driving shaft with universal coupling, connecting the motor to the driving mechanism and permitting free play of the motor about the axle.

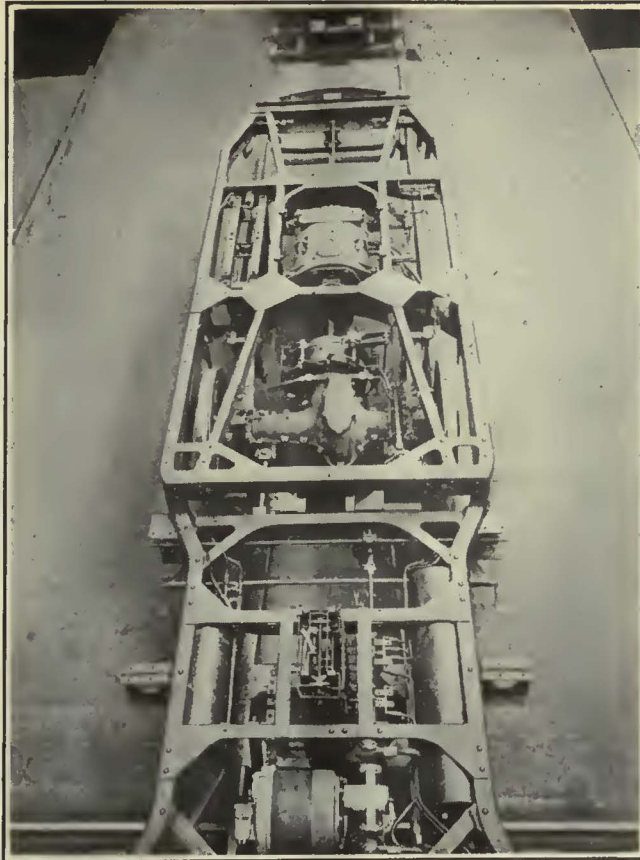
4. Links transmitting the effort of propulsion from the driving equipment to the chassis.

#### DRIVING EQUIPMENT

The driving equipment is shown in an accompanying illustration and consists of (1) an axle carrying the bevel gear and the car wheels and (2) an oil-tight casing which surrounds the gearing and forms a support for the axle pedestals.

To insure the bevel gearing functioning correctly, it is necessary to have the axes of the bevel pinion and the bevel gear keep an invariable position, the one with respect to the other. This is accomplished in the following way:

The bevel pinion is carried on a shaft whose outer end passes through a thrust bearing in the casing, while the inner end is supported by a bearing in a swiveling collar mounted on the axle, and kept in position with respect to the gear by a shoulder on the axle. Though wear takes place the axes of pinion and gear remain in the same plane. Angular displacement of the pinion axis with respect to the gear is provided for in the thrust bearing. The bevel gear is made in two parts which are mounted on a hub of forged steel,



Underframe of Paris Light-Weight Car Showing Position of Motor and Cardan Drive

pressed on the axle. Both oil and grease are used for lubrication. The bevel gear revolves in a bath of oil; the oil is distributed by grooves to adjacent bearings.

#### MOTOR

The motor is of the ventilated type with box frame. At 550 volts and 800 r.p.m. on a one hour's rating the output would be about 50 hp. The weight is 720 kg. (1,584 lb.) or 14½ kg. (31.7 lb.) per horsepower. As already explained, the motors are mounted directly on the chassis and are thus entirely spring-supported.

Ball bearings are used for the armature and these bearings are installed in the end housings, which are bolted to the frame of the motor. To remove an armature, only the rear housing has to be unbolted. The ventilating fan is mounted on the armature shaft on the end opposite to the commutator.

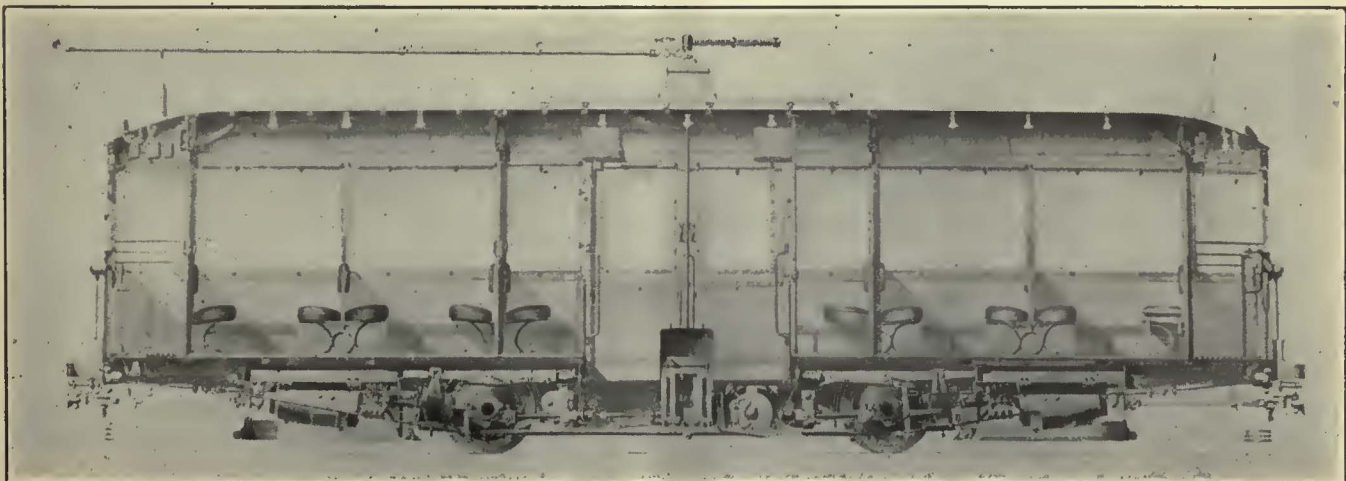
Since the motors are attached directly to the chassis

they are subject to all of its transverse and vertical oscillations. Hence, to maintain the alignment between the motor and the gearing, it is necessary to have a flexible coupling which allows free play to the suspension so that the movement of the motor will have no effect on the alignment of the gearing. This is accomplished by equipping the transmission shaft at each end with a flexible coupling, made up with rubber gaskets.

#### BRAKING EQUIPMENT

Braking is done not against the wheels but by brake shoes which are forced by levers against a drum keyed on the pinion shaft. There are, of course, two pinion shafts, so there are two sets of brakes, one on each shaft.

The brake levers are arranged vertically on each



A Well at the Center Reduces the Step Height While Leaving Space at the Ends for Motors and Driving Mechanism



By This Arrangement of Springs the Unsprung Weight Is Kept Down to a Minimum

side of the drum and are attached at their lower ends to the casing, permitting movement for the application of the brake shoes. In order to provide for the wear of the shoes, the latter are pivoted at one point on the brake lever so that their wear is even over the entire face, irrespective of the position of the brake lever. An adjustment provides for taking up the wear of the brake shoes.

This method of braking is about three times as effective as that of braking on the wheels, as can be shown by a simple calculation. The rate of speed of the motor shaft as compared with that of the car wheels is 69 to 11, but the diameter of the drum is about 425 mm., as compared with 815 mm. diameter of the wheels;  $(69 \times 425) \div (11 \times 815)$  equals somewhat more than 3.

The brakes can be operated by hand or pneumatically from either end of the car.

The compressor motor is of the series type, revolving at 1,100 r.p.m. and of  $2\frac{1}{2}$  hp.

#### CONTROL AND COLLECTOR

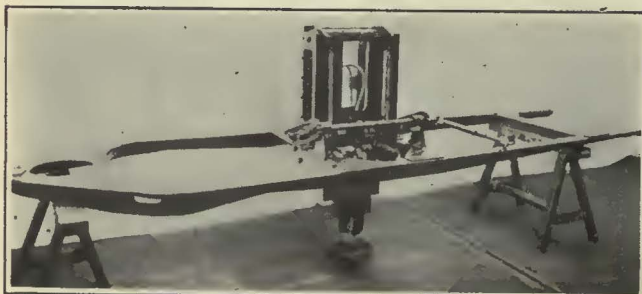
The control equipment contains no special features. It has nine operating positions and four rheostatic braking positions and has been especially designed to reduce its weight, which has been brought down to 104 kg. (229 lb.).

The current-collecting apparatus consists of a plow for operating in the conduit and also a trolley for use on the overhead system.

#### OPERATING RESULTS

The new method of drive shown has given good results from the standpoints of both light weight of equipment and reduced maintenance. The results of some comparative tests with this type of "L" car and of the latest previous type of car with a single truck under exactly the same conditions are given in the table on page 408.

Other tests showed that at the same speed the trac-



Conduit Plow Carried Midway between Wheels and Capable of Being Raised and Lowered by Rack and Pinion

tive effort per ton was about 5.4 per cent less for the type "L" car than for the car equipped with trucks.

The two cars were of exactly the same dimensions. The type "L" car used for the test had operated since being put in service 2,335 km. (1,460 miles) and consequently at the time of the test was in good operating condition. The other car, mounted in the usual way on a single truck, had run 2,000 km. (1,250 miles) after having received a general overhaul. It was equipped with two motors and presented the following general characteristics:

Capacity of each motor, 55 hp.  
Potential, 550 volts.  
Current rating, 88 amp.  
Motor speed, 450 r.p.m.  
Gear reduction, 71:17.

Tests were carried on with these two motor cars operating singly and then each hauling a trailer which was in good operating condition. The equipment was inspected in detail and was lubricated daily during the test. Tests were made with the cars empty and also loaded with 65 kg. (140 lb.) per seat.

The trial runs were made in the suburbs of Paris so as to get track free from street congestion and permitting regularity of operation. The profile varied from level to 4 per cent grade. The length of run was 11.375 km. (7.1 miles) and included 31 stops. The run was made in 34 minutes and the schedule speed was 15.5 km. (9.7 miles) per hour.

#### MAINTENANCE

It is believed that there will be a considerable reduction in maintenance owing to the lighter equipment. A striking feature of these new motor cars is the ease with which they pass around curves of short radius on account of the radial action taken by the axles in respect to the car body. The result is a much decreased wear of track and tires, notably the latter, and an increase has been noted between re-turning of tires of from 20 to 30 per cent in car-miles for the motor cars with these axles as compared with those with rigid axles.

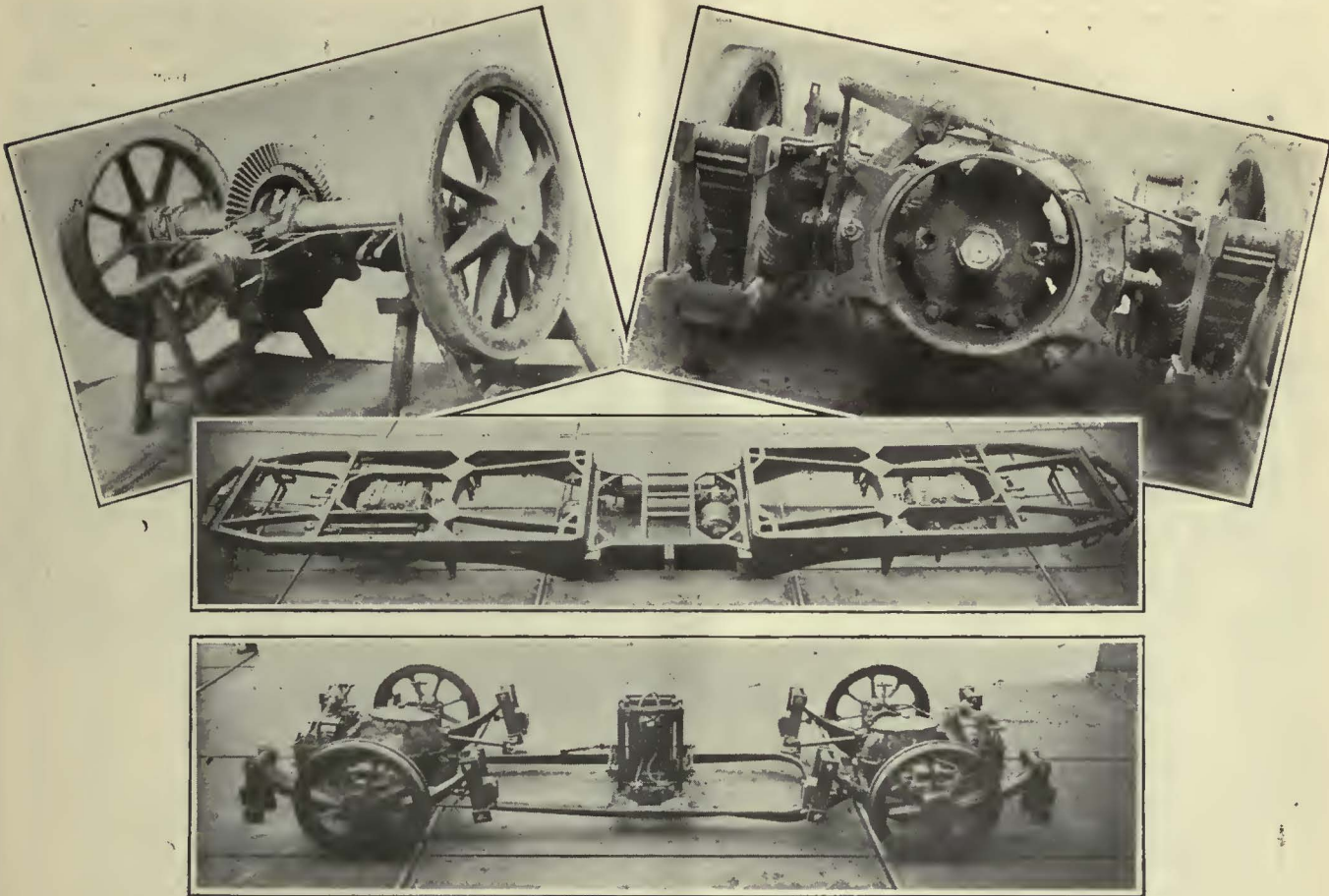
#### REDUCED LUBRICATION COSTS

With this type of motor with Cardan drive, the number of places requiring lubrication is much less, so the amount of lubricant required is less, as well as the time required in applying it. A number of inspections show that the gain in time required in lubricating amounts to 50 per cent and in quantity of lubricant used to 18 per cent.

#### BRAKESHOE EQUIPMENT

The decrease in weight of the braking parts is not the only advantage which follows the method of braking on a drum. There is a gain also in the life of the brakeshoes. The ordinary type of brakeshoe applied on wheels is subject to rapid wear on account of the high pressure of the shoe against the wheel (in the order of 15 kg. per square centimeter), by the condition of the surface of the tire, which is apt to be rough in winter, when sand is often employed, and the effect of the sand on producing wear when it is between the tire and the shoe. Thus, one company with a large traffic reports that the average life of its brakeshoes is only from one month to five weeks.

With the type of brake used on these cars, on account of the higher speed of the motor, the pressure of the shoe on the drum can be greatly reduced, namely, to



Parts of the Equipment of Car with Bevel-Gear Drive in Paris

At top, left—Bevel gear and pinion with upper half of casing removed.  
 In center—This view shows the frame which supports the floor, together with the car motors, the compressor motor, and the

air tank. All of this weight is flexibly supported.  
 Below—The running gear, with bevel gear and gear casing mounted on axles and brake rigging mounted to act on driving

shaft. The mechanism at the center in the lower view is the conduit plow.  
 At top, right—The brake shoes do not act against the wheels, but against a drum on the driving shaft.

about one-sixth that required with the wheel shoe. In addition, the drum is protected against deposits of mud and dust so that it preserves its original surface. The life of the brakeshoe is thus increased to about four months on the average; that is to say, the life of the brakeshoe from this reason is about four times that of shoes used against wheels, but the weight of the metal worn away is reduced in the ratio of one-tenth.

With the "L" type of car the brakeshoes can be adjusted while the car is at the end of the line and it is not necessary to put the car over a pit. Brakeshoe renewal takes somewhat longer than with the ordinary

type of shoe, but it should be remembered that the shoes wear four times as long as with shoes applied to wheels. The result of experience shows that the total saving in time in shoe renewal amounts to about 50 per cent.

**MOTOR REPAIRS**

The replacement of motors on this type of motor car is simple. It is necessary only to remove the four bolts

which attach the motor to the chassis and disconnect the intermediate shaft with the elastic coupling. The motor is then dropped down on a hoist and a new motor is inserted in the same way. A change of motors in this way can be accomplished by two men in a half day. If done at night, when the car is not in service, no useful time of the car is lost.

Where wheels are to be turned down on a wheel lathe, the car body is jacked up and the wheels taken out with their gearings. But the motor does not have to be removed from the car. The whole axle, with gear mounting, is then put in the lathe. The time required to dismount a pair of wheels, turn them down and replace them takes the time of two workmen for half a day.

**CONCLUSIONS**

The following advantages are claimed:

Reduction in total weight of the cars by the elimination of the truck weight. In the car and equipment this amounts to from 15 to 20 per cent in motor cars of the same capacity.

One of the 475 Cars with Bevel Gear Drive in Paris



A reduction in the non-flexibly supported weight of the equipment on account of the attachment of the motors to the chassis. This has been figured as a reduction in weight of from 30 to 35 per cent in motor cars of the same capacity.

A reduction in motor size and energy consumption.

Better braking with reduced effort, reduced weight of braking equipment and reduced wear of brakeshoes; shoe adjustment more easy and less frequent.

Finally, the new type of car, owing to the great latitude permitted as to the length of wheelbase and because of the low floor available with this construction, permits the use of center or end entrances, hence allows a car design which is best adapted to the conditions on each property as well as a seat arrangement best fitted to local conditions. From these advantages it is possible to conclude that this new type of motor car has a definite future.

### New Style Uniforms for P-O Men

**F**INDING that the blue serge or broadcloth, for many years the standard for uniforms, was not only more expensive but harder to keep clean than some of the newer materials, officials of the Pennsylvania-Ohio Electric Company decided to make a change. A sample uniform of gray whipcord was made up for Inspector Enyeart of the Youngstown Municipal lines and in the course of a few weeks he attended several safety committee meetings in Youngstown and also the various cities served by the company.

Two general types of uniform were made standard, one for car operators, consisting of coat, vest and regulation trousers, and one for bus operators, substituting breeches and black puttees for the regulation trousers. Many of the men were so pleased with this change of uniform that they immediately entered their orders for the new suits even before the local stores had an opportunity of stocking up on them. Later the company decided to present each car and bus operator with the initial uniform in order to effect the change as quickly as possible.

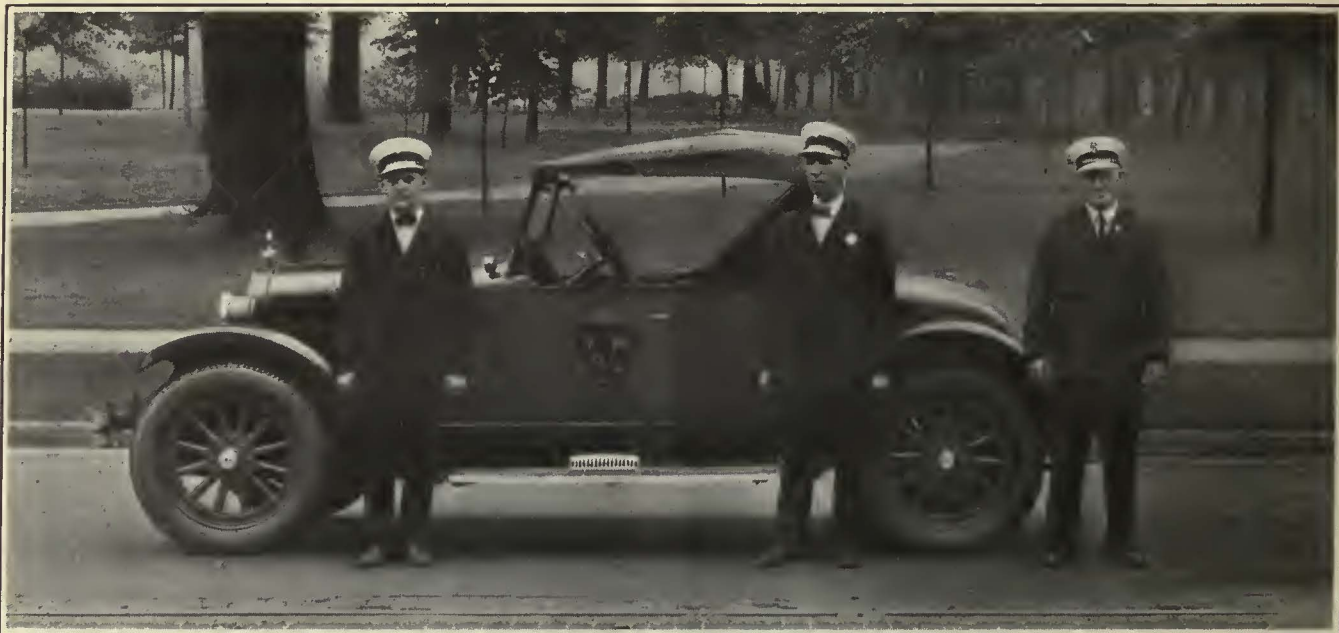


This Gray Whipcord Three-Piece Suit Is Now the Standard of the Pennsylvania-Ohio Electric Company

At left, car operator's uniform. At right, bus operator's.

The accompanying pictures illustrate the standard car operators' type of uniform, the bus operators' and the inspectors' as well. The inspectors' uniform differs in that a white cap is used as a distinguishing mark. On the front of the cap is fastened a metal shield with the insignia of the company. The only place where the trainman's number appears is on the back of the shield, so that it is not visible unless the shield is removed from the cap.

Three of the inspectors are shown standing in front of one of the runabouts assigned to the inspectors. By these cars an inspector may get to a point of trouble quickly. This is considered essential in rendering the quality of service now provided in Youngstown.

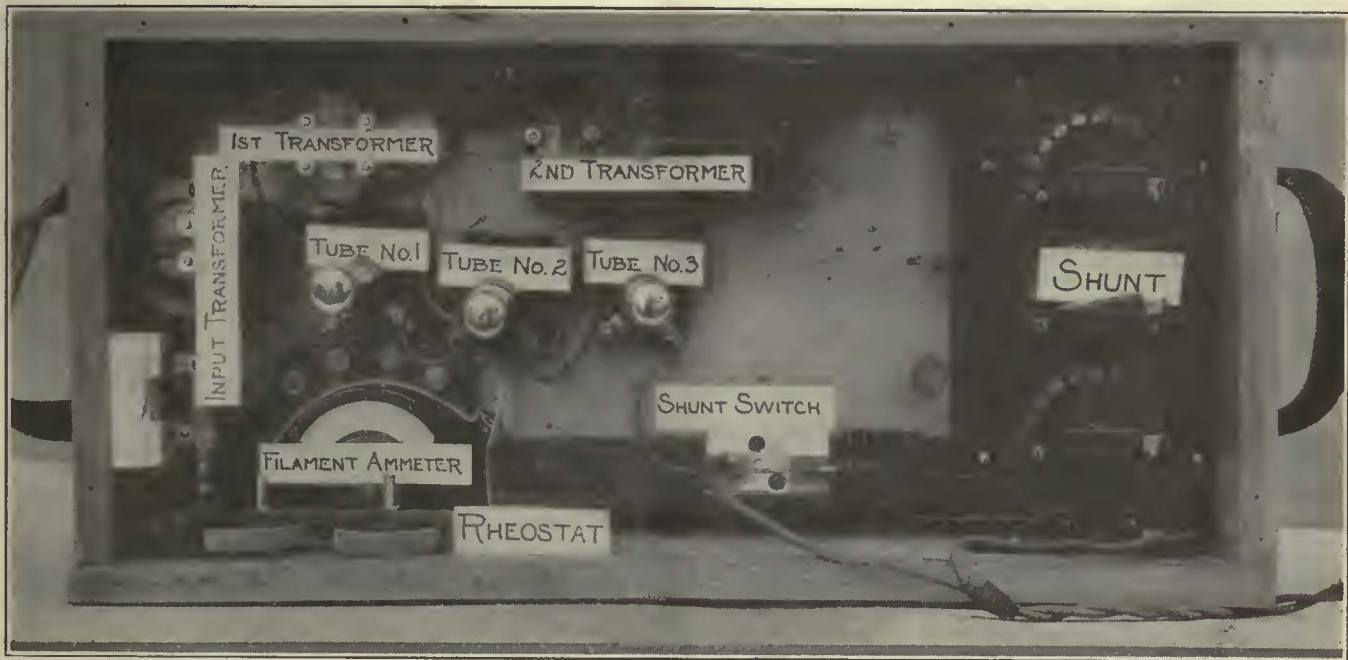


Three of the Seven Inspectors on the Youngstown Municipal Lines Equipped in Their New Standard Uniform of Gray Whipcord. The White Cap Is the Distinguishing Mark of the Inspector. The Runabout Is One of Several Used by Inspectors on Hurry Calls to Points of Trouble

# Recording Apparatus Measures Car Noise

Equipment Based on Radio Principles Developed at University of Wisconsin Through Electric Railway Fellowship of Wisconsin Utilities Association — Startling Possibilities Seen in Comparative Tests — Experiments Were Conducted on Several Wisconsin Street Railways

By James Theron Rood\* and Kent E. Wooldridge†



The Amplifying and Detecting Apparatus Is Compactly Mounted in a Box so that It Is Portable. Tubes Are Mounted on Flexible Supports to Eliminate the Effect of Vibration

**N**OISE of street car operation has been measured during the last year by a device developed at the University of Wisconsin. The results indicate many possibilities. Because this work was a part of the preparation of a thesis, it was naturally allotted a limited time. About two-thirds of the year was spent in the development and construction of a practical measuring equipment that would at once be portable and yet practically unaffected by vibration or other extraneous conditions surrounding the actual use of the apparatus. Only a brief period was left available for actual tests, but many noise measurements were made of car operation in Fond du Lac, Sheboygan, Milwaukee and Madison.

The results accomplished and the tests made, as given in this article, are of significance in that they indicate the extensive possibilities that can grow out of the further development of this method, rather than in the intrinsic value of the tests themselves.

## EDITOR'S NOTE

Kent E. Wooldridge, a graduate student of the University of Wisconsin, was selected by the Electric Railway Section of the Wisconsin Utilities Association to hold for 1925 the fellowship established by that group of railway operators. The subject assigned was the study of noise in the operation of electric cars.

The work was carried on during the college year, in which time Mr. Wooldridge specialized in electric railway operation under Professor Rood, who spent considerable time with Mr. Wooldridge in the development of this equipment. Results of the tests and a description of the equipment are compiled in a volume that is jointly a report to the association and a thesis on which Mr. Wooldridge received his master's degree.

Since graduation, last June, Mr. Wooldridge has been employed by the Chicago Rapid Transit Company as a cadet engineer.

Investigations in the measurements of sound have heretofore been conducted in laboratories and were of scientific value only. Very recently the telephone companies have made studies and measurements of sound in connection with voice transmission and within the year there have appeared descriptions of similar tests applied to the automotive industry. The work at Wisconsin, however, has been devoted directly to the study of noise produced in electric railway operation, both in regard to its quantity and its source or cause.

The apparatus designed and constructed at the university is based upon the principle of sound amplification used in radio reception. In fact, the equipment is fundamentally a three-tube set with the elements selected to give a fairly constant relationship of sound received to energy measured independent of the frequency or type of the sound waves. This required extensive tests of several types of amplifying transformers and loud speakers as well as studies of tube characteristics to obtain uniform results in the measurements of

\*Professor of electrical engineering University of Wisconsin.  
†Chicago Rapid Transit Company.



The Graphical Attachment Is Hand Operated

The movements of the micro-ammeter needle are followed by an operator, always keeping the pointer on the gear wheel opposite the needle. The pen attachment, shifted in accordance with the movement of the gear wheel, produces a graph on the paper tape that is moved at a constant rate of speed by the clockwork.

sounds of different frequencies as well as different intensities. The loud speaker was found to give more proportional variation between sound received and sound measured than any other element of the apparatus. It is believed that some of the better micro-phones used in radio broadcasting have characteristics that would give more uniform results, but such equipment was not available for these tests.

As shown in the wiring diagram, a loud speaker is used for the pick-up of the sound or noise to be measured. The loud speaker element acts as a generator to produce a current of varying intensity in proportion to the sound. This small induced current forms the input to the first of two stages of amplification, two stages of transformer coupling being used. The current is detected or rectified by the third tube. The output is then measured by a micro-ammeter.

In order to produce a graph giving a continuous measurement, a mechanical equipment was constructed that consists of wood gear wheel having approximately

the same radius as the ammeter needle. This gear engages in a rack, also constructed of wood, which is connected to a pen that rests on a paper chart moved at a constant rate by clockwork. By moving the gear wheel forward and backward it was found that the variations of the micro-ammeter needle could be followed quite closely, with the result that a continuous record could be obtained of the noise produced over a run as long as desired. The determinations of speed in the tests were only approximate. When the car passed each street corner in a given run an operator marked the edge of the chart correspondingly. The average speed in that block could then be calculated from the known distance covered and the length of the tape, which was proportional to its speed.

All of the tests made were under like conditions of A, B and C battery voltage so that they were directly comparable. Since there is no standard of noise that can be readily used, the method of using this type of equipment is to establish relative values for different kinds of track construction, different kinds of cars and different kinds of apparatus used on the cars. The

NOISE MEASUREMENT DATA TAKEN IN SHEBOYGAN AND MADISON, WIS.

Curve	City	Amplitude	Micro-Amperes	Relationship, per Cent
3	Sheboygan.....	13.9	1,530	100
2	Sheboygan.....	16.75	1,840	121
1	Madison.....	23.5	2,585	169

Comparison at 20 m.p.h.

values can either be expressed in terms of micro-amperes or in per cent, using one set of conditions as a base.

For instance, the apparatus can be set up in a car and operated over different types of track construction on a property and at several speeds, so as to determine the relative value of the noise produced on each.

PRELIMINARY RESULTS PROVE INTERESTING

Several typical examples of tests made are reproduced in curve and tabular form. Certain conclusions have also been made based on the several tests conducted on the different properties in Wisconsin, some of which are of interest:

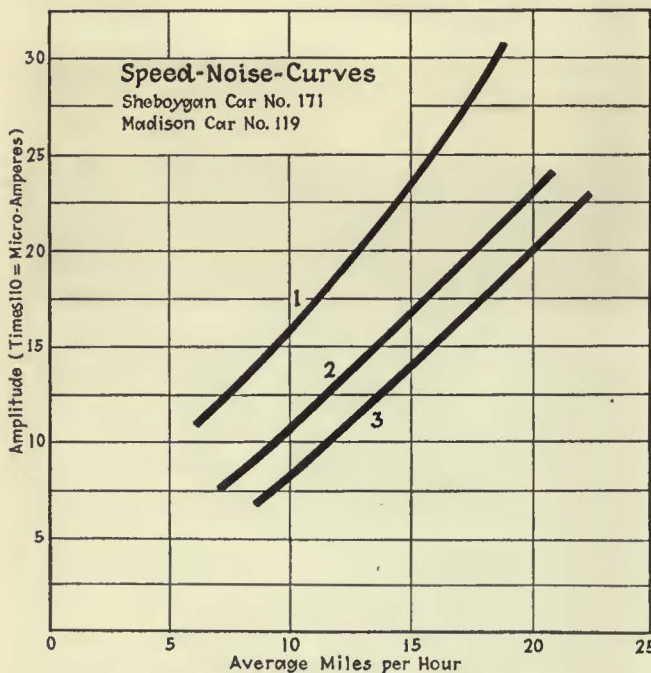
1. Cars running at the same speed over the same track transmit to a passenger's ear about 33 per cent more noise with the windows open than when they are closed (the apparatus is placed in the car so that the loud speaker pick-up is in the center of the car about at the position of a seated passenger's ear). This test gives an indication of the noise-insulating value of the car itself.

2. With the same car run over paved track of the same general type a part of which is constructed with rail insulation of a mastic nature and a part without such insulation, the mastic insulated rail construction showed a reduction of 20 to 25 per cent in noise when running at 20 m.p.h.

3. The noise produced increases at more than twice the rate of speed, roughly in the order of the 1.25 power of the speed.

4. Tests made on cars equipped with different types of gears were considered insufficient to report relative values. It is certain, however, that there is a wide field of opportunity to accomplish noise reduction by the use of quiet running gears. The tests indicate a reduction in noise.

5. Comparisons of tests under widely differing con-



Speed-Noise Curves for Three Tests on Two Different Cars Made in Madison and Sheboygan, Wis.

Curves 2 and 3 are on the same car run over different track construction. Curve 3 is for a different car and in a different city.

Curve 1—Madison—72-lb. 6-in. tee rail on wood ties set in 12 in. of concrete reinforced with wire mesh, concrete paving.

Curve 2—Sheboygan—30-lb. A.S.C.E. tee rail on Dayton steel ties in concrete.

Curve 3—Same as curve 2, but with Carey Elastite rail filler used on each side and on the bottom of the rails.

ditions indicate a reduction in noise heard in the car due to the use of monolithic flooring, rubber cushions under the center plates and insulated side sheathing.

**NOISE ANALYSIS POSSIBLE WITH OSCILLOGRAPH**

A few tests were made to analyze the production of noise over a fraction of a second. The loud speaker pick-up was installed in the middle of a city block and wires were run to the laboratory, where the output circuit of the measuring equipment was connected to an oscillograph. One of the oscillograms is reproduced. The lower curve is a 60-cycle wave from the lighting circuit imposed on the chart for the purpose of measurement. The upper curve is a record of the noise produced as the car passed the loud speaker. Tests such as this may be made of value if further developed in analyzing the types of sounds that all mingled together produce the resultant noise of operation. By the use of harmonic analysis the various frequency components and their relative amplitudes can be determined.

Most of the work done, however, was in the measurement of noise through the deflection of the micro-ammeter needle. Because this is a greatly damped instrument compared to an oscillograph, it responds only to the different volumes of sound produced. When mounted in the car it measures the noise as heard by a car rider. If the same portable equipment were set up on the sidewalk it would measure the effective noise as observed by a person outside. A graph would show an increase in amplitude as the car approached, reaching a peak as the car passed the instrument and tapering off as the car moved away. If the conditions of speed were constant this would give a relative comparison of the noise produced by different cars on the line and might be a fair check as between different kinds of maintenance on the different cars of one type. Likewise the effect of noise-deadening skirts or similar equipment on the car could be accurately determined.

Using the micro-ammeter with the apparatus either in the car or on the curb a speed-noise curve can be produced. By the use of a planimeter the total volume of noise can be measured either per block, per unit of constant speed or for an entire run, as desired.

**NOISE STUDY AN IMPORTANT FACTOR TODAY**

With the coming of the automobile people have become educated to different ideals. Comparisons of street cars today with rubber-tired vehicles bring out clearly the noise feature as one of importance. The human ear is too inaccurate to compare results and it seems imperative that accurate noise measurements must be used in the improvement of car operation. While the actual energy wasted in the production of noise may be small, it may point to equipment defects and is certainly the conscious or unconscious cause of great irritation to those who ride the cars or who live near a car line.

As the elimination of noise primarily requires elimination of the cause

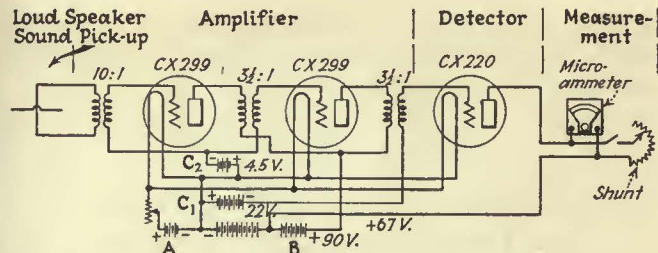


Diagram Illustrating Apparatus and Connections of the Sound Measuring Equipment

The input at the left is through a loud speaker. The small current developed in the coils of the element through the vibrations of the diaphragm is amplified in two stages, then is detected or rectified and measured by the micro-ammeter.

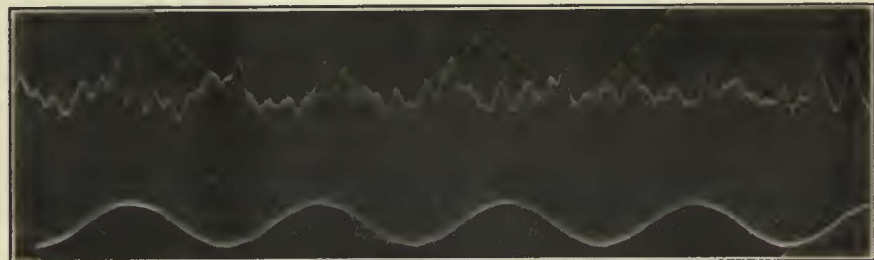
a certain amount will always remain. Of secondary importance is the problem of deadening or absorbing the noise produced and the elimination of features that reinforce the noise.

Roughly, noises can be divided into several types, depending on the source. The first is that coming from the track itself and concerned with it are the types of ties, ballast and paving. The contact of the wheel and rail is a second source. Other sources of noise lie in the trucks, brake rigging, motors and gearing, and the air compressor. The current-collecting equipment is still another source. Noise may originate in the car body, but of greater importance is the sounding-board and resonant effect of the body in amplifying noise produced elsewhere.

So the problem resolves itself into two major parts: (1) The source, and (2) the amplifying or transmitting powers of the equipment and track structure used.

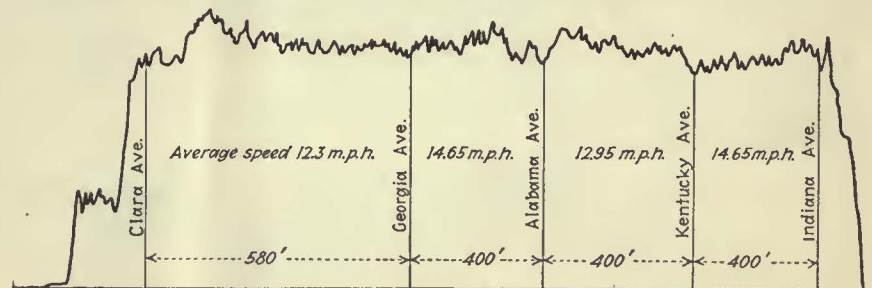
It is hoped that the equipment as developed and the tests described may be helpful in furthering the studies of noise reduction in electric railway operation along broad commercial lines.

So successful has this work been that the Wisconsin



By the Use of an Oscillograph an Analysis of Noise May Be Made

This reproduction of an oscillograph upper curve is the resultant noise. Analysis of this chart presents interesting possibilities in determining the different elements producing noise.



A Typical Graph Produced in a Measurement Taken in One of the Cars at Sheboygan, Wis.

Average speeds are calculated from the area of this speed-noise chart by means of length of paper consumed and the distance between streets being measured. Average Birney car run at moderate speed. Noise volume is measured by obtaining the complete tests were made at different speeds.

Utilities Association plans to continue this work the next college year with Edwin R. Summers, who has been appointed electric railway fellow and will receive the award of \$500 offered by the Electric Railway Section of the Wisconsin Utilities Association.

### 100 Trains Are Moved Simultaneously by Long Island Each Morning

VERY effective advertising is being addressed by the Long Island Railroad "to those who commute" on that road. Especially interesting are some of the facts spread broadcast about the extent of the company's electrification program, particularly within the limits of the city of New York. Of this the company said:

All freight and passenger service located within the city limits must, according to state law, be operated by other than steam power by Jan. 1, 1931. This means that steam locomotives cannot be used to haul passenger and freight trains or for switching cars.

In order to carry out this requirement of the law the Long Island Railroad must spend about \$13,000,000 on a program which has already been approved by the Public Service Commission. Not only main tracks but also yards, sidings, float bridge approaches and shops must be equipped for electrical operation.

Electric locomotives must also be provided to haul through passenger trains to Jamaica instead of Long Island City for interchange with steam locomotives. Later on arrangements must be made to keep steam locomotives out of Jamaica. Large capital expenditures must be made, too, for power house and substation equipment.

To relieve congestion at terminals and on trains during rush hours three things are recommended:

1. Adoption of the plan to establish a new terminal at Diagonal Street, in Long Island City. This project can be completed within twelve months from the time the city authorities give their sanction to proceed with the work.
2. Co-operation with the so-called stagger plan now being proposed by the Department of Health, city of New York.
3. Prompt extension of the city's proposed subway line to Jamaica.

About 1,200 passenger trains are moved over the Long Island Railroad every day. They carry between 275,000 and 400,000 passengers daily. At 8 a.m. approximately 100 trains are moving simultaneously.

### More Passengers in Milwaukee

COINCIDENT with the distribution of the regular quarterly dividend of \$1.75 per share to the 11,126 customer owners of the Milwaukee Electric Railway & Light Company, Milwaukee, Wis., S. B. Way, president, announced that \$8,541,000 of 6 per cent refunding first mortgage bonds had been called for redemption as of Sept. 1 and that they will be refunded with 5 per cent bonds. During the fore part of the year the capital structure of the company was materially strengthened through the retirement of a part of its funded debt. Bonds now constitute 55 per cent of the total capitalization.

In a statement which accompanied dividend checks Mr. Way declared that the company experienced a striking growth in business by its electric railway and electrical departments. For the first six months of this year the number of railway and bus passengers jumped to 106,706,000, against 102,498,000 carried for the first part of 1925, a gain of about 4 per cent. This increase in traffic is attributed to the difficulty which motorists are experiencing in parking their cars in the restricted business district and to the introduction of increased service through the use of additional one-man cars.

### Teaching Safety Lessons in Minnesota

PUBLIC attention was arrested in St. Paul, Minn., recently by a street car of the Twin City Rapid Transit Company which was thoroughly bedecked with safety slogans to induce closer observation of Safety Week in that city. Among the labels on the cars were such ominous warnings as: "Accidents Make Many Orphans," "Co-operation Means Your Safety and Ours—Watch Your Step," "This Car Weighs 20 Tons—Give It a Chance," and others. As a selling appeal for street car transportation the care bore along the edge of the roof at each side the slogan, "The Safest Place Upon the Street." The car was operated over all of the lines in St. Paul and caused much discussion on the part of the public.



The St. Paul Safety Car Carries Its Own Messages



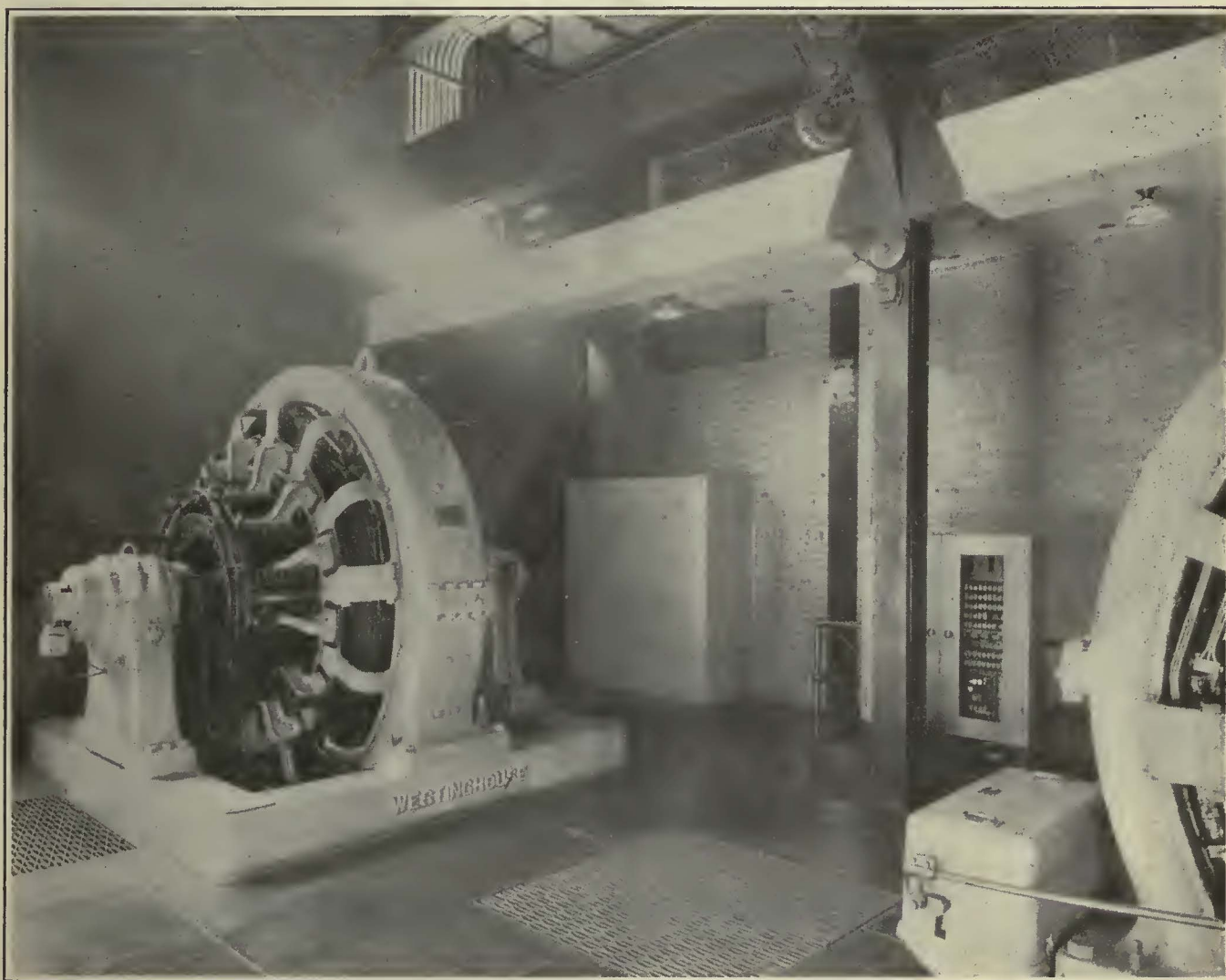
# Cleveland Railway Extends the Use of Automatic Substations

SECOND ARTICLE

By *L. D. Bale*

Superintendent of Power the Cleveland Railway

Experience with Earlier Equipment Helped in Layout of Stations and Building Design—Standard 1,500-Kw. Converters Are Used Throughout—Steel Barriers Isolate High-Tension Equipment—Reliability Features Entire Design



General View on the Main Floor of a Two-Converter Substation, One of Seven Recently Constructed by the Cleveland Railway  
Against the rear wall is a steel cabinet which contains the converter low-tension starting switches, the pneumatic contactors for shunting resistance into the converter circuit and the substation's remote control cabinet.

BASED upon experience gained in the operation and maintenance of the three stations of the earlier type an extensive study was conducted to determine the actual requirements of a building which would most economically house the equipment comprising an automatically controlled substation. Accordingly a layout was devised wherein the areas within the building were utilized to the fullest advantage, resulting in a very compact arrangement, with, however,

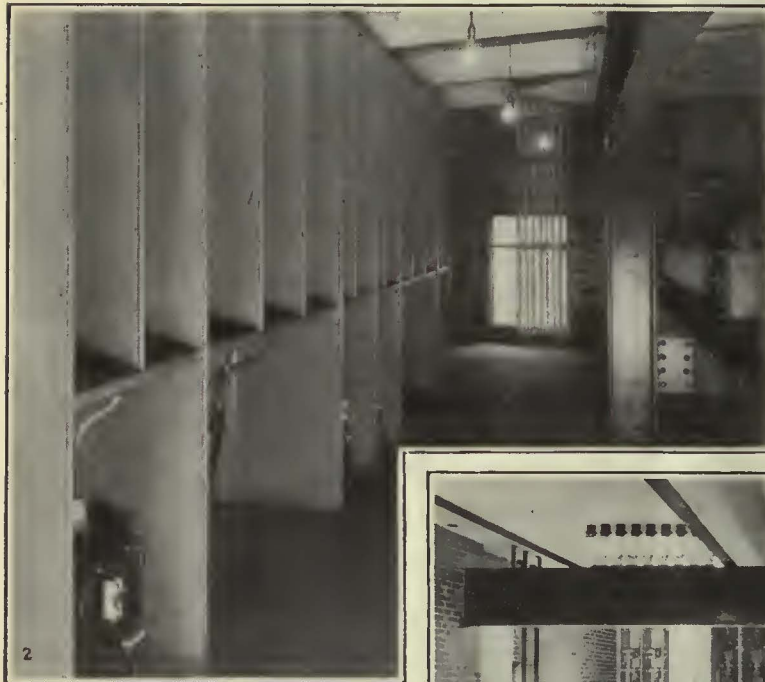
ample clearance for safe operation and maintenance of all equipment.

The seven new substation buildings are identical as to interior arrangements and dimensions. The exteriors, however, were varied somewhat regarding architectural details and texture of face brick in order to agree with surrounding structures. In one instance, station No. 15, the station proper is situated on one corner of a large plot of ground upon which it is in-

### High-Tension Details of Cleveland's New Automatic Sub- station

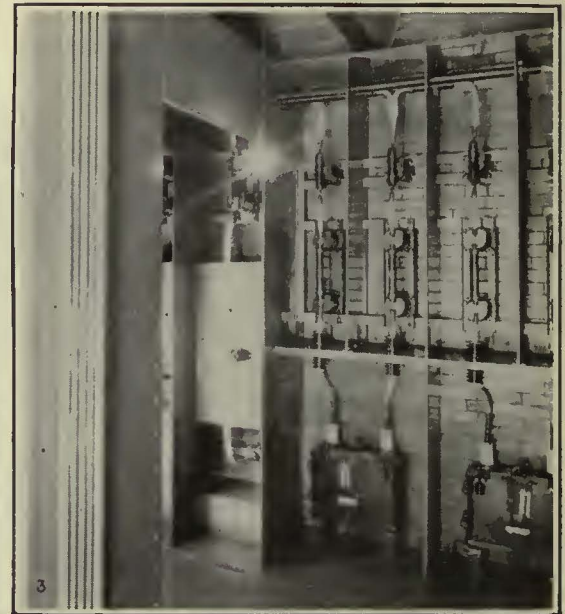
No. 1. The main 11,000-volt oil switches controlling each of the two incoming underground lines are installed on the mezzanine floor. Steel barriers provide phase isolation.

No. 2. A general view of the mezzanine floor, showing the steel barriers to the left and the end of the crane over the main operating room to the right.



building on the system. The buildings are of fireproof construction throughout and are completely equipped with all necessary facilities, including 15-ton, hand-operated, bridge-type cranes.

The method adopted for the natural ventilation of these stations is similar to that of the former automatic substations. Briefly, this arrangement consists of a large ventilating area under the converters, which extends across the width of the building. This area is connected with the exterior of the building at each end by means of air wells. Much of the warm air from the converters is carried



No. 3. Another view on the high-tension balcony showing a further use of the steel barriers for phase isolation. These steel barriers were constructed on a template and are therefore interchangeable.

No. 4. Looking into the mezzanine floor, showing a general view of the high-tension compartment.

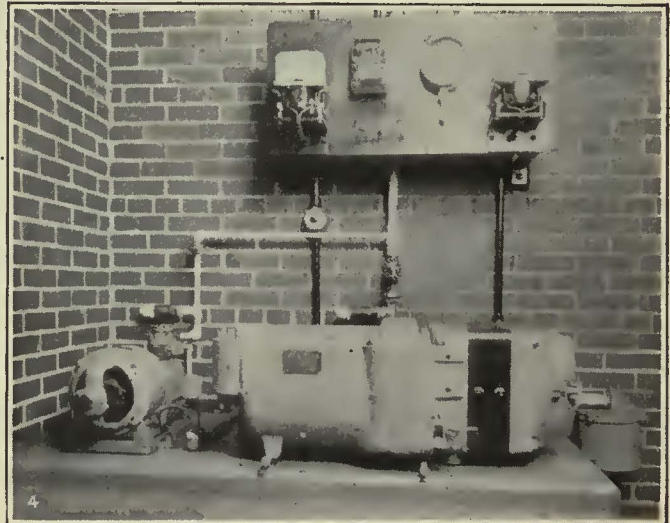
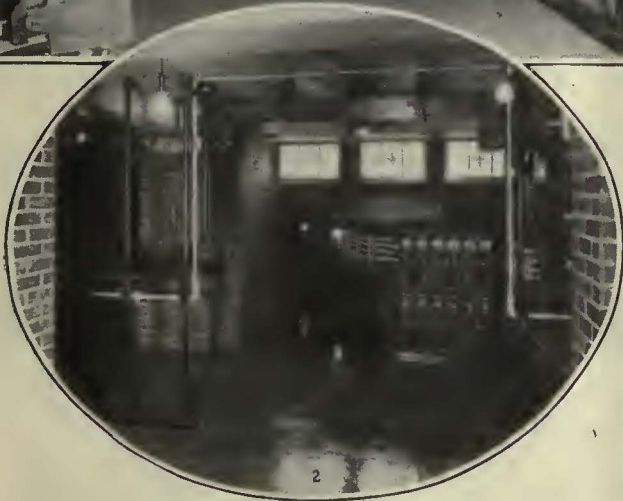
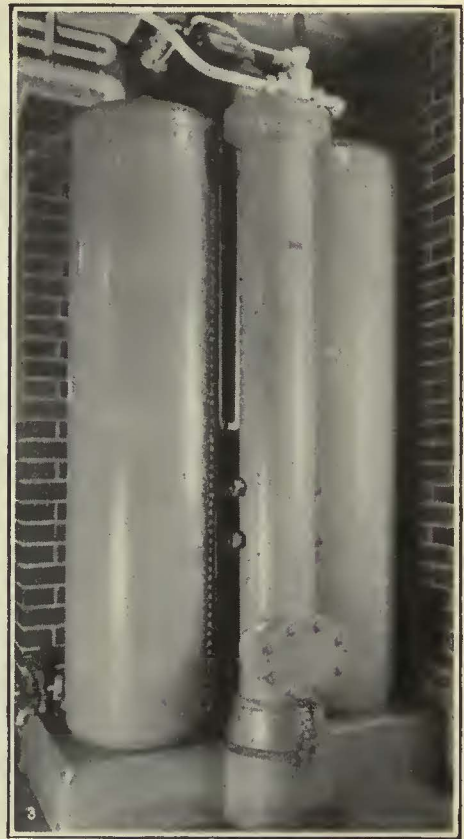


tended to erect a three or four story power department service building. The walls of this substation building are to be incorporated in the proposed structure and were, therefore, arranged accordingly. With the exception of the latter station all the buildings are surrounded with more or less lawn space and further enhanced in appearance by the use of shrubbery.

The dimensions of these buildings are 36 ft. 10 in. wide by 39 ft. 1 in. deep by 40 ft. 7 in. from basement floor to underside of roof steel. Each building contains 44,000 cu.ft. This is equivalent to 14.6 cu.ft. per kilowatt of installed capacity, based upon 3,000 kw. This represents a 45 per cent reduction in cubical content compared with the earlier type of automatic substation

out of the building by way of this area. Openings are provided under the front entrance from which ventilation is furnished for the main operating floor through floor gratings, in addition to air from the basement area through the stair well. Heated air is exhausted from this portion of the building through a 56-in. ventilator located on the roof in line with the magnet frames of the converters. Station No. 14 is an exception, inasmuch as three 36-in. ventilators have been provided, grouped in line with the converters. The elimination of the transformers from the building proper and the placing of the current-limiting resistance on the roof simplify the problem of ventilation.

It will be noted, by referring to the longitudinal sec-



**In the Basement of the Cleveland Automatic Substation Is Installed the D.C. Connections and Auxiliary Equipment**

No. 1. Directly below the converter in the basement is installed a pneumatically operated positive converter contactor and the main and auxiliary d.c. contactors. This view shows the equipment for a substation with one 1,500-kw. unit. A second set of contactors is added in stations with two units.

No. 2. At the entrance to the outgoing d.c. feeder tunnel is installed a negative drainage panel for the mitigation of electrolysis.

No. 3. In the basement near the compressors are two air storage tanks each of 11.2 cu.ft. capacity. One is used for the operation of pneumatically operated contactors and the other for air cleaning around the station. A governor is arranged so that the tanks used for the operation of the contactors is not depleted. The middle cylinder is a dehydrator and contains 2.2 cu.ft. of calcium chloride, which lasts five months. By chemical analysis 70 per cent of the moisture in the air used in the operation of the station is removed by this process.

No. 4. Two air compressors are installed. The large one, generally used, is a standard 25-cu.ft. car type compressor supplying air to two reservoir tanks. In case of total failure of the station the small auxiliary unit shown at the left is available. This consists of a 3-cu.ft. compressor driven by a 110-volt motor using energy from the station storage battery.

tion drawing, that the building may be divided into five general sections based upon the grouping of the equipment. These divisions and the principal items of equipment which they contain are as follows: Main or operating floor, control board and converters; basement, all outgoing direct-current cables and contactors, positive converter contactors, direct-current buses and a majority of the station auxiliaries; mezzanine, all high-tension switching equipment, high-tension bus structure, etc.; transformer vaults, the main static transformers; roof, all current-limiting resistances.

The alternating-current supply, as is customary on this system, is obtained through duplicate underground 11,000-volt, three-phase, 60-cycle, grounded neutral lines, normally tied in parallel through the a.c. bus at the substation end. Each line is of sufficient capacity for the supply of both converters at rated load. The lines are protected by inverse-time-limit overload relays at the generating plant, while at the substation only instantaneous reverse-power relays are installed. This arrangement allows either of the a.c. lines to be disconnected, through routine operation or by reason of trouble occurring upon them, without interfering with the continuity of service of the station. Each line is connected with the a.c. bus at the substation through a 600-amp. oil circuit breaker, non-automatic except through the action of the reverse-power relay.

All high-tension equipment is isolated from the remainder of the building by its location on the mezzanine floor, which is utilized only for this purpose.

The use of all-steel barriers, shown in four of the illustrations, was resorted to in order to economize space and to produce an economical high-tension bus and phase-isolating structure. These barriers were laid out with templates and, therefore, the various sections are interchangeable. Erection of this type of barrier not only facilitated construction but produced a satisfactory, light-weight structure at about half the cost of the customary brick and stone compartments.

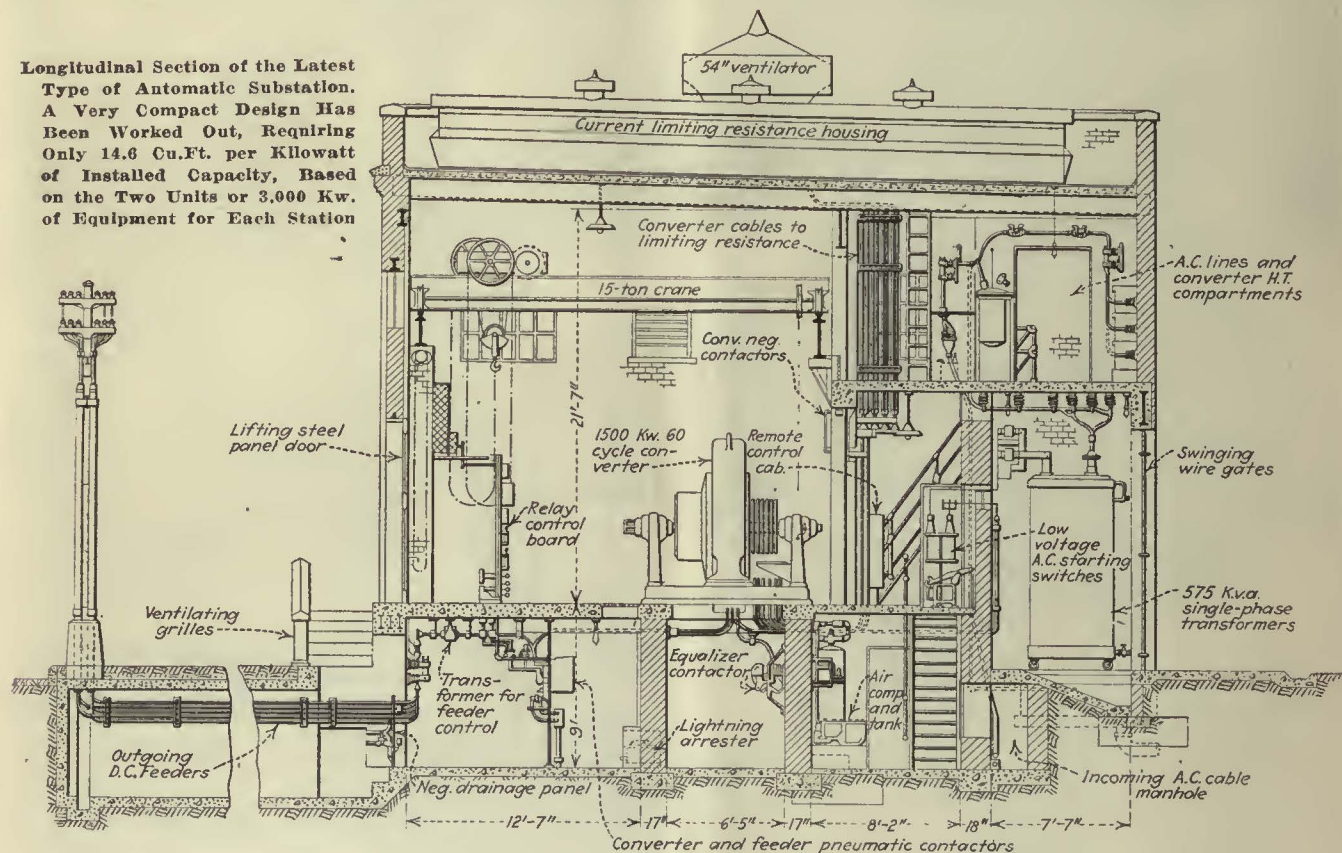
Connection from the converter high-tension oil switch is made to the single-phase, 550-kva. power transformers located directly beneath. These transformers are oil-insulated and self-cooled. They are arranged three to a compartment, with facilities for natural ventilation and the drainage of oil.

The starting and running connections between the transformer secondaries and the 1,500-kw. converter are made through two 2,000-amp., heavy-duty, solenoid-

possessing a relatively high drop-out point and pick-up point expressed in per cent of solenoid operating voltage. Adoption of the magnetically operated contactor for the control of outgoing d.c. feeders to a railway system on which a large proportion of the conversion equipment consists of automatic substations of relatively small capacity would result in a situation where, in the event of trouble affecting one or more stations in an area, under peak-load conditions, the potential on the buses of the station affected would likely become sufficiently low to allow the contactors to unseal or drop open, thus isolating the station or area. It was deemed advisable, since the program of the railway calls for complete automatization, to discontinue the use of a contactor which was subject to the above difficulties and adopt one whose operation would be independent of voltage conditions of the station bus.

Air supply for the operation of pneumatic contactors

Longitudinal Section of the Latest Type of Automatic Substation. A Very Compact Design Has Been Worked Out, Requiring Only 14.6 Cu.Ft. per KIlowatt of Installed Capacity, Based on the Two Units or 3,000 Kw. of Equipment for Each Station



operated oil circuit breakers. These breakers are inclosed in a steel cabinet, provided with oil drains and located on the main operating floor on the opposite side of the transformer vault wall.

The d.c. energy for both converter and outgoing feeders is handled through electro-pneumatically operated contactors similar to those utilized in electric locomotive work. One of the illustrations shows a typical rack containing the main positive contactor, connecting the converter to the main bus, and the main and auxiliary feeder contactors for one-half of the outgoing d.c. feeders of the station. The controlling relays, etc., for these contactors are mounted on the main control board on the floor above.

The conditions leading up to the adoption of the electro-pneumatic contactor in preference to the magnetically operated contactor are of interest. This latter contactor is more or less standard equipment for automatic substation use, but it has the disadvantage of

is obtained from a standard 25-cu.ft., 600-volt d.c. car type compressor as a main source. A 3-cu.ft. compressor, operating from the 110-volt station control battery, is installed for emergency purposes and automatically cuts in on the failure of the main compressor. These compressors are illustrated herewith.

The air storage consists of two 11.2-cu.ft. tanks. One tank comprises the main reservoir from which air is supplied for the operation of contactors. The second tank furnishes air at reduced pressure for cleaning purposes about the station. The air flow between tanks is controlled through an auxiliary devices governor, thus assuring that the pressure of the main reservoir will not be lowered to a point which would jeopardize the successful operation of contactor during cleaning periods.

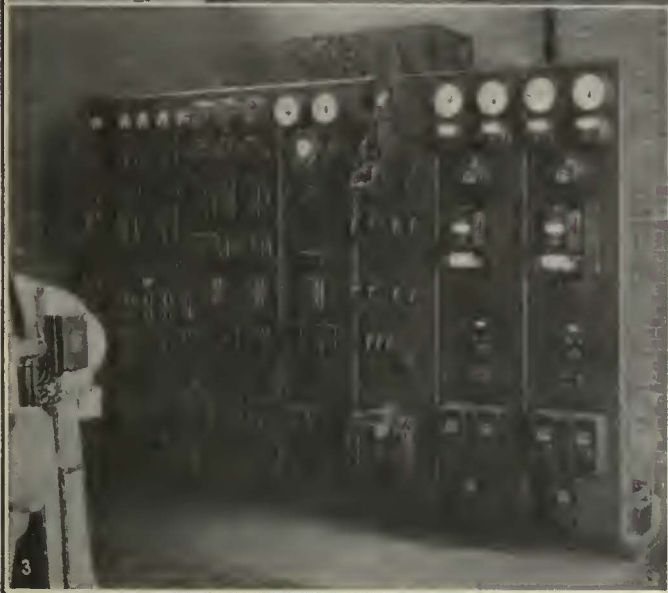
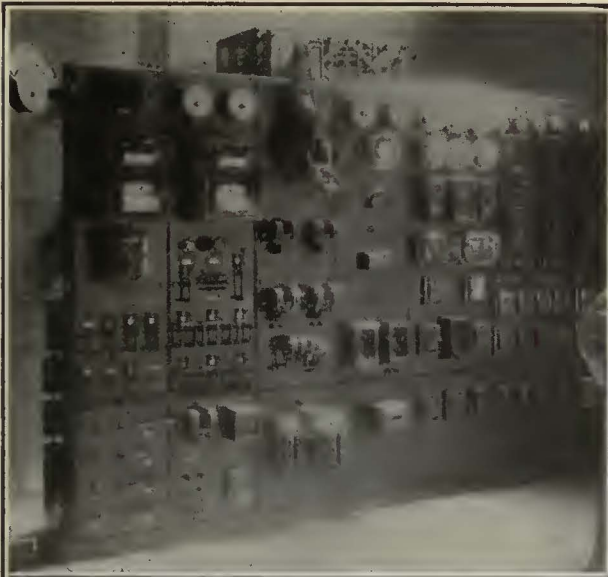
In the initial operation of these stations considerable difficulty was experienced with the high moisture content of the air delivered to the contactors. This resulted in corrosion of the piping system and the pistons,

## Switchboards Are Well Balanced

No. 1. On the right control board, from left to right, the first two panels contain the control for station auxiliaries and lighting switches for the main control circuits of the converters, wattmeter sender for remote metering, curve drawing voltmeter, etc. The next three panels contain control for one converter and the remaining three panels control five outgoing d.c. feeders.

No. 2. The two control boards for a two-unit, automatic substation are separated by the main doorway.

No. 3. A near view of the left control board for a 1,500-kw. automatically operated rotor converter. From right to left, the first two panels contain the control equipment for the incoming a.c. line; the third, fourth and fifth panels control the converter, and the sixth and seventh control the four outgoing d.c. feeders. The eighth panel on the left has mounted on it the air-operated sequence drum used to obtain simultaneous operation of the contactors of both units in the station.



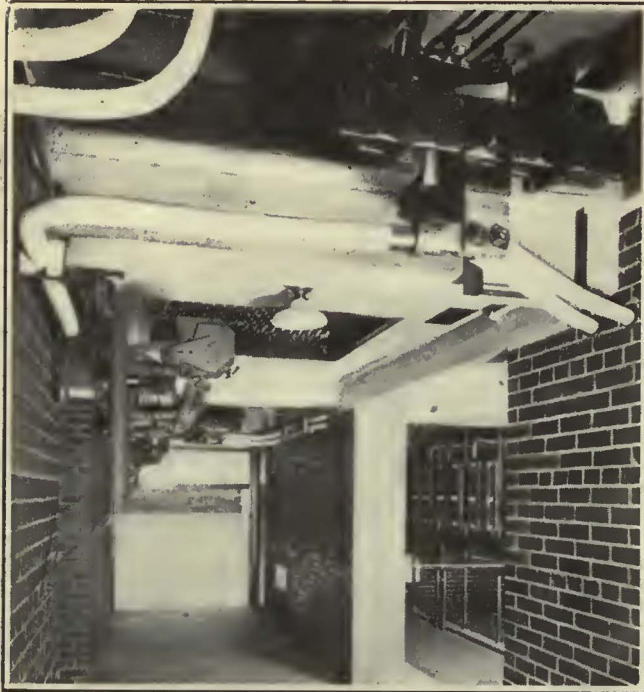
steps, with values calculated to give operation continuously, or nearly so, thus assuring continuous operation of converters in the event of undue or severe overloads. This resistance is shunted into the negative side of the converters by pneumatically operated contactors shown in one of the illustrations.

A heavy-duty current-limiting resistance is normally connected between the two positive buses of the station, main and auxiliary. The object of this is to supply energy to the auxiliary bus for the clearing of faulty feeders which have been automatically transferred from the main bus to the auxiliary bus as a result of short-circuit conditions. This resistance is under the control of the dispatcher. Energy through it may be supplemented or augmented by tie feeders transferred by the dispatcher from the main to the auxiliary bus.

All current-limiting resistance is located in steel cabs on the roof of the building. The maximum of natural ventilation is afforded in this position, in addition to keeping the building cubical content down to a minimum. The steel cabs containing the resistance grids are illustrated herewith. The control of resistance-shunting

cylinders and control valves of the contactors. Experiments were conducted, using various mechanical moisture extractors, with little or no success, primarily due to the extremely small flow of air occasioned by the operation of a contactor. The elimination of moisture was finally attained by the use of a chemical dehydrator. This contains 2.2 cu.ft. of calcium chloride. On the average, as determined by chemical analysis, it removes 70 per cent of the moisture during the five months life of one charge of chemical. The air reservoirs with the dehydrator in the foreground are shown in one of the pictures.

The current-limiting resistance is arranged in three



Directly Underneath the Converter Is a Large Ventilating Area. The D.C. Connections and the Positive Converter Contactor Are Seen

contactors, where two converters are located in the same plant, has in several instances presented a problem. This was due to the difficulty of securing simultaneous operation; i.e., of preventing pumping of contactors (interchange of load) of the two units when subjected to overload. This phase of the control has been decidedly simplified in the stations under discussion by the utilization of an electro-pneumatic sequence drum in connection with the pneumatic contactors. Control of the contactors of both units through the action of this drum insures their simultaneous operation. Sensitive relays, which function in conjunction with transformers located in the main leads of the converters, control the operation of the sequence drum. This device is an adaptation of the "notching-up" relay used in automatic acceleration of multiple car unit equipment.

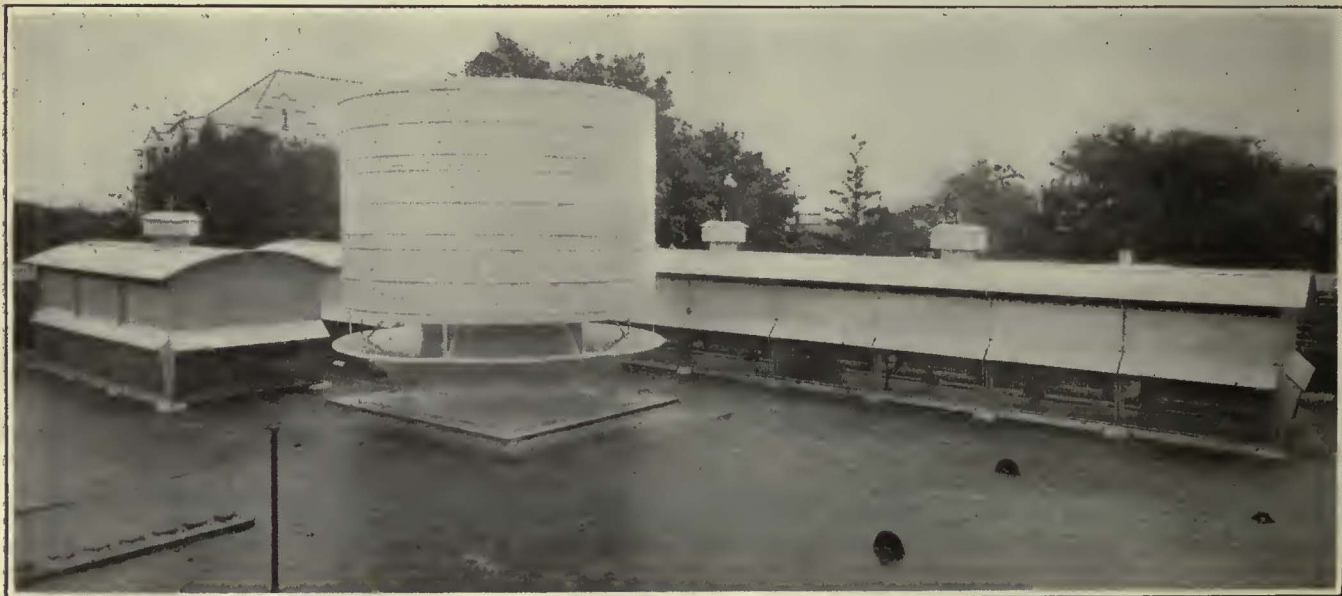
It will be noted that the main control board is structurally balanced, thus presenting a pleasing appearance. This board contains the control of all major and auxiliary equipment of the station. No heavy-duty buses or equipment are mounted on it, with the exception of one manual circuit breaker per converter, which is operated only in the event of overspeed of the converter.

Each station is complete with a 125-volt, 150-amp.-hr. storage battery, floated on the control bus with a differentially wound, 5-kw. motor-generator set. A center tap is taken off this battery for the supply of energy of the remote control and supervisory system. The combination of the battery and motor-generator set supplies a dependable source of energy for the operation of important items of converter and, particularly, feeder controls which must be depended on to operate satisfactorily over a rather wide range of conditions.

The small contactor board shown in the center background of the illustration on page 419 comprises the negative drainage board. This is standard equipment in all the Cleveland Railway substations. It is utilized to control the connections between subterranean structures (pipes, cable sheaths, etc.) and the station negative bus for the mitigation of electrolysis. The rail connections from the station negative bus are tapped to rails at points sufficiently distant to establish an area immediately adjacent to the station in which underground structures are drained. The potential difference of, and the current flow over, underground structures may be varied if desirable by the introduction of resistance in the connections.

### Automatic Parcel System for Chicago

THE Chicago Rapid Transit Company has lately installed steel lockers known as the "Automatic Parcel System" at all Loop stations. They are placed at convenient points either in the stations proper or on the platforms. Each locker is individual and the keys are numbered to correspond with the number on the locker. The shopper places his, or her, package in the locker, drops a dime in the slot in the lock, turns the key and carries it away as a check. All that is necessary to obtain the package is to insert the key and open the locker. Hundreds of shoppers are using these lockers.



On the Roof of the Substation Is a 54-In. Ventilator and the Current-Limiting Resistance, Mounted in a Steel Cab. The bus tie resistance used to burn off short circuits on the line is also shown. This view was taken on the roof of a single-converter station. Duplicate equipment of resistances is installed on two converter substations.

# Maintenance Notes

## Lubrication Basis for Gears and Pinions

DESIRABLE inspection and lubrication periods for gearing were discussed at the semi-annual meeting of the Electric Railway Association of Equipment Men, Southern Properties. Of the various railways reporting, Knoxville inspects gearing and puts in gear compound every 30 days. Chattanooga makes an inspection at from 800 to 1,000 miles and lubricates if necessary.

Memphis and Little Rock have inspections every week and apply grease when needed. New Orleans has a 1,000-mile inspection basis, with lubrication when needed. Dallas inspects every 1,500 to 2,000 miles in interurban services and every 500 miles on city cars. This company has found that weather conditions have much to do with the lubrication and so it does this work when necessary. Birmingham has a 1,000-mile inspection period and lubricates every 60 days during warm weather.

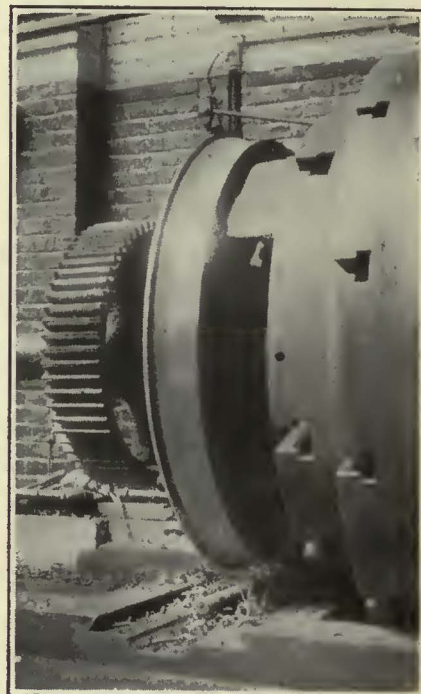
The company has found that safety cars do not need lubrication as often as other cars operated, the period for these usually running about 90 days. Mobile makes a weekly inspection and lubricates when necessary. Atlanta lubricates every 1,000 miles.

## Canvas Liners Reduce Brake Rigging Noise

PIECES of canvas soaked in linseed oil paint are placed between brakeshoe heads and their hangers and at connections to brakeshoe beams on cars of the Department of Street Railways, Detroit, Mich. These canvas pads cut down vibration and so reduce noise. This method of installation insures a full surface contact and makes a tighter fit, so there is less danger of bolts and nuts working loose. The company also uses fine thread bolts which are S.A.E. standard, as it has been found that they have less tendency to work loose under vibration. Standard roofing canvas is used for the shims.

## Machining Steel Wheels Before Building Up

REVERSING the usual process with regard to machining and building up car wheels by means of welding, the Holyoke Street Railway, Holyoke, Mass., follows the practice of first machining the wheels to approximately the right cross section across the tread and then building up around the flange to restore the desired section throughout. The major portion of metal is turned from



Turning a Steel Wheel Before Building Up with the Welding Process

inside of the tread, adjoining the flange, thus making it possible to obtain a smooth tread with a minimum loss of metal. The welding process which follows simply restores the flange to the proper thickness and shape.

It has been found possible to build up the flange with such accuracy that only a slight amount of turning is necessary to finish the surface and complete the operation. In the accompanying illustration a wheel is shown after the preliminary machining has been accomplished and the wheel made ready for the building up process.



Installing a Canvas Pad at the Center Connection to the Brake Beam in the Shops of the Department of Street Railways, Detroit, Mich.

## Using Oversize Steel Sleeves on Armature Shafts

**M**ANY railway properties have adopted the practice of shrinking steel sleeves on worn armature shafts, thus bringing the diameter back to size. The Concord Electric Railways, Concord, N. H., however, is perhaps the first to use sleeves

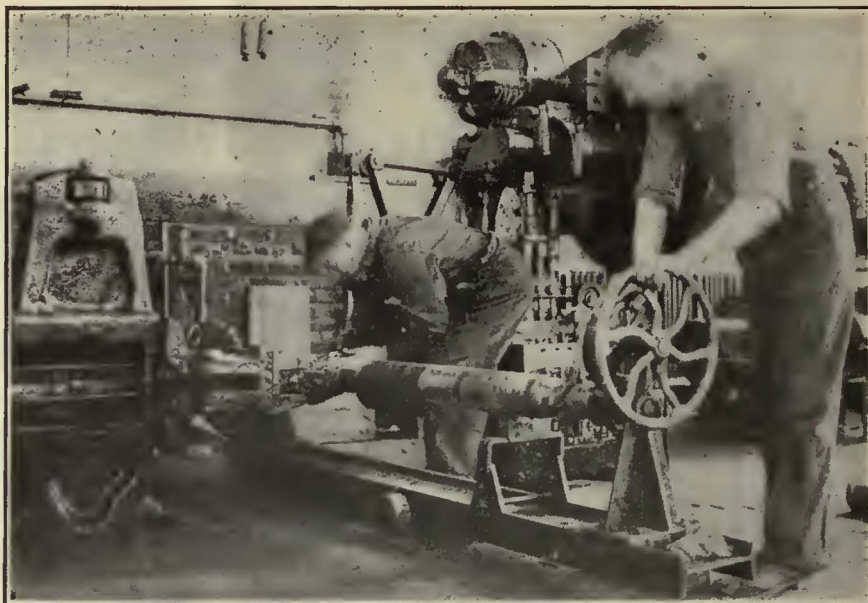


On the Right Is One of the Solid Brass Bearings, While a Section of Seamless Steel Tubing Used for a Sleeve on the Armature Shaft Is Shown on the Left

with an outside oversize dimension. After the armature shafts on that property have worn down to a minimum diameter of  $\frac{1}{8}$  in. below the standard a Shelby seamless steel tube with an outside diameter of from  $\frac{3}{8}$  in. to  $\frac{1}{2}$  in. over the normal dimension is shrunk on the shaft, its length being sufficient to fit snugly in under the thrust collar.

Solid brass bearings, made by the J. F. Hodgkins Company, Gardiner, Me., are used with the armature shafts which have been treated in this fashion. These were adopted when it was found that the babbitted steel bearings normally used were not entirely satisfactory for use with the oversize shafts. The motors are of the GE-67 type, specially equipped with Ransom vacuum oilers.

Occasionally a thrust collar will become worn before the oversize sleeve has again been worn down to the standard diameter. When this happens, making it necessary to remove the collar, the shaft is machined to normal size, the collar is removed and the armature may be operated with regular babbitted bearings. Generally, however, it has been found that the thrust collars remain in fairly sound condition and



Bent Axle Being Straightened by Use of an Old Wheel Press in the Cleveland Railway Shop

need not be changed during the life of the reconditioned shaft. The tubing is purchased in long sections and cut to size when needed.

## Wheel Press Used to Straighten Bent Axles

**S**TRAIGHTENING of axles is done in the shop of the Cleveland Railway with the assistance of an old wheel press. The special attachments for doing this work were described in the *ELECTRIC RAILWAY JOURNAL* for Oct. 19, 1918. As shown in the accompanying view, the axle is first mounted on a portable carrier, fitted so that it may be revolved. A workman seen at the right can revolve the armature quite rapidly by means of a hand wheel

which turns the axle through a gear and pinion. The workman to the left holding a piece of chalk can mark the section that is out of line. The axle is placed against two horizontal supports seen to the left. When the axle is accurately placed against these supports the thrust arm of the wheel press is advanced against the axle. This process of measurement and straightening is repeated until the axle is straightened.

## Portable Slotter Used in Huntington

**U**NDERCUTTING of mica on commutators is done by a small circular saw driven by a motor through a flexible connection in the repair shop of the Ohio Valley Elec-



Portable Undercutting Slotter Used in Huntington, W. Va.



tric Railway at Huntington, W. Va. The saw is held in a heavy handle as shown in the illustration. It is moved along the slot by hand and guided by eye. The driving motor is supported in a hanger from a rig that is movable within a limited range.

### New Housings for Los Angeles Railway Motors

**E**XCESSIVE wear of bearings and motor frames, together with frequent troubles with babbitt-lined bearings, has caused the engineering department of the Los Angeles Railway, Los Angeles, Cal., to inaugurate an extensive program for the rehabilitation of its Westinghouse 306-L railway motors. The company has 710 of this type in operation which have been in service since 1910.

The work to be done will include the boring out of the motor frames and the installing of new housings. The new housings are patterned somewhat after the design used by the Public Service Railway of New Jersey, which was described in the *ELECTRIC RAILWAY JOURNAL*, Dec.

20, 1924. In addition to providing new housings, the motors will have solid Kelley metal bearings and Rico oilers.

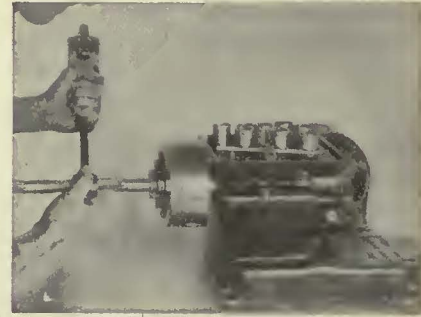
These motors have a large porthole in the motor frame at the commutator end. Trouble has been experienced in wet weather from water and mud entering this opening and causing grounds or short circuits of fields. A test of the temperature rise during the summer season on motors was made with the portholes covered up, and it was found that they could be operated without undue heating if the hole was done away with, so the new design provides for the elimination of this.

The work of making these changes has been completed on 32 cars or 64 motors. The program is being carried out as the cars are brought in regularly on the overhauling schedule and the work will extend over a period of two years. A wonderful improvement in the operation of these motors has been found on the cars already overhauled. Service of this railway is very exacting, but the improved motors have produced a material reduction in field coil and armature troubles.

cord, completing the equipment and making the lamp vapor and dust proof.

### Power Reamer to Do Work of Old Hand Reamers

**W**ELL adapted for general machine shop use, but particularly valuable for reaming bushings and small compressor crankshaft bearings, a new motor-driven reaming machine has just been placed on the



Reaming Out a Bushing by Means of the New Power Reamer, "Reamo"

market by the Van Norman Machine Tool Company, Springfield, Mass. The new machine, called "Reamo," is a compact bench type, driven by a Westinghouse motor at a speed of 30 r.p.m. It produces a smooth polished job free from chatter and the work when finished resembles a broached bearing. For ordinary operation the work is held in a natural position at the waistline of the operator so that the reamer enters and follows through one or both bearings in a straight line. The work can then be withdrawn from the reamer while it is still turning, thus leaving no marks on the bushing or bearing. When the reamer has been set for the correct size the bearing can be reamed rapidly. The Reamo takes reamers up to 1½ in. diameter.

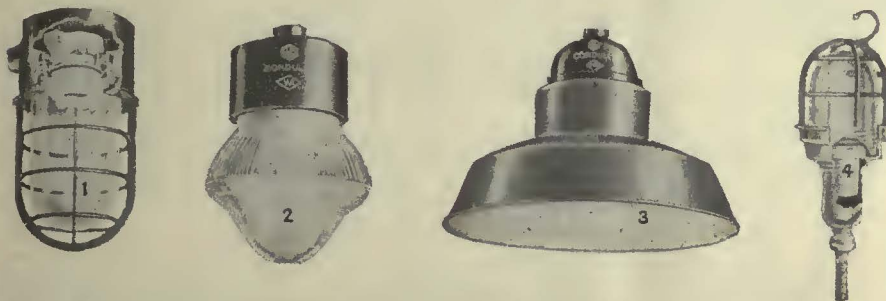
## New Equipment Available

### Vapor and Dust Proof Condulets

**F**OR electrical installation of lighting or other wiring where vapors, fumes, gases or dust are present the Crouse-Hinds Company, Syracuse, N. Y., has just placed on the market a new series of condulets, hand lamps, switches and fuse boxes. These are particularly suited for installation in paint storage, gasoline storage, general oil storage and woodworking plants. Condulets of the V series have hubs cast solid with the body. The globe is threaded and screws into the condulet so as

to bottom on a flat gasket. This series provides for installation of screw guards as well as various types of reflector units.

For portable lighting a vapor-proof hand lamp of similar construction is provided. It has a swinging bail, a watertight cord outlet with cord reinforcement to prevent chafing, a key receptacle with lamp grip and a watertight operating handle for the key receptacle. The body is aluminum and the guard, including the base, is brass. The handle is provided with a stuffing box which consists of a gland nut and tapered rubber plug which surrounds the



Vapor and Dust Proof Condulets Used in Lighting Installations. No. 1, Screw Guard; No. 2, Condulet Holophane Reflector; No. 3, Porcelain Reflector Unit; No. 4, Hand Lamp

### Direct-Current Time Relay

**A** DEFINITE time relay for operation on direct-current circuits has been designed by the General Electric Company. This is made in two forms, designated as type MC-12, one for 115-volt operation and the other for 230 volts.

The new relay is designed to operate within a range of from five seconds, minimum, to 35 minutes, maximum. An extra lead is brought out through the enclosing case for connecting to the necessary resistor. A resistor mounted inside the case is connected in multiple with the motor armature to give constant speed.

## American Association News

### Cleveland Exhibit Hall Completed on Schedule and Practically Sold Out

ON FRIDAY, Sept. 3, the immense new building which has been constructed to house a large portion of the exhibits at the American Electric Railway Association convention was completed. The next day, Saturday, it was formally turned over to the Cleveland convention committee. Thus the building was finished in just four weeks from the time the work of clearing the ground was begun.

The progress of construction has been told in a series of pictures published in this paper week by week. On this page the views show not only the appearance of the new building but its relation to the Auditorium and other city buildings. The top view was taken looking east along Lakeside Avenue from the roof of the County Building. In the extreme left is the City Hall and fronting it the Public Auditorium and on the right the newly completed building.

The middle picture is looking north-northwest from the corner of East

previous pictures published of the new Exposition Building. This shows the outside finish (stucco) and skylights being completed. Work on the interior decorations, landscaping at the north end and cleaning off of the contractors' equipment was started immediately after the building was turned over to the committee. The parked automobiles in the right foreground are the same as those seen in the middle view, and likewise show the location of the car exhibits. In the center may be seen the car tracks serving the exhibit and connecting at the upper right of the view with the steam railroads. The large building in the background is the County Building (courts and administration offices).

The speed with which the work has progressed indicates the spirit of the Cleveland Railway management in doing everything possible to make the exhibit a success.

"Only four booths out of the entire space remain to be sold," said Fred C.

### COMING MEETINGS OF *Electric Railway and Allied Associations*

*Sept. 17-18*—Mid-West Claim Agents Association, sixth annual convention, Elms Hotel, Excelsior Springs, Mo.

*Oct. 4-8*—American Electric Railway Association, annual convention and exhibits, Public Auditorium, Cleveland, Ohio.

*Oct. 10-15*—Congress International Tramway, Local Railway and Motorbus Association, Barcelona, Spain.

*Oct. 25-29*—Annual Congress and Exhibit, National Safety Council, Book-Cadillac Hotel, Detroit, Mich.

*Nov. 16-18*—Society of Automotive Engineers, National Transportation and Service Meeting, Boston, Mass.

*November 16-19*—American Welding Society, fall meeting and International Welding and Cutting Exposition, Buffalo, New York.

J. Dell, director of exhibits. "What is still more important, all but sixteen of the exhibitors have paid. This is practically a full month in advance of the convention.

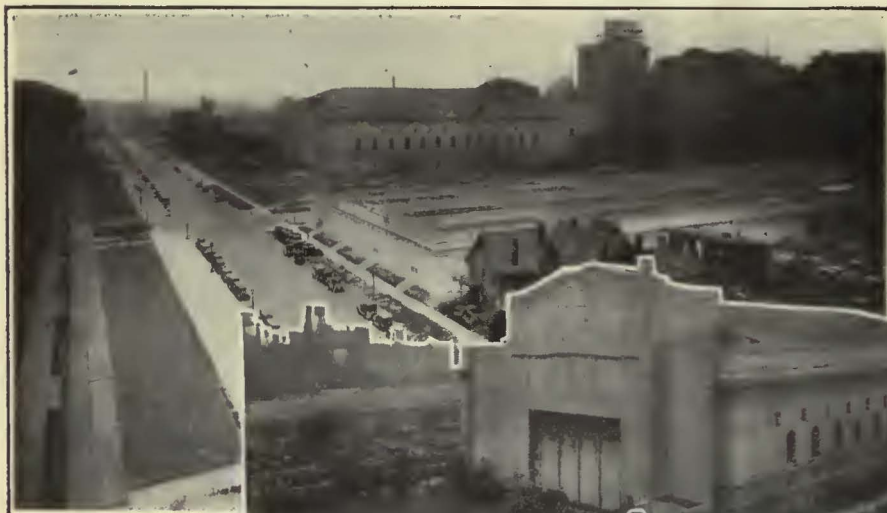
"Due to contractual commitments it is necessary to get the payments in at once, as assignments of space are, of course, not official on behalf of the association until checks have been received and the exhibitor receives his duly executed contract.

"Up to the close of business on Sept. 8, the space taken totaled 117,465 sq.ft. The gain over last week's figure is small only because there is practically nothing left to sell."

At top—The new building, put up in just four weeks, with the Public Auditorium in the background.

Center—Close-up of the Auditorium, with the new building behind and the open-air exhibit space between.

Below—Close-up of the new building.



Home of the  
A.E.R.A.  
Oct. 4-8

Sixth and Superior and shows the relative position of the newly completed building and the Public Auditorium. At the right background is the City Hall, fronting Lakeside Avenue and overlooking East Sixth Street. The Public Auditorium is in the center and the new building is at the left. The parked automobiles are in the space that during the convention will be used by car exhibits.

The bottom view was taken from approximately the same point as the



# The News of the Industry

## Wages Advanced in Cincinnati

Arbitrators Award Trainmen 2 Cents More an Hour at Cost of \$300,000 a Year

An increase in wages that by 1926 will cost the Cincinnati Street Railway, Cincinnati, Ohio, \$300,000 a year more than is now paid to workmen was granted to railway employees in an arbitration agreement announced by the arbitration board.

Walter A. Knight, the company's representative, refused to sign on the grounds that the company's expenses already had been increased through rehabilitation work required by the new franchise and also because the general tendency of wages was stationary.

The agreement was signed by James H. Vahey, representing the employees, and by former Judge Joseph W. O'Hara, the impartial member of the board.

The award follows:

Retroactive to July 1, this year, an increase of 1 cent an hour to 54 cents.

Oct. 1, 1926, an increase of 2 cents an hour to 56 cents. Jan. 1, 1928, an increase of 2 cents an hour to 58 cents.

### CONTRACT TO RUN TWO YEARS

The contract is to expire on July 1, 1928. According to the company an increase of 1 cent an hour means an additional expense of \$60,000 a year.

The new agreement is designed to include drivers of the buses operated by the company. The agreement provides that in the event electric railway transportation is discontinued and bus service substituted trainmen shall be given preference as drivers for the buses.

Both Mr. Vahey and Mr. Knight issued statements explaining their attitudes in the matter. Mr. Knight's statement follows:

As I cannot join in the award I desire to explain why.

The complicated corporate relations have been unscrambled and the city is now dealing with the owning company which operates the property.

The service-at-cost franchise granted the Cincinnati Street Railway effective on Nov. 1, 1925, reduced the dividends of stockholders from 6 per cent to 5 per cent for the first three years, and furthermore has improved its service materially.

Two crosstown lines and feeder lines of motor coaches have been put on by the company to supplement the street cars and round out the service.

All this tends to insure to users of public urban transportation safe, comfortable, convenient and rapid service and is sound business policy for it accommodates the public and because of the increased attractiveness of the service causes more people to ride.

But such service is expensive to furnish and can come only from the receipts from fares. If it is humanly possible to avoid it the rate of fare must not be increased and car riders hope the time will come when some decrease can be made.

At this time the cost of living in Cincinnati is declining a little and the tendency

for the next year or so seems to be in that direction.

Wages are not generally increasing; in fact, are generally stationary with a slight tendency downward.

Considering all these conditions and, having the public's interest in mind, as it seems to me an arbitrator should in such a case as this, I am compelled to conclude that this is a time for conservatism, and that the two arbitrators who make this award to the motormen, conductors and carhouse men have gone too far. Giving away other people's money, especially when many will be benefited, may bring a pleasant thrill with it, but this does not justify awards that are economically unsound and hazardous, as I believe this one to be.

It is possible that the excess may be made up by new economies in the management of the property, by such additional and uniform courtesy to the public on the part of motormen and conductors as will attract more people to use the service offered, and by increased efficiency of employees generally. I am satisfied that nothing else can do it, and I hope that every effort will be made to bridge the gap in these ways.

It is with deep regret that I find myself unable to join in the award.

The new two-year agreement will take the place of the last two-year agreement, which ended July 1, 1926.

## Improvement Planned at Holyoke

President Pellissier of the Holyoke Street Railway, Holyoke, Mass., has announced that plans are under way for extensive improvements to the lines in Amherst and from the Center to Northampton. The company recently abandoned that section of its lines from Sunderland to North Amherst, which has never been operated at a profit. Service in the abandoned section will be provided by George Fisher, South Deerfield, who has been authorized to extend his bus line to Amherst Center. Mr. Fisher is restricted and cannot take passengers on between Amherst and the bridge near the Sunderland line.

## Improvements Promised on West Virginia Line

The West Virginia Utilities Company, Wheeling, W. Va., plans to consolidate the two traction lines it owns in Morgantown and to operate them as one unit with improved equipment and a service schedule doubling the number of cars used and halving the time between cars, according to O. L. Eaton, Jr., commercial manager of the company. Three new cars are being constructed for use in Morgantown. They will be on exhibition at the convention of the American Electric Railway Association in Cleveland. These cars are part of a consignment purchased by the company for use on its Wheeling and Morgantown traction units. Mr. Eaton states that the South Morgantown trackage, recently acquired by his company to be joined to its Sabraton line, will be improved and the entire line, comprising about 5 miles of track, will be placed in first-class condition.

## Consolidation with Service at Cost in Chicago

City Plans to Appoint Committee to Collaborate with Companies in Working Out New Plans

For the first time since the negotiations began for a new traction ordinance in Chicago the city, representatives of the companies and bankers are unanimously agreed that the local transportation properties should be consolidated.

Whether an ordinance should be granted to a single corporation for the operation of all forms of local transportation, including surface, elevated, subway and motor bus lines, or whether the surface and elevated lines alone should be merged has not been definitely decided, but the general policy of consolidation is no longer a stumbling block in the way of traction progress.

The settlement of this important point was the feature of a meeting held in Chicago on Sept. 1, the second of a series of conferences to work out a solution of the city's perplexing transit problems. At the instance of the bankers, the city was authorized to appoint a committee to collaborate with the companies in working out the details of such a plan.

It was further agreed at the meeting that the type of grant to the proposed company should be an indeterminate permit. Although the traction officials have long been advocating a grant of this kind from the state, no opposition was expressed when the Aldermen proposed to have the franchise issued by the city. Their silence was taken to mean that they assented. The question of whether the city or the state shall exercise control over the consolidated properties was purposely left open for the time being.

Barring more or less determined opposition on the part of the bankers and company representatives to the Aldermen's notions about amortization and city compensation, the general proposition that the new ordinance should be based on service at cost, with a reasonable return on the investment, and not a fixed rate, was likewise concurred in. Such service at cost would necessarily include, it was pointed out, expenses of operation with adequate provision for damage, depreciation and renewal reserve funds.

The bankers and company officials, however, strongly urged an amortization fund to reduce the capital investment on the grounds that it would establish good credit, make available all the money needed for extensions and at the same time enable the company to maintain a reasonable fare.

Frank O. Wetmore, chairman of the First National Bank, voiced the con-

viction of the majority of traction representatives in asserting that the city's compensation—55 per cent of net receipts—should be eliminated. By putting the surplus back into the properties, he contended, the city could, if it wished at some time to purchase, buy the properties at much lower cost than if it accumulated a traction fund, similar to the present \$45,000,000 account, which draws only from 2 to 2½ per cent interest. City compensation is a charge against the car rider, Mr. Wetmore added, for which he receives no immediate benefit.

### Short Shrift Made of Carhouse Bandits

Salvatore Merro and Salvatore Rannelli will pay—Merro with his life and Rannelli by life imprisonment, for the murder of Theodore M. Conway, paymaster of the Public Service Corporation of New Jersey, Newark, N. J., killed by bandits in a raid on the Central Avenue carhouse on June 4. Neither of the prisoners was actually seen in the act of shooting the paymaster nor in the carhouse, but more witnesses positively identified Merro than Rannelli as having been seen in a gun battle running from the scene of the attempted hold-up. The case was tried before Judge Van Riper in the Court of Oyer and Terminer. The jury deliberated 4½ hours before returning its verdict of guilty of first degree murder against both defendants, adding a recommendation for life imprisonment for Rannelli.

Summing up the state's case, Prosecutor Biglow praised the state witnesses, who, he said, rushed to the aid of the law at the time of the outrage and, further, came to court to see that justice was done, thereby doing their part toward stamping out the epidemic of murder and robbery.

Mrs. Conway, widow of the murdered paymaster, has been provided for by the welfare department of the Public Service Corporation. She will receive the full amount of her husband's pay until June 30, 1927, and thereafter one-half his yearly salary for twelve years, by which time her children will probably be self-supporting.

### Island Ferries to Go to Toronto Transportation Commission

It appears that another activity is to be added to the operations of the Toronto Transportation Commission, Toronto, Ont. That body is about to take over and operate the ferryboats across the bay. The stage is all set for this, and the board of control has requested the ferry company to give the commission access to all books and other documents. Mayor Foster is quoted as follows:

As we will not be taking over until the end of the season, it will be next year before the T.T.C. would have to operate the ferries, and the question of fares or change in the staffs operating the ferries would not come up until then. Of course, after the regular season closes, about the end of October, I suppose either the city or the T.T.C. will operate an abbreviated service for the convenience of Island residents for a few weeks, as Mr. Solman has done in past years.

### Paving Relief Approved

Pennsylvania Commission in Agreement with New Arrangement Made at Williamsport

Another name has been added to the long list of electric railways that have received relief from burdensome paving requirements. The company is the Williamsport Passenger Railway, Williamsport, Pa. The case was passed upon some time ago by the Public Service Commission of Pennsylvania, but the full text of the finding has only recently become available. The commission says that the proceeding involving the operation of the railway in Williamsport came before it under unusual and exceptional circumstances. It held in substance that the modification by the city of the street railway paving obligation previously imposed was in line with modern thought on the subject and in conformity with the expressed opinion of the commission.

Some time ago the electric and railway systems operating in Williamsport were sold to the Lehigh Power Securities Corporation. The new management advised the City Council that it would require an expenditure of \$300,000 to place the system in proper condition; that under the present rate of fare of 5 cents and the street paving burdens imposed under the existing ordinances it was impossible to raise the money for the improvements. The Council, by resolution, authorized the Mayor to appoint a committee to investigate the matter and make definite recommendations. This committee filed its report on Nov. 6, 1925. This report discussed in detail the history of the street railway system in Williamsport. On Dec. 15, 1925, the report was finally adopted by the Council, including specific recommendations covering additional equipment and facilities, suggested rate of fare, increase of employees' wages, rerouting, and modification of paving obligations.

As a preliminary step to carry the report into effect the Council on Dec. 30, 1925, enacted an ordinance to authorize and empower Lewis W. Heath, as trustee for the Williamsport Passenger Railway, Vallamont Traction Company, East End Passenger Railway and South Side Passenger Railway, and as trustee for Williamsport Railways (to be formed by the merger and consolidation of the four first-mentioned companies), to maintain a railway upon certain streets in Williamsport, then occupied by the four railway companies. The ordinance repealed on the date it becomes effective all existing ordinances granting franchises to the then operating companies.

The commission in this case did not pass upon or fix any value of the property and franchises of the companies nor any rate of fare. The only question before it was whether the terms and conditions of the ordinance of Dec. 30, 1925, were reasonable and the approval of the ordinance contract necessary or proper for the service, accommodation, convenience and safety of the public. It points out that the ordinance does not become effective until a new corporation is legally created by the consolidation and merger

of the existing railways in the city. Before the charter can issue to the new corporation the commission must approve the terms and conditions of the consolidation and merger. Any or all questions with respect to capitalization of the new corporation can be raised in the subsequent proceeding before the commission. The proceeding does, however, change and modify the existing obligation resting upon the companies for street paving. In this connection the commission says:

Under the laws of Pennsylvania, street railways must look to the municipalities which granted the franchises for any relief from such obligation. The Appellate Courts of Pennsylvania have held that this commission has no jurisdiction to vary the franchise ordinance imposing upon a street railway the obligation to pave or keep in repair the streets upon which its tracks are located. (Swarthmore Borough vs. Public Service Commission, 80 Superior Court 59; 277 Pa. 472.)

In a former proceeding, Borough of Swarthmore vs. Philadelphia, Morton & Swarthmore Street Railway, and Philadelphia Rapid Transit Company (Complaint Docket No. 3579) Volume V, Decisions of Public Service Commission, pp. 438 and 446, in which the question of street paving was involved we said:

"It is a matter of common observation, that the street railways of the country have been forced to meet a considerable diminution in street passenger traffic. This has been caused in large part by the use of privately owned automobiles. It is manifest, therefore, that street railways should not continue to be burdened with obligations beyond that which is directly involved in the service which they are called upon to render and reasonable for them to bear in connection with the maintenance of state and municipal governments under whose authority they are authorized to render service.

"The Federal Electric Railways Commission, called together to study the street railway situation of the country, in reporting to the President of the United States, after extended hearings, recommended: 'Effective public co-operation should be exercised by eliminating, in so far as it is practicable, special assessments for sprinkling, paving, and for the construction and maintenance of bridges, which are used by the public for highway purposes.'

The modification by the city of Williamsport of the street paving obligation now imposed on certain of the companies operating street railways in the city is, therefore, in line with the modern thought on the subject and in conformity with the expressed policy of the commission.

One of the operating companies—Williamsport Passenger Railway Company—is incorporated under the special act of Assembly approved April 16, 1863 (Pamphlet Laws of 1864, page 1080) and is not required to obtain a franchise from the city or contribute any moneys toward the paving or repaving of the streets occupied by its tracks. This company owns and operates more than one-half of the trackage in the city. Before the company can merge with the other companies operating in Williamsport, it must accept the provisions of the street railway act of 1889, and subject itself to the requirements of said act and relinquish the special provisions it now possesses under its charter. It would be unjust and unreasonable to require this company, after the merger, to assume a street paving burden and obligation which it is not now required to bear.

We have given careful consideration to all the provisions of the ordinance submitted for approval and find nothing therein which in our opinion is inimical to the interests of the public.

In conformity with the above, we find and determine that the approval of the aforesaid ordinance contract is necessary and proper for the service, accommodation, convenience and safety of the public.

### More Skip Stops in Baltimore

The United Railways & Electric Company, Baltimore, Md., has notified the Maryland Public Service Commission that it will start the skip-stop system on six additional lines in the city. The plan is to be effective only between 6 and 9 a.m. and 4 and 7 p.m.

## Formal Order in Milwaukee One-Man Case

The Railroad Commission of Wisconsin has issued its formal order authorizing the Milwaukee Electric Railway & Light Company to operate one-man cars on its Wells-Downer line. The operation of two-man cars will be continued on this line, but the company offers to provide the extra service recommended in the commission's report on railway service in Milwaukee by the partial use of the one-man car.

The investigation which the commission conducted last spring following complaints by the public showed a deficiency of service on many lines. Recommendations consequently were made by the commission in its report urging the purchase of 75 additional cars, increased service on a number of lines, track extension of certain lines and other improvements.

In its report the commission recommended the purchase of 75 new cars to improve service, but the commission in its latest order cut the number down to 40 cars. The order provided, however, that 95 per cent of these cars are to be available for service during the winter months.

Engineers of the commission also recommended the double tracking of the Oakland-Delaware line north of the Atwater road, extension of the Eighth Street line to Lake Street on the north and extension of the Mitchell Street line two blocks beyond the Northwestern tracks on Forest Home Avenue, on which work has already been started. The engineers also recommend that if the Pabst-Wauwatosa line is to be maintained it should be double tracked as far west as Third Avenue in Wauwatosa. If, however, the Vliet Street and North Avenue lines are to be extended in the future, the Pabst-Wauwatosa line west of 60th Street could be discontinued.

## A House-to-House Canvass in Chicago

Much success has attended a service improvement campaign being conducted by the Chicago Rapid Transit Company, operating the elevated lines in that city, among the employees who come into direct contact with the public. As a first step in the campaign an accurate survey was made of the public attitude toward the railway company.

A staff of trained men and women was sent into homes in the evening to ask the people questions regarding "L" service. Many people were interviewed and their answers to the questions asked were carefully analyzed. It was found that 61 per cent were favorable toward the company, 21 per cent were indifferent, 9 per cent very friendly, 7 per cent unfavorable and 1 per cent hostile. The reasons given for the attitude toward the company were carefully studied and it was found that the biggest factor was the personal service of the individual employees. The least important factor was the rate of fare.

With the information obtained from this survey and analysis of the public reaction toward the company, the cam-

aign was started among the employees. The idea is to get the employees thinking of their work and how they can best please the patrons of the company. When the matter was explained to the employees they showed a fine spirit of co-operation.

## Forty Years of Faithful Service

William S. Fisher, motorman with the Concord Electric Railway, Concord, N. H., completed his fortieth year of service on Aug. 17. Mr. Fisher would be an asset to any company on account of his loyalty, carefulness and the deep interest he takes in the company for which he works. He has seen the change from horse cars to narrow gage steam, then to electric power on the same gage, and finally from the 3 ft. to the standard gage of 4 ft. 8½ in. At the time that he entered the service, horse cars were run from Fosterville to Allison Street, while steam motors or steam "dummies" were run from Fosterville to the northern terminal at Penacook. About four years later the electric railway was instituted. Mr. Fisher worked for six years as a fireman on the Boston & Maine Railroad previously to his employment with the electric road.

## Chicago Bank Favors Terminable Permit and Service at Cost

A terminable permit and service at cost—two of the outstanding features of the Chicago traction ordinance now pending before the local transportation committee of the City Council—are endorsed as sound principles in a bulletin recently issued by the Northern Trust Company, Chicago.

"Regardless of the chances for final adoption of the ordinance," the bulletin reads, "its framers are entitled to gratitude for bringing before the citizens of Chicago the principles of a terminable permit of the right sort, and service at cost."

The so-called barometer rate of fare, or service at cost, it points out, has been found successful in other cities. It allows a fair rate of return on investments under all conditions, even when earnings are diminished.

Showing the advantages of the terminable permit, the bulletin explains that street railway franchises under the Illinois state law are now limited to twenty years. As a result, near the close of the franchise, a company is uncertain as to its future, and both its service and profits deteriorate.

"Under the present law," the bulletin continues, "it appears impossible to frame a franchise under which refunding of the \$162,000,000 in Chicago street railway bonds now outstanding can be accomplished."

Traction officials have declared flatly that they will not negotiate on the basis of the ordinance as now drawn, but Corporation Counsel Francis X. Busch, the author of the draft, believes that at least the principles may be retained if other independent financial interests take the same attitude as the Northern Trust Company in that the attraction of capital is admittedly the vital problem in any agreement.

## Transportation Business Increases in St. Louis

Col. Albert T. Perkins, general manager for Receiver Rolla Wells of the United Railways, St. Louis, Mo., in commenting on the improved conditions on the street cars expressed the belief that the gain in revenue passengers for the six months ended June 30 compared with the same period in 1925 was due in large measure to several large conventions and public gatherings held in St. Louis this year. These included the Grotto convention, centenary of the St. Louis Archdiocese and dedication of St. Louis Cathedral and the Lutheran convention and dedication of Concordia Seminary.

The total number of passengers carried by the United Railways for the six months ended June 30 was 135,460,138, compared with 135,093,695 in the similar period of 1925. However, this year was far behind the total for the six months of 1923, the company's banner year. In that year the first six months registered 137,651,059 passengers.

The St. Louis Bus Company, which exchanges transfers with the railway, in the six months ended June 30 carried 2,217,115 passengers, compared with 881,598 the first six months of 1925. On the last day of June last year this company had twenty buses in regular service. At present it is operating 28 buses. However, in the early months of 1925 the company's lines were not fully organized and for that reason the large increase in traffic shown is somewhat abnormal, but its business has been growing steadily on all its lines.

## Fare Continuance Authorized on New York & Stamford Road

The Public Service Commission of New York on Sept. 1, by formal order, authorized the New York & Stamford Railway, Portchester, N. Y., to continue in force until July 1, 1927, the passenger fares in effect prior to July 1, 1926, on its lines within the State of New York and within the zones prescribed as follows:

Zone No. 1—Between Mechanic Street, New Rochelle, and dividing line, 1.5 miles, a fare of 5 cents with free transfer privilege to and from lines of the Westchester Electric Railroad in New Rochelle.

Zone No. 2—Between Dean Place and westerly boundary of Larchmont, 2.2 miles, with lap zone extending east to Delancey Street, Mamaroneck, a fare of 7 cents with free transfer privilege to and from cars of Larchmont Manor line. The Larchmont Manor line, extending from the New Haven Railroad station and the terminus of line at Larchmont Manor, village of Larchmont, a distance of 1.49 miles, is included in zone 2, with fare of 7 cents and free transfer privileges between main points in village of Larchmont only.

Zone No. 3—Between westerly boundary of village of Mamaroneck and the Mamaroneck-Harrison town line, 1.9 miles, with lap zone extending west to Beaver Street, town of Mamaroneck, fare of 7 cents.

Zone No. 4—Between westerly boundary of town of Harrison and North Street in village of Rye, about 1.8 miles, fare of 7 cents.

Zone No. 5—Between North Street, Rye and Liberty Square, Port Chester, 2.61 miles, with lap zone extending to Mill and Main Streets, Port Chester, fare 7 cents with free transfer privileges to and from Rye Beach-Rye station line and the Rye Beach-Port Chester line.

Zone No. 6—Between Liberty Square.

Port Chester, and Railroad and Greenwich Avenues, Greenwich, Conn., about 3.12 miles, with lap zone extending westerly to town hall, Greenwich, and easterly to New York & Stamford Railroad's carhouse in Port Chester, 7 cents.

Special tickets or books containing 28 tickets will be sold for \$1 to pupils under eighteen years old attending school. Each ticket is good for one ride between any two points within any zone except between Dean Place and Mechanic Street, New Rochelle.

Passengers boarding cars in the village of Port Chester are entitled to free transfer within the village of Port Chester only.

Passengers boarding cars in zones 5 and 6, outside Port Chester, are entitled to transfer to local line within Port Chester for 3 cents for transfer. Passengers boarding cars of local line in Port Chester are entitled to transfers to points in zones 5 and 6 outside of Port Chester, including Rye Beach line, upon payment of 3 cents for transfer.

The village of Mamaroneck waived the provisions of the franchise restricting fares within the village of Mamaroneck zone.

The schedule is of interest because it represents an agreement largely mutual, arranged on a basis believed to be all that the traffic will bear.

### Elevated Tramway Proposed for Montreal

Particulars were disclosed at a recent meeting of the City Council of Montreal, Que., of the main plans for an elevated high-speed tramway line north from Place d'Armes. By the proposed system, cars would be able to reach Mount Royal Avenue from St. James Street in five minutes, according to an authoritative opinion, compared with the present rate of twenty minutes by the surface lines. These plans, it was stated, have been prepared for three or four years by the Montreal Tramways and the Montreal Tramways Commission. St. Urbain Street is considered the logical route for the proposed elevated line. The change would necessitate widening from about 30 ft. to 80 ft. from Craig to St. Catherine. Plans call for elevated tracks on St. Urbain Street from Craig Street to a little above Ontario Street. At this point the tracks would go underground, below Sherbrooke Street, and come out on the surface again at Milton Street. From there north surface lines would be followed. By laying the elevated line made in this way grade crossings at the congested intersections would be avoided. Beyond Milton Street, St. Urbain is considered wide enough for the surface lines.

Provision is made for one stop only between Craig Street and the reaching of the street surface at Milton Street. This is at St. Catherine Street. Steps would lead up to the elevated lines from that thoroughfare.

Provision is also made for a convenient entrance to the terminus of the elevated lines at Craig Street extending to St. James Street, where passengers could step off the street into the passageway to the landing platforms.

With an 80-ft. street there would be

room for parking cars and traffic in both north and south directions.

Consideration has been given to providing better transit north from Place d'Armes, because that is the most congested area.

## Final Eucharistic Congress Facts

Further Particulars Are Given About Passenger Movement Over Rapid Transit and North Shore Lines

The International Eucharistic Congress of Chicago, Ill., is now largely a memory, but interest still attaches to the final transportation figures, unavailable heretofore because of the vastness of the whole undertaking and the difficulty experienced in keeping a comprehensive check of the number of tickets sold and cars operated. In the archives of the electric railway industry will repose the record of this stupendous achievement in mass transportation by the Chicago Rapid Transit and Chicago, North Shore & Milwaukee lines, which last June hauled more than 225,000 pilgrims to the scene of the closing ceremonies at Mundelein.

Some amazing disclosures of the Mundelein trek follow: Four hundred and forty-five special trains, composed of 2,785 cars, operated into a six-track terminal in a single day! Three hundred and twenty rapid transit trains of six cars each operated from Chicago over the elevated tracks to Howard Street and thence over the Skokie Valley route of the North Shore line directly to Mundelein, 40 miles away. Ninety trains of eight cars each were operated in shuttle service over the 13-mile branch of the North Shore Line from Lake Bluff to Mundelein. From Milwaukee, Racine and Kenosha, Wis., 35 special trains, composed of 177 cars, were run by the North Shore Line during the morning of the great Catholic pilgrimage.

### THURSDAY THE BIG DAY

For the suburban roads the big day was Thursday, June 24, when the congress moved to Mundelein, Ill. It is estimated the attendance at Mundelein that day was more than 400,000. Details of the passenger movement on June 24 supplementing those contained in the account published in the *ELECTRIC RAILWAY JOURNAL* for July 3 follow:

Nearly 250,000 were transported over the combined Chicago Rapid Transit and North Shore Line to Mundelein and return. Approximately 170,000 were carried by the Chicago Rapid Transit from Chicago, 45,000 via shuttle train from the Lake Bluff station of the Northwestern steam road and approximately 30,000 from North Shore line points in Wisconsin, making a total traffic over the joint electric lines of roughly 250,000.

Combined facilities of the three steam roads accommodated only about 85,000.

About 340,000, or 80 per cent of the great throng, were transported by rail. The rest went by automobile.

The total number of Rapid Transit cars in the Mundelein service was 932.

A total of 372 trains was operated by the Rapid Transit and North Shore Line.

The number of pilgrims transferring from the Northwestern steam road and from North Shore Line points at Lake Bluff is estimated at 75,000.

There were approximately 1,000 cases of fatigue and heat prostration during the day at Mundelein, several minor injuries

incurred in the crowd that jammed the stockade outside the terminal, but not an accident occurred which could be laid to the Rapid Transit or North Shore Line.

In addition to the six-tracked terminal at Mundelein, three temporary substations were installed on the Libertyville branch to meet the extraordinary power demand. Overhead trolley equipment was placed on 125 motor cars of the Metropolitan division of the Rapid Transit lines, which normally operate on third-rail only. Arrangements were made to short circuit a part of the resistance in the headlight circuit of the elevated cars and to install special lamps to provide for the extra candlepower needed for operating in the country. Emergency crews from all maintenance departments and first aid teams were located at strategic points along the right-of-way. All available employees were drafted by the transportation department for train and platform service, and in addition a large number of employees of the Commonwealth Edison Company and of the Public Service Company of Northern Illinois were used for transportation service. Means were taken to reduce as much as possible the chance of danger due to the inexperience of these men. The car switches for changing from overhead trolley to third rail were closed with busbars, keeping both the overhead trolleys and third rail shoes alive, so that the trainmen did not have to manipulate the dangerous knife switches. At the points where the change from overhead trolley to third rail and vice versa was made, the trains were stopped and men stationed on the ground saw that everything was in readiness for going ahead.

A fare of \$1.50 was charged for the round trip of about 80 miles. To avoid confusion and save time, fares were collected at the Mundelein enclosure on the pay-leave system outbound and on the pay-enter system inbound. An advance ticket sale was started some time before Thursday, first in the different parishes, and then at "L" stations and other convenient points.

The two companies went to great length to safeguard their patrons. Practically all injuries experienced by the visitors were due to crowding at the gates of the terminal, once when a deluge of rain and hail fell during the program, and again at the close of the ceremonies. Employees worked heroically to keep the crowds in order, and a large medical force, under the direction of Dr. Hart E. Fisher, chief surgeon, treated the injured. Two hospital cars were on hand, one at Mundelein and the other at Lake Bluff. The car at Lake Bluff was transferred to Mundelein when the rush for home began.

The problems of the Chicago Surface Lines were of a different character, but no less exacting than were those of the "L" and the North Shore. The record of the Surface Lines was equally impressive. It has been given quite fully before. The city's experience with traffic during the Eucharistic Congress last June, when a rigid ban was placed on parking in all loop streets for three days, was so satisfactory that a resolution establishing a permanent no-parking rule for the downtown district has been introduced in the City Council.

There were close to 1,000,000 visitors in the city, but downtown traffic was less congested during the great religious conclave than it has been for years. Reports from official observers indicated that the greatly augmented traffic moved with more swiftness than that attained by the ordinary business day's traffic. The no-parking rule had the effect of doubling the width of the downtown streets. In spite of the heavier riding, the speed of Surface Lines cars through the Loop was much greater than usual.

### Chicago Elevated Wage Controversy Is Settled

The wage controversy between the Chicago Rapid Transit Company and 4,500 of its trainmen, begun on June 1 when the last agreement expired, has been effectively settled by compromise between the two parties.

Under the terms of the arbitrators' award, which was made on Sept. 4, the company will pay the entire cost of maintaining a \$20 a week sick benefit for all employees in service one year or more and a \$1,000 death benefit for all employees in the service of the company three months or longer. Hereto-

the men had demanded 57½ cents. The old top wage was 50 cents. The new contract terminates on Sept. 1, 1929. It calls for 44 cents for the first year of service, 49 cents for the second year and 54 cents for the third year. The agreement also includes a 2-cent increase for other railway employees.

### Street Car Company Has Air Service to Norfolk, Va.

On Sept. 13 the air service of the Philadelphia Rapid Transit Company, Philadelphia, Pa., will be extended to Norfolk, Va. Chairman T. E. Mitten announced during his address to the eighth annual meeting of employee and employer committeemen at Willow Grove Park, Philadelphia, on Sept. 1, that this step would be taken. The extension in daily service is another step in Mr. Mitten's demonstration of the possibilities of commercial aviation in this country. Heretofore the service has been available only between Philadelphia and Washington, but with the delivery of a third triple-motor Fokker plane the plan is being made more comprehensive. Possibly before the close of the Sesqui-Centennial exposition another step will be taken in providing

### Some Recent Wage Settlements

The United Electric Railways, Providence, R. I., has settled with its employees on a new wage scale effective for one year from June 1, 1926. Motormen, conductors and one-man car operators have been granted an increase of 1 cent an hour. Bus operators, who formerly received the same rate as motormen and conductors on two-man cars, namely, 61 cents an hour, have been granted the same rate as one-man car operators, 68 cents an hour.

The wage rates for trainmen of the Macon Railway & Light Company, Macon, Ga., have been renewed for one year from Aug. 1, 1926.

The wage rates for trainmen of the Oklahoma Union Railway, Tulsa, Okla., which expired July 15, 1926, have been continued in effect, without change.

The agreement between the Great Falls Street Railway, Great Falls, Mont., and its employees, which expired Aug. 15, 1926, has been renewed for one year without change.

The contract between the Joplin & Pittsburg Railway, Pittsburg, Kan., and its employees, which expired Aug. 1, 1926, has been continued for an indefinite period by mutual consent.

The wage rates for trainmen of the Toledo, Bowling Green & Southern Traction Company, Findlay, Ohio, have been renewed for one year from Aug. 16, 1926.

### Crash on Detroit United Causes Ten Deaths

Ten deaths and the injury of 30 other passengers resulted from the head-on crash of two Detroit United interurban cars while traveling at high speed on a curve near Monroe, Mich., on Sept. 2.

According to a statement by the general manager of the Detroit United Lines, the conductor of the southbound car has admitted that orders to await a second car at a siding were forgotten. The motorman is in the Monroe Hospital seriously injured. Both the conductor and motorman had been instructed at Rockwood, Mich., to await two cars on Pine siding, 3 miles north of Newport, according to the statement attributed to the D.U.R. official, but they awaited only the first, a local car, and then continued on, forgetting that the northbound Toledo-Detroit express was approaching. A report of the accident gave the speed of each car at about 45 m.p.h. They met in the middle of a 2,000-ft. curve, and because of trees and telegraph poles which obscured the view neither motorman could see the other car approaching. In the collision one car ripped loose from its trucks and rode over the other, crashing through the vestibule and into the smoker. Six of the passengers killed were taken from the smoker of the southbound car.

Separate investigations are being conducted by the D.U.R. officials and authorities of Monroe County, in which the wreck occurred. Both motormen on the wrecked cars are reported to have had fine records. One was considered one of the oldest and most trusted employees of the division.



Miniature of Sign Displayed in Street Cars by Philadelphia Rapid Transit Company

fore the men have contributed three-fifths of the cost of maintaining these welfare features and the company two-fifths.

B. J. Fallon, vice-president of the company, and Maclay Hoyne, representative of the union, who composed the board of mediation, denied the trainmen's demand for an increase of 5 cents an hour over the present 77 cents paid motormen and the 72 cents paid conductors.

Had the demands for increased wages been granted, rapid transit officials say, the annual payroll of the company would have been increased by more than \$700,000.

The new agreement is retroactive to Sept. 1. It will run until May 31, 1927.

### Wages Fixed in Birmingham

The Birmingham Electric Company, Birmingham, Ala., and its union conductors and motormen compromised on Sept. 7 on a top wage of 54 cents an hour, thus averting a strike which had loomed for a week. More than 800 men are affected, with a cost to the company of \$125,000 a year.

The amicable settlement was brought about by the City Commission intervening as arbitrator when railway officials and men were deadlocked. Just before the compromise the men voted to strike. The railway had offered 52 cents, but

passenger air service from New Brunswick, N. J., to Philadelphia, Washington and Norfolk. This would be the nearest available landing field in the vicinity of New York City.

Chairman Mitten explained the venture of the Philadelphia Rapid Transit Company into commercial aviation as an effort to demonstrate that such a service has real possibilities in this country. In spite of the proud boast of Americans that commercial flying is further advanced here than elsewhere in the world, Mr. Mitten pointed out that prior to the establishment of the P.R.T. air service as a feature of the Sesqui-Centennial practically all that the country had in this direction was "hoptoads at \$5 a hop."

While the P.R.T. air service will cease with the close of the Sesqui-Centennial, Mr. Mitten announced himself as willing to aid in the formation of an American Air Service Corporation to carry on the establishment of routes throughout the entire country. This could only be done, however, provided the government is sufficiently appreciative of the value of such an undertaking to back the venture with its resources. The Philadelphia Rapid Transit Company will go out of the aviation business, but it will have served a real purpose in demonstrating the fundamental possibilities of this line of endeavor.

### Offers Made to Co-operate in Whitestone Operation

Willingness of the Brooklyn-Manhattan Transit Corporation to operate the Whitestone branch of the Long Island Railroad, if the city acquires it, was announced by Borough President Maurice E. Connolly of Queens in an interview on Sept. 3. Mr. Connolly said that William S. Menden, president of the B.-M. T., had assured him that the company would operate the branch as a part of its Queensboro rapid transit line without an additional fare.

The Long Island Railroad has offered to give the city its Whitestone branch, together with twenty acres of shore property, in order to be relieved of half the expense of the elimination of its grade crossings, the total cost of which is estimated at \$4,000,000. Under the terms of the offer the railroad right-of-way may be used for rapid transit purposes or for a highway. The company's contention is that the branch is unprofitable and that the company cannot afford to pay half the cost of the proposed elimination of grade crossings. This offer is pending before the Board of Estimate, and Mr. Connolly is expected to move for its consideration at an early meeting.

At the B.-M. T. offices it was stated that Mr. Menden at his conference with Mr. Connolly had assured the Borough President that the B.-M. T. was "ready and willing to co-operate with the city authorities in extending rapid transit service in Queens."

### Another Dorchester Transit Award Announced

The C. & R. Construction Company is the lowest bidder and undoubtedly will receive the contract to build the third section of the Dorchester rapid transit system, to be operated by the Boston Elevated Railway. The bid was \$626,550 and the nearest competitor for the contract was the J. C. Coleman Sons Company, bidding \$650,695. There were eleven bidders and the highest bid was \$1,069,400.

This section covers about 1 mile between Geneva Avenue and Peabody Squire and will include the construction of the Shawmut station and the rebuilding of Peabody Square bridge. With the awarding of this contract more than one-half of the 6-mile extension will be under construction. The New Haven Railroad has discontinued its service to four stations and permanently abandoned the location to clear the way for the rapid transit electric railway construction work.

### One-Man Cars on Two More Buffalo Lines

One-man cars have been placed on two more local lines in Buffalo, N. Y., by the International Railway. Similar cars are now in operation on almost every line in the city. Additional cars have been placed on all routes where one-man operation is in effect, thus reducing the headway between cars. Cars which have been rebuilt for one-man operation have been equipped with all of the latest safety devices.

B. J. Yungbluth, president of the International Railway, announces that one-man car operation has enabled the company to increase service and at the same time reduce accidents more than 16 per cent in a two-year period. Mr. Yungbluth explains that, despite the opposition to the one-man car service in Buffalo, the company has found that this form of transportation has proved of benefit to car riders and the management because no attempt would be made to increase the number of one-man car lines if it was found that accidents were increased, for Mr. Yungbluth says accidents are the most costly by-product of transportation.

A change announced by the company on all one-man cars allows passengers going toward the business section of the city to pay as they board and to pay as they leave on the outbound trip.

### Albany Fare Case Reopened

The Public Service Commission has fixed Sept. 30, at Albany, N. Y., as the time for the hearing of the petition of the United Traction Company for a determination that increased passenger fares may be charged in various municipalities and that new fares may be put in effect on short notice. At the same time the complaint of the city of Albany against the United Traction Company asking for a reduction of fares will be heard.

This reopening of the fare case is the next step in the application of the United Traction Company for an increase in its fares in the Capitol district from 7 cents to 10 cents. On Aug. 18 the Public Service Commission decided that the Legislature had taken away its power to regulate fares as against local franchise fare restrictions in the cities of Troy and Rensselaer. This left the company in the position of being able to petition for an increased fare on such of its lines as are located outside the cities of Troy and Rensselaer only.

### Urge for Rapid Transit Line Felt in Seattle

Spurred into activity by a report by the City Planning Commission urging construction of subways and elevated tracks for a rapid transit system, the utilities committee of the City Council recently took up the matter of creating a rapid transit line along Westlake Avenue from Virginia Street to Fremont, rebuilding the roadbed and replacing the present rails with heavier ones.

D. W. Henderson, superintendent of the municipal railway system, said for three years the required rails have been at the Georgetown station, but that he has been unable to obtain the \$62,000 necessary to pay for the cost of laying.

It is proposed that the project be financed by the issuance of interest-drawing warrants, to be sold to the Water Department, which has sinking funds to invest. The railway superintendent states that the reduction of running time on Meridian Avenue, Phinney Ridge and Green Lake lines will increase the revenues.

### City Orders Brunswick Company to Remove Rails

The City Commission of Brunswick, Ga., recently adopted a resolution instructing the Brunswick & Interurban Railway to remove its tracks beginning on Newcastle and Gloucester Streets, and then on other streets until all have been removed and the streets repaved in the same condition as those parts adjacent. Some time ago the sale of the rail and overhead of the company was reported with the intimation that the purchaser intended to salvage the old tracks, but to junk all of the other material. Apparently this deal was never concluded and the company still has the property on its hands. It is trying to make some disposition of the rails and hopes to be able to do so before long. The matter evidently has been brought to a head by the condition of the paving in several places in Newcastle Street, because the city will not consider repairing the paving until the rails are up and out of the way. The company that owns the rails was composed of a group of public-spirited citizens who bought the car line in an endeavor to keep it operating. The owners have been figuring on selling the rail to reimburse themselves for losses sustained in operating the company.

### Franchise Details Completed in Louisville

All details of the new franchise and operating ordinance of the Louisville Railway with the city of Louisville, Ky., have been completed, the bill having been passed by the Board of Councilmen, Board of Aldermen and signed by Mayor A. A. Will. The company has 60 days in which to accept the provisions of the law. The car fare rate will remain at 7 cents straight as at present, with half fare for school children and free rides for policemen and firemen in uniform, as well as park guards. The contract also provides for transfers from bus lines to street car lines, with a maximum of 10 cents for combination rides. The ordinance is to run for a period of two years, after which a readjustment of fare rates will be based on earnings.

### Deadlock in Newark, Ohio

Citizens and company are still talking it over in Newark, Ohio. Despite many conferences attended by prominent citizens who have the best interests of the city at heart, no tangible plan for the restoration of railway service has been evolved that is satisfactory to the Southern Ohio Public Service Company. There were stumbling blocks enough in the past to a settlement, but it now develops that the Council, in passing the city-wide bus ordinance, legally authenticated competition under a grant in some respects just as binding as that under which the Southern Ohio Public Service Company functioned. No ready means appears to be at hand to nullify this ordinance, a condition understood to be necessary to secure the resumption of railway and bus service by the Southern Ohio Public Service Company.



## "Follow the Ball!" Says Dana

Edward Dana, not as general manager of the Boston Elevated Railway, Boston, Mass., but as plain Edward Dana, tells the employees of the railway in *Co-operation* for August that now is the time to plan ahead in order that the ninth year of public control may end successfully on June 30, next. He says that this year "calls for the best our organization can give." As he sees it, the degree of success that is reached "will be governed by the extent to which we 'follow the ball' daily and weekly until June 30." He asks the men to "exert every effort to increase revenue by rendering courteous service and displaying real interest in our patrons."

Incidentally *Co-operation* hammers away at the idea of increased car riding. It spreads the gospel that "A Ride a Day Keeps Poor Service Away," and says: "Secure all the fares, guard transfer losses, cultivate more riders. It's our business." And in this work it recognizes that "modern rolling stock is necessary to provide adequate and dependable car service." Then the company furnishes these facts:

New rolling stock costing \$13,905,935 has been placed in service on the lines of the Elevated since July 1, 1918, as follows:	
35 Cambridge subway cars..	\$657,597
48 East Boston tunnel cars..	839,390
65 Elevated cars .....	1,305,693
296 Center-entrance cars .....	4,108,593
46 Trail cars .....	317,513
461 Double-end surface cars..	5,344,857
134 Single-end surface cars and buses .....	1,282,282
<b>1,135</b>	<b>\$13,905,935</b>

There are 82,450 electric passenger cars in operation in the United States.

23,085, or 34 per cent, are more than twenty years old.

30,685, or 28.7 per cent, are between ten and twenty years old.

23,680, or 37.3 per cent, are less than ten years old.

On the Boston Elevated approximately 46 per cent of the cars have been purchased since 1918 and the average age of all cars is only nine years.

The rapid transit lines have 79 per cent of the service operated on the Boston Elevated with all steel cars, Philadelphia has 100 per cent, New York 50 per cent, and Chicago 24 per cent.

In 1918 the cars out of service for repairs

amounted to 17 per cent, whereas in 1926 only 6 per cent are under repairs. The total of reported car defects for each 10,000 miles operated is only 5.3 at the present time.

## "L" Platform Extension Work in Chicago Nearly Finished

Completion of the Chicago Rapid Transit Company's program of station platform extension is expected soon. The platforms of elevated stations in the Loop district were the first to be completed after the work was begun last autumn. In many instances platform lengths have been virtually doubled to take the new eight-car express trains.

The Lake Street west side division has already been completed and the final extension on the south side division is being made at the 55th Street station. A new section of steel structure has been installed at Sheridan Road on the north side division to permit straightening of tracks for lengthening the platforms. The Addison Street station is all that remains to be extended on this division.

Extension work on the Garfield Park branch was finished last month, and when the three other branches of the Metropolitan division are equipped with longer platforms the facilities for passenger handling over the entire Rapid Transit system will be greatly increased.

## \$1,500,000 to Be Spent by Ohio Interurban

Improvements to cost \$1,500,000 are proposed by the Cincinnati, Hamilton & Dayton Traction Company, Cincinnati, Ohio. The program provides for the construction of a freight siding in Cumminsville, at which place the interurban company's Cincinnati terminus is located. Quite recently the City Council of Cincinnati granted the interurban company a 25-year franchise to enter the corporate limits of Cincinnati. New equipment will be purchased and general improvements made to the roadway.

## Contempt Action to Be Appealed by Detroit

Charles P. O'Neil, corporation counsel of the city of Detroit, has announced that he will initiate before the Michigan Supreme Court, certiorari or mandamus proceedings for the purpose of setting aside contempt proceedings brought against William P. Rutledge, commissioner of police, in the jitney case.

Judge Guy A. Miller in Circuit Court refused to set aside the proceedings, which were started after Rutledge is alleged to have violated the injunction issued by Judge Harry J. Dingeman restraining the police from interfering with the jitney drivers. Judge Miller held that the injunction issued by Judge Dingeman was valid. O'Neil maintains that it was void and for that reason the contempt proceedings were not legal. It is upon this point that an appeal is planned. Details of the controversy between the city of Detroit and the jitney drivers were told in the *ELECTRIC RAILWAY JOURNAL* of July 31.

## Vote on Detroit Transit Plan in Spring

The rapid transit ordinance, embodying a subway system for Detroit, Mich., to cost approximately \$180,000,000, will not be submitted to the voters at the Nov. 2 election, but will in all probability be presented to the people for final action in the spring.

Mayor John W. Smith said he believed additional time should be given for the thorough study of the project, in view of the enormous amount of money involved. At the hearing before the City Council at which the matter came up for discussion serious opposition to the plan advanced by the transit commission developed, especially as applied to the proposed plan for the financing of the scheme. The Mayor believes that with more than 200 candidates seeking office at the November election the opportunity for proper discussion of the transit question does not present itself.

Sidney D. Waldon, chairman of the Transit Commission, stated that it was his personal opinion that the people should have ample time to study the question.

The plan for Detroit was reviewed in the *ELECTRIC RAILWAY JOURNAL* for Aug. 28, page 355.

## Something May Be Told

OF THE hundreds of corporation executives who have been discussing with animation Professor Ripley's strictures upon the reticence of annual reports, not a few have offered a rebuttal which fails to rebut. . . . Professor Ripley's main premise, that the stockholder has a right to enough information to enable him to draw intelligent conclusions concerning both the safety and the profitableness of his investment, is unassailable. . . .

That the majority of stockholders throw annual reports away unread is more easily asserted than proved. The assumption cannot be offered in defense of present practice, if only on the principle that the accused cannot take advantage of his own wrongdoing. If annual reports are not read, it is primarily because so many of them are either unreadable or not worth reading.

To publish a mass of technical and uncorrelated facts is not to meet the

stockholder's legitimate demand. He is not an auditor and neither are the directors of the company auditors. The chief executive has no difficulty in making himself intelligible when he talks to the board; neither does he find it impossible to engage their interest. The difference is that in one case he wants to do these things and in the other he frequently doesn't. But he should infinitely prefer to make the effort, rather than have bureaucratic dictation dragged into a naturally personal and private relation.

It has been remarked that schools should be opened for the training of stockholders in the study of corporation affairs. H. G. Wells supports Carlyle in his dictum that the only real university consists of books. What better university for the stockholder can there be than annual reports of going-or-coming-concerns, properly written?—*Wall Street Journal*.

## News Notes

**Easton Road Gradually Ceasing Service.**—The Philadelphia & Easton Electric Railway, Doylestown, Pa., has discontinued carrying United States-mail between Easton and Doylestown. The company will continue in service a few more months. The road has already discontinued service into Easton.

**Retrouting Proposed to Speed Up Service.**—In an effort to furnish faster service on the Olive-University and Olive-Delmar lines the United Railways, St. Louis, Mo., proposes to consolidate the Olive-University and Olive-Maryland lines and change the routing of the

Olive-Delmar line. Consent of 51 per cent of property owners of three blocks is needed to make the proposed changes. As usual, some are opposing the plan, which means better facilities for many thousands of residents of the territory served.

**Strike Pickets Discharged by Indianapolis Judge.**—On the grounds that the strike was over and "there should be no malice," Judge Paul C. Wetter in Municipal Court Sept. 2 dismissed a woman and six men who appeared to answer charges of picketing, congregating and vagrancy, preferred against them during the recent strike of employees of the Indianapolis Street Railway. Mrs. Jeanette O'Brien, the woman, had been prominent as a speaker and leader at meetings of strikers.

**More Power Sought by Brooklyn Company.**—The Brooklyn-Manhattan Transit Company, Brooklyn, N. Y., is negotiating with the Brooklyn Edison Company for a contract by which the latter would supply such additional power as may be needed by the B.-M. T., which now produces part of its power and obtains the remainder from the Interborough Rapid Transit Company.

**Denver Orphans Ride Free.**—The Denver & Intermountain Railroad, operating between Denver and Boulder, Col., on the recent receipt of its seventeen new buses invited the orphans of Denver to a free ride throughout the city. The line, known as the "Kite" route, operates buses as an auxiliary to its electric railway service.

**Jamaica Line Issues Time-Table Booklet.**—The Jamaica Central Railways, Inc., Brooklyn, N. Y., has furnished a time-table for its patrons of the Belmont Park and Liberty Avenue Divisions. In the foreword the company expresses the intention of exercising the greatest care in operation and of adhering rigidly to these schedules. Interruptions, which are usually due to causes beyond the company control, will no doubt occur, but everything will be done to restore service to normal as quickly as possible. The booklet includes a list of the officers of the company. The time-table carries advertising of local merchants.

**Six Hundred Cars of Peaches.**—Fruit movements on the Salt Lake & Utah and the Bamberger Electric Railroads, Salt Lake City, Utah, have been said to indicate one of the heaviest total shipments in the history of the lines. A total of 600 cars of peaches is expected to be moved to Eastern and Middle Western centers during the month of September. The Bamberger line, serving the territory between Ogden and Salt Lake, from early estimates will handle about 200 cars of the fruit for New York, Chicago, St. Louis, Kansas City, Detroit and other centers of population. The Orem line, serving Utah County, will move about 400 cars, if predictions are fulfilled. Shipments of peaches started fully two weeks ahead of the usual season. Cantaloupes also will be shipped eastward in great quantities, although not in as large numbers as peaches.

## Recent Bus Developments

### Report on New York Bus Proposals Expected Sept. 15

Mayor Walker of New York has called a special meeting of the Board of Estimate for Sept. 15 to receive the report of the Board of Transportation analyzing the bus franchise applications which have been pending several months. No action will be taken on Sept. 15, Mayor Walker said, because the board members will need time to study the report first.

Chairman John H. Delaney of the Board of Transportation says his completed report will comprise 1,000 pages. It is assumed it will deal with the respective virtues of the three city-wide bus systems proposed and the borough and sectional bids which make up the 70-odd applications.

Another feature which has received attention by the board is that of fare rates which will prove most desirable to the public and still afford income sufficient to enable the operators to pay their franchise tax to the city. The proposals range from a flat 5-cent fare to a flat 10-cent fare.

Mayor Walker said the Board of Estimate would probably vote to refer the report to the committee of the whole and then study it informally. He thought it probable the members might be prepared to take action at the regular meeting on Sept. 21.

### Express Service in Buffalo

Express bus service has been started by the International Bus Corporation, a subsidiary of the International Railway, Buffalo, N. Y., on the Delaware Avenue line between the downtown business district and the Kenmore-Tonawanda village line. The one-way fare is 25 cents, compared with 15 cents for the usual service. Only four stops are made in the city of Buffalo, one at the Buffalo city line and two in the village of Kenmore. The stops are marked with signs. The express service is ten to fifteen minutes faster from terminal to terminal than the local service. Double-deck buses are run during the morning and evening rush hours.

### Traction Company Opposes Steam Road Bus Charter

The petition of the Alton Transportation Company, a subsidiary of the Chicago & Alton Railroad, for permission to operate motor coaches between Jacksonville and East St. Louis, Ill., was opposed by officials of the St. Louis Electric Terminal Railway, St. Louis, Mo., at a Commerce Commission hearing in Chicago recently.

The St. Louis Electric Terminal Railway is a subsidiary of the Illinois Power & Light Corporation and according to E. A. Roehry, general manager and one of the principal witnesses, the granting of a charter to the rail-

road's bus line to do a local business in Venice, Madison and Granite City would divert substantial traffic from the traction company's lines.

Mr. Roehry declared that his company has more reserve equipment than is needed at peak hours now. He produced numerous exhibits to show that the Illinois Power & Light Corporation absorbs a deficit registered by the St. Louis Electric Terminal Railway almost every year.

### Buses on Templeton-Gardner Run

Stockholders of the Templeton-Gardner Street Railway, Templeton, Mass., have voted to ratify a decision of the directors to substitute bus service for electric service on the company's lines. Orders have been placed for the immediate delivery of the latest type passenger buses, and it is expected the complete change from electric to bus service will take place within 60 days.

### Community Builder in Oregon

Another bus has been added to the fleet of the Oregon City Motor Bus Company, under the direction of G. C. Fields, superintendent of the interurban lines of the Portland Electric Power Company, Portland, Ore. These buses run between Portland (Sixth and Salmon Streets terminal) and Oregon City over the West Side Highway, serving the communities of Dunthorpe-Oswego, Bolton and West Linn en route, and maintain a 30-minute schedule between terminals on weekdays and more frequent service on Saturdays, Sundays and holidays.

When the Oregon City Motor Bus Company commenced operation on this line on Sept. 24, 1924, the West Side Highway between Portland and Oregon City was without a dependable transportation system and in consequence there was very little building activity along the way. The Oregon City Motor Bus Company purchased first-class equipment, put on frequent and dependable service and in a short time real estate values commenced to move and homes to arise.

Lakewood, located between Oswego and Oswego Lake on the peninsula, has been developed into one of the most beautiful residential spots in the country. About  $\frac{1}{2}$  mile south of the town of Oswego, at the foot of Oswego Lake, one of the finest bathing, boating and picnic resorts to be found anywhere is patronized by thousands of people, particularly on Sundays and holidays. The buses discharge and pick up passengers at the entrance and may be credited in a large measure with building up this resort. Robinwood, a beautiful and sightly tract just south of Marylhurst, has been opened up recently and promises to be a fine residential district. Many new homes have recently been built at Bolton and West Linn and many more are under construction. These activities are all reflected in in-

creased travel on the buses. At the present time the Oregon City Motor Bus Company owns and operates three Yellow coaches and four Fageol "Safety" coaches over this route.

### Buffalo-Niagara Falls Operation Sanctioned

The Public Service Commission of New York on Sept. 2 granted to the International Bus Corporation a certificate of convenience and necessity for the operation of a bus line between Buffalo and Niagara Falls.

Opposition was offered to the granting of the certificate by the New York Central Railroad, the Lehigh Valley Railroad and M. L. Van Dyke, operating a sightseeing bus line between Buffalo and Niagara Falls, Ont.

At the hearing on the application, which was held in Buffalo on Aug. 16, it was shown that the International Bus Corporation, a subsidiary of the International Railway, proposed to substitute buses on certain lines to meet an increasing and insistent demand on the part of the public for bus transportation.

No local passengers will be carried in the village of Kenmore, the town of Tonawanda, city of Tonawanda, city of North Tonawanda, or from Tonawanda to North Tonawanda, town of Wheatfield, the village of LaSalle or the city of Niagara Falls.

The buses will be operated on an hourly schedule from 8 a.m. to 8 p.m. from Buffalo and from 8.30 a.m. to 7.30 p.m. from Niagara Falls, with an additional trip from Niagara Falls at 10 p.m.

Rates of fare will be: Buffalo to Kenmore, 25 cents; town of Tonawanda, 35 cents; city of Tonawanda, 50 cents; town of Wheatfield, 70 cents; LaSalle, 80 cents, and Niagara Falls, \$1.

### New Bus-Trolley Equipment for Richmond

The Virginia Electric & Power Company has placed orders for \$500,000 in new bus-trolley equipment for Richmond's unified transportation system, following the action of the Board of Aldermen in over-riding, by a vote of nine to one, Mayor J. Fulmer Bright's veto of the bus line ordinance. The measure became a law on Sept. 3. Officials of the company say equipment has been ordered sufficient to render satisfactory service on all the new routes and that operations would start about Jan. 1. The orders just placed also include some new trolley equipment for extensions and betterments that are to be made, and this work was started without delay, as well as the rerouting that is to be carried out under the blanket trolley franchise recently adopted.

### Municipal Buses at Buffalo a Costly Fare

Local newspapers in Buffalo, N. Y., are calling upon Mayor Frank X. Schwab, who started the municipal buses after his return from Europe, to give a detailed accounting of the \$15,000 bus fund voted by the City Council.

Charges are made that all this money has been spent and that the income from the operation of the municipal buses, run in competition with the lines of the International Railway and its subsidiary, the International Bus Corporation, is not sufficient to pay the operating expenses. Newspaper editorials say that continued operation of buses by the Department of Public Safety is piling up a big deficit for the taxpayers to discharge.

Letters from the public being printed in Buffalo newspapers describe acts of discourtesy by the policemen-conductors, attempts by drivers of the municipal buses to coerce drivers of the double-deck buses of the International system and cite cases in which abusive language has been used by the policemen-conductors toward passengers and crews on International operated bus routes.

### Change of Route Starts Bus Battle in Ohio

What may be the first skirmish to an extended legal battle between the suburban bus companies and interurban railroads operating from Cincinnati, Ohio, to surrounding villages recently developed in the Common Pleas Court of Clermont County.

F. A. Nichols, general manager of the Cincinnati, Georgetown & Portsmouth Electric Railway, appeared before Common Pleas Judge Charles White at Batavia and obtained an injunction against Victor Nobis, owner of the Cincinnati-New Richmond Bus Company. Mr. Nichols told Judge White that the bus had taken passengers on in territory which legally was to be served by the Cincinnati, Georgetown & Portsmouth Railway only.

Due to recent washouts which destroyed several small bridges on the River Road, Nobis, according to Mr. Nichols, changed his bus route from the River Road to the Grant Highway, deviating far up on the road and detouring through Mount Pisgah, Lynnedale and Hamlet and going thence over the road between Fruit Hill and Mount Washington.

According to Mr. Nichols, the territory between Hamlet and Cincinnati is reserved for electric railway traffic only. Basing his decision on the complaint, Judge White issued the temporary injunction. No date has been set for the final hearing.

### Railway Granted Bus Privilege

The Public Service Commission of New York has issued an order granting the Binghamton Railway Bus Lines, Inc., certain bus rights. The railway is permitted to lease for a period of five months from Sept. 1, 1926, the operating rights, together with the equipment, of the Triple Cities Bus Lines, Inc., and Edward J. Dorey for bus routes in certain streets in the city of Binghamton, the village of Endicott and the towns of Dickinson, Union and Vestal in Broome County. The Binghamton Railway Bus Lines, Inc., applied to the Public Service Commission on Aug. 9 for the right to lease the above-mentioned property. The stock

of the petitioner, it was stated, was owned by the Binghamton Railway, which stated that it had amended its certificate of incorporation so that it might operate the bus lines in conjunction with the existing service on the trolley lines. In the transaction were included eight buses, which would bring the total number of buses owned and operated by the Binghamton Railway up to eleven. Under the plan the belt line would be so combined with the bus line now being operated by the railway as to cover more territory.

**Denver Extends Bus System.**—The Bus Transportation Company, a subsidiary of the Denver Tramway, Denver, Col., has applied to the State Board of Public Utilities for a permit to operate an automobile line between Denver and Golden on West Colfax Avenue and the Golden paved road.

**Transfers Interchanged.**—The Virginia Electric & Power Company, Richmond, Va., began the interchange of transfers from its trolley cars to the buses on Sept. 5. Also effective Sept. 5 a straight 8-cent fare was being charged on the buses. The railway fare is 7 cents with transfers from street cars to buses costing an extra cent.

**Bus Line Discontinued in Washington.**—The Capital Traction Company, Washington, D. C., has been directed by the Public Utilities Commission of the District of Columbia to discontinue the operation of its Rock Creek Park Golf Course bus line. Under the date of Aug. 11 the company submitted to the commission the operating results for the months of May, June and July showing a total loss for the three months of \$1,326. A hearing was held in July, at which the railway showed that the line was operated at a loss. The application was opposed by the concessionaire of the golf course and by the Director of Public Buildings and Public Parks, and the company's representative finally requested that no action should be taken at that time, but that the returns from a longer summer period should be awaited.

**Extension of Bus Service in Indiana.**—G. O. Nicholai, manager of the Terre Haute, Indianapolis & Eastern Traction Company, Terre Haute, Ind., has announced a further improvement in the bus service of his company. On some routes buses are being added and on others the lines are being extended.

**Railway Has Competing Bus Line Suspended.**—Operation of the bus line run for the last five years by F. W. Herzog between Edwardsville and Glen Carbon, Ill., a distance of 5 miles, was suspended Aug. 31 on an injunction granted by Circuit Judge George A. Crow at Belleville on an application filed by the East St. Louis & Suburban Railway, East St. Louis, Ill. The company contended that Herzog had failed to obtain a certificate of convenience and necessity from the Illinois Commerce Commission. Herzog stated that he had applied to the Commerce Commission for the permit some two months ago. He also sought to have the line extended to Granite City, Ill. Counsel for Herzog announced that an appeal would be taken.

# Financial and Corporate

## Net Off in St. Louis

Receiver Reviews Conditions Which Confronted Company in 1925—Prospects Ahead Are Better

Gross operating revenue of the United Railways, St. Louis, Mo., for the year ended Dec. 31, 1925, was \$18,894,574. This compares with the sum of \$19,515,275 for 1924, or a decrease of \$620,700. Net income for 1925 showed a loss of \$206,174 compared with a surplus of \$29,876 for 1924, or a decrease of \$236,051 for the year. These and other significant facts about the operation of the company are all contained in the pamphlet report of the company for the year presented by Rolla Wells, the receiver, of which this account is merely a digest.

No interest has been paid on the underlying bonds, or on the bonds of the St. Louis Transit Company, since Oct. 1, 1923, and no interest has been paid on the St. Louis & Suburban Railway general mortgage 5 per cent bonds since April 1, 1923. Interest has been accrued on the books to Dec. 31, 1925, at the rates provided by the mortgages and extension agreements, on all the issues of bonds.

The amount expended by the protective committee of the St. Louis Transit Company bondholders in payment of interest coupons No. 49, on United Railways first general mortgage 4 per cent bonds due Jan. 1, 1924, was refunded to that committee on Feb. 15, 1926, with interest at 6 per cent by order of federal court.

The receiver was authorized by the court on Feb. 15, 1926, to enter into a contract with the reorganization committee conformably to the committee's offer of Feb. 10, 1926, providing for payment of series "B" receiver's certificates, the obtaining of \$6,000,000 par value United Railways 4 per cent bonds in exchange for divisional bonds, and the sale of 4 per cent bonds to the reorganization committee.

The outstanding issue of \$4,200,000 series "B" receiver's certificates was called for payment April 1, 1926, at 100½ and accrued interest. The principal of these certificates, together with accrued interest and premium for calling the issue before maturity, aggregating \$4,347,000, will be paid with \$1,900,000 cash supplied by the reorganization committee and \$2,447,000 supplied by the receiver from funds on hand.

The three issues of divisional bonds, viz.: Compton Heights, Cass Avenue and Lindell bonds, aggregating \$4,100,000, were also called for payment on April 1, 1926.

On Feb. 23, 1926, the court ordered the St. Louis Union Trust Company, trustee under the mortgage securing the first general mortgage 4 per cent gold bonds of the United Railways, to certify and issue to the receiver \$6,000,000 par value of United Railways 4s, which bonds will be delivered by the receiver to the reorganization committee, for \$6,000,000 cash supplied by

it for part payment of series "B" receiver's certificates, and for refunding the three issues of divisional bonds amounting to \$4,100,000 par value.

The court also ordered the trustee to cancel \$3,768,000 first general mortgage 4 per cent gold bonds of the United Railways remaining in its hands for refunding divisional bonds.

The payment of the receiver's certificates and the three issues of divisional bonds on April 1, 1926, will cure the default in the United Railways first general mortgage 4 per cent bonds, which bonds will remain on the property until their maturity July 1, 1934, in accordance with the plan and agreement for the reorganization of the company, dated Oct. 1, 1924.

No payments were made during the year on the liability of \$2,396,321 for mill tax due the city of St. Louis, this

### STATEMENT OF FUNDED DEBT OF UNITED RAILWAYS, ST. LOUIS

Issue	Total Outstanding Dec. 31, 1925
Underlying bonds:	
Compton Heights, Union Depot & Merchants Terminal Railroad, first mortgage 6s, due 1923.....	\$986,000*
Cass Avenue and Fair Grounds Railway, first mortgage 6s, due 1923..	1,640,000*
Lindell Railway, first mortgage 8s, due 1923.....	1,474,000*
St. Louis & Suburban Railway, consolidated mortgage 8s, due 1923....	2,000,000*
Total underlying bonds.....	\$6,100,000
United Railways of St. Louis, first general mortgage 4s, due 1934.....	30,300,000*
St. Louis & Suburban Railway, general mortgage 5s, due 1923.....	4,500,000*
St. Louis Transit Company 5s, due 1924	9,790,000*
Total.....	\$50,690,000
Receiver's certificates, series "B" 6s, due 1926.....	\$4,200,000
* In default.	

### CONDENSED INCOME ACCOUNT OF THE UNITED RAILWAYS, ST. LOUIS, FOR YEAR 1921 TO 1925, INCLUSIVE

	1925	1924	1923	1922	1921
Revenue from transportation.....	\$18,669,775	\$19,288,743	\$20,220,765	\$19,740,118	\$19,498,946
Revenue from other railway operations.....	224,798	226,531	232,679	223,437	159,604
Gross operating revenue.....	\$18,894,574	\$19,515,275	\$20,453,445	\$19,963,555	\$19,658,551
Operating expenses (including depreciation) ..	14,684,076	15,093,195	15,123,183	14,895,508	15,093,218
Surplus over operating expenses.....	\$4,210,498	\$4,422,080	\$5,330,262	\$5,068,047	\$4,565,332
Taxes.....	1,810,701	1,772,134	1,832,620	1,845,722	1,675,697
Income from operation.....	\$2,399,796	\$2,649,945	\$3,497,659	\$3,222,324	\$2,889,635
Income from other sources.....	285,449	287,870	225,700	202,830	216,349
Gross income (less operating expenses and taxes).....	\$2,685,246	\$2,937,816	\$3,723,359	\$3,425,155	\$3,105,985
Deductions from income.....	2,892,514	2,907,939	2,913,614	2,912,063	2,802,939
Net income—Railway.....	\$207,268	\$29,876	\$809,745	\$513,091	\$303,045
Net rental income from bus equipment.....	1,093	0	0	0	0
Dividends.....	0	0	0	0	0
Surplus.....	\$206,174	\$29,876	\$809,745	\$513,091	\$303,045

Figures in italic denote deficit.

### TRAFFIC STATISTICS

	1925	1924	1923	1922	1921
Revenue passengers.....	270,105,400	279,222,520	292,671,781	286,076,475	282,447,190
Transfer passengers.....	145,698,764	149,555,651	155,343,193	152,261,868	150,562,354
Total passengers.....	415,804,164	428,778,171	448,014,974	438,338,343	433,009,544
Percentage of revenue passengers using transfers.....	53.94	53.56	53.08	53.22	53.31
Average fare per passenger (including transfers), cents.....	4.48	4.49	4.50	4.49	4.49
Average fare per revenue passenger, cents..	6.90	6.89	6.89	6.89	6.89
Passenger car-miles.....	42,440,837	43,911,064	45,652,714	44,229,300	44,229,210
Revenue passengers per car-mile.....	6.36	6.36	6.41	6.47	6.39
Total passengers per car-mile.....	9.80	9.76	9.81	9.91	9.79

### CONSOLIDATED INCOME AND EXPENSE STATEMENT OF THE UNITED RAILWAYS ST. LOUIS, YEAR ENDED DEC. 31, 1925

Operating Revenue:			
Revenue from transportation:			
Passenger revenue.....	\$18,628,734		
Special car revenue.....	31,288		
Express revenue.....	9,753	\$18,669,775	
Revenue from other railway operations:			
Station and car privileges	\$172,754		
Rent of equipment.....	1,765		
Rent of buildings and other property.....	23,663		
Sale of power.....	26,615	224,798	
Gross operating revenue.....		\$18,894,574	
Operating Expense and Charges:			
Current operating expense:			
Way and structures.....	\$1,055,856		
Equipment.....	1,690,175		
Power.....	1,852,732		
Transportation expense	6,708,803		
Traffic expense.....	22,630		
Injuries and damages reserve.....	1,133,674		
General and miscellaneous.....	720,203		
Depreciation reserves..	1,500,000		
	\$14,684,076		
Taxes.....	1,810,701		
Total operating expense, depreciation and taxes.....		\$16,494,778	
Income from operation.....		\$2,399,796	
Non-operating Income:			
Rents—Less expense and taxes.....	\$11,092		
Interest on deposits.....	13,503		
Interest from investments	260,829		
Miscellaneous.....	24	285,449	
Gross income.....		\$2,685,246	
Other Deductions:			
Interest on bonded debt..	\$2,361,980		
Interest on receiver's certificates.....	252,000		
Interest on bond interest coupons matured—not paid.....	36,360		
Interest on mill tax judgments.....	143,779		
Amortization of discount and expenses in connection with sale of receiver's certificates, Series "B".....	74,717		
Income tax on bond coupons.....	21,000		
Bank services, payment of bond and receiver's certificates, interest coupons	2,677	2,892,514	
Net loss for the year from railway operations.....		\$207,268	
Less: Net rental income from bus equipment.....		1,093	
Net loss for the year.....		\$206,174	

STATEMENT OF CAPITAL EXPENDITURE  
MADE BY THE UNITED RAILWAYS, ST.  
LOUIS, 1925

Way and structures.....	\$318,084
Equipment.....	91,033
Power.....	6,563
<b>Total additions.....</b>	<b>\$415,681</b>
Deductions:	
Way and structures.....	\$21,728
Equipment.....	183,118
Power.....	13,801
<b>Total deductions.....</b>	<b>\$218,648</b>
<b>Net addition during the year.....</b>	<b>\$197,032</b>

amount being the balance of judgment obtained by the city against the company for mill tax to Dec. 31, 1918. The interest on this judgment, however, has been provided on the books to Dec. 31, 1925, and the current mill tax has been paid regularly.

The total taxes, street paving costs and expense on account of city sewers construction were \$2,229,193, or 11.8 per cent of gross operating revenue, or 0.825 cent per revenue passenger, as compared with 0.796 cent per revenue passenger in 1924.

In addition to the direct taxes the United Railways expended \$365,399.65 for street paving and furnished free transportation for the policemen and firemen of St. Louis.

There was also expended and charged to operating expenses an amount of \$23,993.97 for carrying tracks over or around new sewers built by the city.

The total mileage in single track on Dec. 31, 1925, was as follows:

	Miles
City track.....	347,2787
County track.....	115,6013
<b>Total.....</b>	<b>462,8800</b>

During the year 1925, 0.7486 mile of track was added and 1.0440 miles was removed.

Since 1904 the amount of track reconstruction, renewal and extensions of track of the company in the city and county was as follows:

Year	Miles	Year	Miles
1904.....	21.56	1916.....	15.39
1905.....	8.90	1917.....	19.72
1906.....	29.18	1918.....	15.80
1907.....	21.65	1919.....	25.01
1908.....	32.99	1920.....	26.50
1909.....	39.93	1921.....	29.82
1910.....	45.34	1922.....	23.54
1911.....	32.69	1923.....	26.82
1912.....	25.85	1924.....	26.24
1913.....	27.72	1925.....	17.28
1914.....	21.77		
1915.....	28.05		
		<b>Total for 22 years.....</b>	<b>561.75</b>

The number of passenger cars owned at the end of 1925 was 1,608, of which 1,429 were motor cars and 179 trail cars. This compared with 1,638 at the end of 1924, 1,614 at the end of 1923 and 1,579 at the end of 1922.

Thirty-two passenger cars were retired from service and destroyed during 1925 and two special cars, "Ariel" and "Electra," were converted into passenger cars for use on the St. Charles line.

One hundred and forty-three cars were remodeled by changing old-type folding steps to well-type steps, with manually operated doors.

One hundred and ninety cars were equipped with a manually operated trip-

ping device on rear door operating mechanism, preparatory to one-man operation.

One hundred and fifty-four cars were provided with special sash at conductor's booth to give conductor a clear view.

Twenty-six cars of the large "600" type were equipped with independent air compressors to replace the storage air equipment.

One flat car was entirely rebuilt and provided with steel underframing in place of wood.

Twenty cross-bench open cars were provided with additional guard rods the full length of car on closed side.

The roofs of 527 cars were painted.

	Cars
General overhauling and repainting.....	320
Car body and collision repairs.....	1,413
Truck and motor repairs.....	195
Revarnishing.....	377
<b>Total.....</b>	<b>2,305</b>

This total compared with a total of 2,245 in 1924, and 1,861 in 1923.

Five Six-Wheel Safeway 29-passenger buses were purchased, the chassis from the Six-Wheel Company and the bodies from St. Louis Car Company.

The seven automatic substations, installed principally during 1924, have resulted in improved operating voltage, decreased distribution losses, better return-circuit conditions and (due to decreased loads at adjoining stations) a reduction in the cost of maintenance of substation equipment. Studies are being made to determine the most efficient operating methods under various conditions, substation and transmission losses at different loads being balanced against distribution losses.

In spite of the fact that the number of automobiles registered in St. Louis in 1925 was more than 8 per cent greater than in 1924, and nearly four times as great as at the beginning of

the receivership, and in spite of the increased number of buses and bus lines, the increased efficiency of operations and the excellent co-operation on the part of the police department not only prevented a decline but actually caused an improvement in the street car transportation service.

The average miles per hour (including terminal delays, etc.) for 1925 was 9.76, as compared with 9.73 in 1924 and 9.75 in 1923.

The average number of revenue passengers in 1925 was 3.27 per cent less than in 1924. Car-miles in 1925 decreased 3.35 per cent from 1924 and car-hours decreased 3.01 per cent.

A check made of a typical day of the traffic in and out of the congested business district, as published by the special committee of the Board of Aldermen, was as shown in the accompanying table.

As in the past two or three years, since the great growth of the automobile traffic, the Saturday, Sunday and holiday street car traffic showed in 1925 a much greater falling off than that of the remaining days of the week as shown in the accompanying table.

Toward the latter part of 1925 and in the early part of 1926 it would appear that the street car traffic is again beginning to increase and to be gaining proportionately over automobile and bus competition.

The popularity of the street car service is also being gradually increased by the co-ordinated system of transportation started in connection with the St. Louis Bus Company early in 1925. Under that system the 10-cent fare on the bus gives free transfer privilege to street cars, and transfers from the street cars to buses are issued on the payment of 3 cents in addition to the regular 7-cent street car fare. These buses are all run in extension of or in supplement to the street railway service, and seven lines of these buses are now in operation.

TRAFFIC IN AND OUT OF THE CONGESTED BUSINESS DISTRICT OF ST. LOUIS  
(Entire business day, 7 a.m. to 6 p.m., both in and out)

	Vehicles		Passengers		Passengers per Vehicle
	Number	Per Cent of Total	Number	Per Cent of Total	
Street cars.....	9,645	9.6	308,779	62.8	32.1
Private automobiles.....	87,700	87.2	142,759	29.0	1.6
Buses.....	1,976	2.0	36,233	7.4	18.3
Service cars.....	1,208	1.2	3,913	0.8	3.2
<b>Total.....</b>	<b>100,529</b>	<b>100.0</b>	<b>491,684</b>	<b>100.0</b>	<b>4.9</b>
Commercial vehicles.....	37,837	.....	50,893	.....	1.3
<b>Total.....</b>	<b>138,366</b>	<b>.....</b>	<b>542,577</b>	<b>.....</b>	<b>3.9</b>

(Maximum hour, p.m. peak, leaving district, one way only)

	Vehicles		Passengers		Passengers per Vehicle
	Number	Per Cent of Total	Number	Per Cent of Total	
Street cars.....	868	8.4	62,332	72.4	71.8
Private automobiles.....	9,291	89.3	17,601	20.4	1.9
Buses.....	123	1.2	5,557	6.5	45.2
Service cars.....	117	1.1	634	0.7	5.4
<b>Total.....</b>	<b>10,399</b>	<b>100.0</b>	<b>86,124</b>	<b>100.0</b>	<b>8.3</b>
Commercial vehicles.....	2,722	.....	3,576	.....	1.3
<b>Total.....</b>	<b>13,121</b>	<b>.....</b>	<b>89,700</b>	<b>.....</b>	<b>6.8</b>

PASSENGER REVENUE

	Days	Year 1925	Days	Year 1924	Decrease	Per Cent Decrease
Total.....		\$18,628,734		\$19,247,650	\$618,916	3.22
Average day.....	355	51,037	366	52,589	1,551	2.95
Average week-day.....	257	53,637	256	55,053	1,415	2.57
Average Saturday.....	50	55,394	51	57,146	1,751	3.06
Average Sunday.....	52	35,931	52	38,105	2,174	5.71
Average holiday.....	6	34,280	7	36,859	2,579	7.00

Holidays: New Year's Day, Decoration Day, Independence Day (year 1924, 4th and 5th), Labor Day, Thanksgiving Day, Christmas.

During the year one-man operation of street cars was put into effect on Sundays only on the Park line, Compton line, Tower Grove line and the Sarah line. Cars have gradually been fitted for such service and operators broken in for one-man operation on various lines. Regular one-man operation was also put into effect on October, 1925, on that part of the St. Charles line between Wellston and Woodson Road.

In order to bring about a uniform system of entrance on all types of cars and to bring weekday operations in that respect in line with the one-man operations on Sundays, and in order to increase the rapidity of loading of cars, a general front-entrance arrangement with "pay-as-you-pass-conductor" system went into effect in November, 1925.

In the summer of 1925 an ordinance was passed prohibiting parking of automobiles in certain congested districts between 7 a.m. and 10 a.m. and between 4 p.m. and 6 p.m. These hours were later changed by a new ordinance to 7 a.m. to 9:30 a.m. and 4:30 p.m. to 6 p.m. This arrangement has helped materially in getting cars through those districts.

There was no change in the basic 7-cent fare during 1925.

The total number of employees on Dec. 31, 1925, was 5,811, compared with 5,803 on Dec. 31, 1924, and with 6,014 on Dec. 31, 1923. The maximum number of employees during 1925 was 6,269 compared with 6,361 in 1924.

No changes in agreements as to wages and working conditions were made in 1925. But a materially decreased labor turnover and the reaching of the fourth year wages by an increased percentage of motormen and conductors made a material increase in the average wages in that department over the previous years.

The total miles in single main track of the Missouri Electric Railroad on Dec. 31, 1925, were 23,4838. Of this mileage 7,6551 was double track, meas-

#### INCOME STATEMENT OF THE MISSOURI ELECTRIC RAILROAD

	Year Ended	
	Dec. 31, 1925	Dec. 31, 1924
Revenue from transportation.....	\$154,897.96	\$164,746.82
Revenue from other railway operations.....	2,505.10	2,114.26
Gross operating revenue	\$157,403.06	\$166,861.08
Current operating expense and depreciation....	\$160,252.30	\$158,973.04
Taxes.....	13,709.88	12,452.80
Total operating expenses, depreciation and taxes	\$173,962.18	\$171,425.84
Loss from operation.....	\$16,559.12	\$4,564.76
Non-operating income.....	1,521.50	1,624.30
	\$15,037.62	\$2,940.46
Interest on bonded indebtedness.....	35,000.00	35,000.00
Net loss for the year from railway operations....	\$50,037.62	\$37,940.46
Net loss from bus operations.....	\$9,507.19	.....
Net loss for the year....	\$59,544.81	\$37,940.46

ured as such, and 7,8922 single track, measured as such. In addition to the above there was 0.2814 mile of spurs and miscellaneous track. This main track mileage includes 2,5139 miles of track of the St. Louis County Street Railroad, operated as part of the Missouri Electric.

## Financier Optimistic

Representative of Banking House Says Carefully Selected Bonds Should Prove Profitable

Bonds of electric railways, which can now be obtained on an attractive basis, afford an excellent opportunity for the intelligent investor. This is the opinion of D. F. Jordan of Halsey, Stuart & Company, expressed in an article contributed by him to the San Francisco *Examiner*. Mr. Jordan says it would be premature to say that the electric railways have generally re-established their pre-war earning status, but for those companies which operate in large cities under a favorable franchise, which enjoy cordial public relations and which are economically and capably managed he sees the outlook as encouraging.

Mr. Jordan said:

A study of the situation in electric railway securities indicates that in certain companies improvement has progressed to a point which warrants favorable investment consideration.

The difficulties which have confronted the industry for several years are too well known to require detailed comment. The competition of the passenger automobile and the bus, the handicap of a stationary 5-cent fare, and the burden of heavy increases in operating expenses have combined to affect adversely the corporate earnings.

The extent to which these obstacles have been met and overcome to a large extent is not fully appreciated by the public generally or by investors.

The competition of the passenger automobile and the bus was never so serious as might readily have been assumed from casual comment. The passenger automobile did harm to interurban traffic, but had limited effect upon city riding. Bus operation, save in outlying districts, has yet to prove more economical or serviceable than the trolleys. No major city rail operation has been suspended and buses substituted permanently for cars.

Incidentally, the traction lines are carrying more passengers than ever before. Their chief difficulty has never been lack of traffic, but inadequacy of earning power. The handicap of a stationary fare has been a more serious problem. A 5-cent fare for a street car ride had become an American institution. The companies found it difficult to secure rate increases because of franchise restrictions and the general impression that lower operating costs were not far distant.

Eventually, but unfortunately not before several companies were brought to the brink of receivership, relief came in the form of higher fares. The 5-cent fare has disappeared save in a few cities like San Francisco and New York, where exceptional conditions exist.

In theory, the actual cost of service, large or small, should be covered, with a reasonable margin of profit based upon capital investment, by revenue rates set sufficiently high by the regulatory public commissions. In practice the companies find it more profitable to insure earnings by keeping down expenses than by seeking higher rates.

Many economies have been put into effect, such as one-man cars, decrease of transfer abuse, cheaper power, elimination of unprofitable lines, substitution of buses where economical, reduction of paving obligations and more efficient equipment.

Mr. Jordan says that wages, however, the chief operating cost, remain high and will continue so under existing economic conditions, but that it should be carefully noted that anything approaching a depression in business will enhance rather than harm the position of the electric railways.

## Property at Rome, Ga., Goes to Southeastern

Acquisition of the Rome Railway & Light Company, Rome, Ga., by the Southeastern Power & Light Company was announced on Sept. 3. The former

company, which furnishes electric light, power and transit in Rome, Ga., and vicinity, was valued at about \$2,000,000. As a result of this and other recent purchases Southeastern has brought under its control practically all utilities in Middle and North Georgia.

Passengers carried by Southeastern transit systems in July totaled 9,802,000, and those carried in the first seven months of the year totaled 68,780,585. Buses operated by Southeastern carried more than 2,500,000 passengers in the seven-month period.

## More Moves in Kansas City Reorganization

William G. Woolfolk, president of the Kansas City Public Service Company, and Powell C. Groner, attorney for the company, on Sept. 2 submitted a formal request to the State Public Service Commission for the issuance of the latter body's formal order transferring the properties of the Kansas City Railways to the potential owners. They also sought permission to issue new securities as provided in the reorganization plan.

Frank P. Sebree, attorney for the holders of second mortgage bonds of the old company, is said to have entered objections to the commission's issuance of the order of transfer.

It is said that the filing of the report of John T. Harding, special master commissioner, fixes Dec. 1 as the limit in which the physical transfer of the railway may be made, and Mr. Woolfolk has expressed the belief that it will be possible to effect the transfer some time in October.

An extension of 12½ years of the old Jost franchise in Kansas City, Mo., so as to permit issuance of 30-year securities by the new owners is under consideration by the City Council, although an amendment, said also to be under consideration, would stipulate that the new company shall sell fifteen car tickets for \$1.

On the other hand, Howard Payne, city clerk of Kansas City, Kan., was notified on Sept. 3 that the reorganization plan of the Wyandotte Railways, successor to the Kansas City Railways in that city and a subsidiary company of the Kansas City Public Service Company, potential owner of the old Kansas City Railways, had been approved by the Public Service Commission of Kansas. Simultaneously the commission authorized the issuance of \$1,250,000 of first mortgage bonds to finance the property.

Through Mr. Woolfolk, president, and Mr. Groner, attorney for the Kansas City Public Service Company, the Wyandotte company on Aug. 17 applied to the Kansas commission for authority to consummate reorganization of the property in Kansas and for a certificate of convenience authorizing the issuance of the necessary securities.

Mr. Groner said the plans of the company included the re-establishment of service over the Twelfth Street viaduct to the Argentine district and that further extensions and improvements of service would be taken up for discussion with the city authorities immediately, when the property has been

finally transferred to its purchasers by the federal court. Service over the viaduct has been eliminated since the reconstruction was begun in October, 1923. Mr. Woolfolk, however, is said virtually to have promised service over the bridge by Oct. 1 if the company's plans were approved soon by the Kansas commission.

No franchise for operation in Kansas City, Kan., has yet been applied for by the new company, but it is said that the city commissioners will demand the fulfillment of various obligations of the Kansas City Railways before a franchise will be granted the Wyandotte company.

### Radial Lines Report Deficit

In a recent report the Hydro-Electric Power Commission of Ontario stated that the total deficit on all divisions of the York Radial Railways was \$162,022 for the six months ended April 30. For the similar period last year the loss was \$142,276, while two years ago it was \$172,925. Revenue from the Scarboro and Mimico divisions was less than that returned last year, while on the Metropolitan it increased slightly.

Operating expenses were \$366,669, while the income from the three divisions was \$303,059. The deficit from operation shown is \$63,609. To this is added interest to the extent of \$93,237, and taxes to the amount of \$5,175.

### I.R.T. Directors Nominated

Herman A. Metz, former City Comptroller, was named on Sept. 8 by the Transit Commission to continue as a director representing the public on the board of the Interborough Rapid Transit Company, New York, N. Y., for a three-year term. Mr. Metz, head of large chemical enterprises and identified with milling and banking interests, already has served three years on the Interborough board and his re-election by the board is taken for granted.

Edward J. Berwind, Mortimer N. Buckner and Charles E. Dunlap were nominated for re-election as directors of the Interborough Rapid Transit Company by holders of Interborough voting trust certificates. Charles Day was nominated for re-election as a director representing the 5 per cent first and refunding mortgage bondholders. The annual meeting for the election of directors will be held Sept. 22.

### Receiver Takes Management of Insolvent Road

Frederick W. Kruse, former Supreme Court Justice and member of the Appellate Division, named receiver for the Olean, Bradford & Salamanca Railway, Olean, N. Y., when it was declared insolvent, has taken up the duties of his new office.

The company was placed in the hands of a receiver as a result of action taken by Justice Thomas H. Noonan in Supreme Court in Buffalo.

Judgment creditors were represented by John K. Ward, attorney, Olean, formerly city attorney, and James P. Quigley, Olean attorney, appeared for the company. The State Tax Commis-

sion and the public were represented by Donald S. Dudley, deputy attorney-general.

It is the second time the property has gone into the hands of a receiver. The present company is a reorganization of the Western New York & Pennsylvania Traction Company.

**Car Line Dismantled in Indiana.**—Work has begun of tearing up the rails on the Normal City line of the Union Traction Company of Indiana, at Muncie, Ind. The line served one of the most populous parts of Muncie, the seat of the eastern division of the Indiana State Normal School. Two bus lines, one of them owned by the traction company, are now being operated between this section and the business district. Bus competition also caused the railway to abandon its Avondale line running to the southwestern part of the city. Traction buses are operating over that route. Only four car lines have been retained in service.

**Would Abandon Portion of Line.**—The Buffalo & Erie Railway, Fredonia, N. Y., filed on Sept. 7 a certificate of abandonment of that portion of its constructed road in the city of Lackawanna on Ridge Road between South Park Avenue and Abbott Road.

**Quarterly Dividend Deferred by Indianapolis Railway.**—The Indianapolis Street Railway, Indianapolis, Ind., has sent the following notice to preferred stockholders: "The expenditures found necessary to protect the company's

property against the recent attacks of labor agitators and to restore normal transportation conditions, together with the constantly increasing use of privately owned automobiles and continued bus competition, were very fully considered at the last meeting of the board of directors and it was voted unanimously to defer the payment of the quarterly dividend on the preferred stock due Sept. 1, 1926."

**Railway Placed Under Receivership.**—The Denver & Interurban Railway, Denver, Col., known as the Kite Route, running between Denver and Boulder, was placed in the hands of a receiver on Sept. 2 by Federal Judge Robert E. Lewis of the United States Circuit Court of Appeals, acting as United States district judge at Denver. William H. Edmunds, general manager, was named receiver. This is the second time the road has been placed in the hands of a receiver. On June 12, 1918, Federal Judge J. A. Riner of Cheyenne, Wyo., sitting for Judge Lewis at Denver, ordered the road into the hands of a receiver on the application of the Guaranty Trust Company, New York, acting for the holders of bonds secured by a mortgage on the property. At that time the road was unable to pay interest on \$1,000,000 indebtedness. Three years later Judge Lewis restored the road to its private management. The Kite Route is a subsidiary of the Colorado & Southern Railroad. Only recently the road officials placed buses in service as an aid to the electric line.

## Book Review

### Year Book American Engineering Standards Committee—1926

American Engineering Standards Committee, New York, N. Y. 75 pages.

Growth in the magnitude and savings resulting from standardization work are shown in the Year Book of the American Engineering Standards Committee just issued. More than 200 definite standardization projects are now in process or have been completed and 365 national trade associations, technical societies and government bureaus are co-operating in the work. All this has resulted in some 1,600 representatives co-operating.

For the convenience of those interested, the A.E.S.C. maintains a file of specifications, which are sold at cost. These include standards issued by all the foreign standardization bodies with which it regularly exchanges information and for those of all the national trade associations and technical societies in the United States which have issued standards and specifications. This is done as a means of co-operating in the important work represented in the National Directory of Commodity Specifications recently published by the Department of Commerce.

About 7,000 standards are available for examination and reference in the file of the A.E.S.C. This information

service is of particular value to engineers in specifying various materials used. Of the projects studied during the past year, nine relate to transportation. Of these, six have been approved by the American Engineering Standards Committee.

The Year Book lists the member bodies, gives outstanding developments and work accomplished, explains the relation of the American Engineering Standards Committee to various associations and lists the individual standardization projects that are now under consideration and indicates the stage of development that has been reached. Rules of procedure for establishing American standards are given together with a list of co-operating bodies that are assisting in this standardization.

### The Universal Directory of Railway Officials

The Directory Publishing Company, Ltd., London. 398 pages. \$5 post free.

This is the 32d annual edition of the Universal Directory of Railway Officials, compiled from official sources under the direction of the editor of the *Railway Gazette*. The book gives, first, a list of railroad societies, associations and unions in the United Kingdom, with their officers; then tabulates the railroads themselves alphabetically under

the various countries of the world, showing their complete organization; and lastly, an index of all the officials of the roads with cross-reference to the section in which the administration of their road is elaborated.

The Universal Directory will be found most useful in the offices of railroads having international interests, for no other publication contains a complete list of the officials of the principal roads all over the world.

#### McGraw-Hill Books

McGraw-Hill Book Company, Inc., New York, N. Y. -260 pages.

This is a complete catalog with a classified table of contents, authors' index and a subject index.

#### Blue Book of Southern Progress

Published by Manufacturers Record, Baltimore, 1926. 370 pages. Price 50 cents.

Owing to the great developments in the southern part of the United States there is a wider interest throughout the country in this section. The Blue Book of Southern Progress opens the door into realms of wonder, the work of Southern resources and Southern ingenuity. A survey of the South gives a birdseye view of the great achievements which are being performed by the people of the Southern communities. The 1926 issue of this book, largely the work of Richard H. Edmonds and Howard L. Clark, is designed to stimulate the Southern people themselves with a desire for a broader knowledge of their own region. The book is complete and more comprehensive than any other edition. A study of the development of every phase of Southern life is made. It includes such subjects as railroading in the South, agricultural development, manufacturing, building and construction, mineral expansion, with complete summaries of the country's economic progress, the South's economic progress and the economic progress of individual Southern states. Many pictures are included to enhance the interest.

#### Addresses by Preston S. Arkwright

Public Relations Department, Georgia Railway & Power Company, Atlanta, Ga. 386 pages.

Because his words of wisdom fell upon willing and anxious ears the addresses of Preston S. Arkwright have been put into book form as "a permanent record of his expressions upon public utility affairs." The president of the Atlanta property has been called upon on many occasions to speak before public gatherings on public utility subjects and his speeches cover a wide range. A cursory glance at the table of contents shows his versatility and adaptability, while his ideas on creating company spirit and courting public favor are worthy of the attention and assimilation of railway magnates. In publishing the book the public relations department of the Georgia Railway & Power Company hopes it will increase the employees' "pride in their vocation and stimulate greater enthusiasm in the principles of public utility service."

## Personal Items

### G. C. Whitney with Commission

Assistant Signal Engineer of Brooklyn Company Takes Similar Post with New York Body

Gilbert C. Whitney, formerly assistant engineer with the Brooklyn-Manhattan Transit Corporation, Brooklyn, N. Y., has been appointed to the newly created position of signal engineer with the State of New York Transit Commission. Mr. Whitney is personally responsible for several modern advances in the railway signaling art, among which are to be found basic studies and patents in color-light signal design; automatic track circuit control of power-operated switches which also provides positive approach and route locking independent of the switch and signal operating levers; the induction



G. C. Whitney

circuit controller for the reversible control of electric circuits without contacts; the Whitney indication system installed on the lines of the Brooklyn-Manhattan Transit Corporation, which provides continuous indication of train position, train movement and motor-operating characteristics, and also provides a continuous index as to the condition of insulated joints and detects local defects in the propulsion current return system and without contacts or moving parts, and more recently the reversible control of signal circuits without contacts or moving parts.

Mr. Whitney received his early training in the public, high and state normal schools at North Adams and the Buffalo Technical High School. After a very broad practical training in the electrical and mechanical arts, obtained in part with the General Electric and New England telephone and telegraph companies, he entered the railway signal field in 1905 at the Buffalo factory of the General Railway Signal Company and was employed on manufacture, assembly, test, field installations, estimates and engineering until 1909.

He then entered the employ of the New York Central Railroad in the elec-

tric zone and there was concerned with signal repairs, maintenance, drafting, circuit design and estimates until 1912, when he became assistant engineer with H. S. Balliet, assistant terminal manager and signal engineer. From 1917 to 1918 he was employed by J. M. Waldron, signal engineer of the Interborough Rapid Transit Company, chiefly on scientific signaling studies and circuit design. From 1918 until his recent appointment he has been assistant engineer with R. C. Johnson, signal engineer of the Brooklyn-Manhattan Transit Corporation on the development, installation and maintenance of signals on the elevated and subway lines in New York and Brooklyn. Mr. Whitney was born April 9, 1883, at North Adams, Mass.

### A. J. Schulthess Superintendent at Spokane

Appointment of A. J. Schulthess as general superintendent of the Spokane United Railways, Spokane, Wash., was announced on Sept. 1 by M. W. Birkett, vice-president and general manager. Mr. Schulthess will be the operating head of the United system to replace the late R. A. Willson, assistant general manager, who died in August. He joined the staff of the Spokane Traction Company in 1904 and has been active in railway work in Spokane for 22 years. He was employed by the Washington Water Power Company in 1910 and has been assistant to Mr. Willson since that time. At the time of the consolidation of the railways in Spokane in 1922 he was made superintendent of properties and his promotion at this time includes the position of manager of Natatorium Park, owned by the United.

Frederick Krug, formerly superintendent of power production of the Porto Rico Railway, Light & Power Company, San Juan, Porto Rico, has recently been appointed assistant to C. C. Giles, who is now president of that company as well as of the Porto Rico Railways Company, Ltd., the holding company. Mr. Krug has been affiliated with the Porto Rico properties since 1922, when he became superintendent of the La Plaza hydro-electric plant of the Porto Rico Railway, Light & Power Company. He had formerly served as assistant superintendent of the electrical department of the New York-Honduras-Rosario Mining Company.

J. K. B. Hare, formerly in charge of syndicate public utility sales for the Pittsburgh district of the Westinghouse Company, has been appointed manager for the company at Columbus, Ohio. Mr. Hare has been employed with the Westinghouse Company since 1912. He first enrolled in the employ of the Westinghouse Air Brake Company as a draughtsman, and later entered the sales department, serving in the Chattanooga district.



## Manufactures and the Markets

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

### Exports of Electrical Goods Increase in June

Exports of electrical goods from the United States during June, 1926, totaled \$3,591,570, an increase of \$2,650,760, or more than 44 per cent above those of June, 1925, and an increase of \$1,165,670 when compared with May, 1926. It was the third highest month since May, 1921, being exceeded only by April, 1926, which reached \$9,070,500, and December, 1925, which totaled \$8,808,600. These figures were published by the United States Department of Commerce, Bureau of Foreign and Domestic Commerce.

Exports of electrical equipment of particular application to electric railway usage for the months of June in each year were as follows:

	June, 1925	June, 1926
Direct-current generators...	46,652	102,348
Alternating - current generators .....	81,532	174,728
Storage batteries .....	198,921	278,535
Transforming or converting apparatus .....	310,818	290,566
Transmission and distribution apparatus .....	414,181	559,265
Railway motors .....	21,619	86,139
Electric locomotives .....	22,497	72,227
Railway signals, switches and attachments .....	77,094	32,485
Copper bare wire.....	114,952	294,037

### Goldschmidt Thermit Receives Another Federal Decree

A final decree for an injunction has just been issued by the United States District Court for the Western District of Missouri against the Liquid Steel Welding Corporation, Anton Lucas and others of Kansas City, Mo., in a suit for infringement of patents brought by the Goldschmidt Thermit Company, a subsidiary of the Metal & Thermit Corporation of New York City. The suit involved the same three patents which were at issue in the suit of the Goldschmidt Thermit Company against the Alumino Thermic Corporation of Roselle Park, N. J., and others in which

a decision was recently rendered by the U. S. District Court of New Jersey, Judge Bodine presiding, in favor of the same plaintiffs. The Liquid Steel Welding Corporation of Kansas City is reported to have ceased its operations and permanently closed its plant.

### Personnel Changes in General Body Company

W. M. Peters has assumed control of the sales organization of the General Body Company of Defiance, Ohio. Richard McCrackin has been made manager of the company's plant. Manufacture will be continued of the "Miller Built" line of bus bodies and in addition the company will furnish commercial bodies and a full line of cabs.

The General Body Company is operating the plant formerly occupied by the Trumbull Wagon Works Company and has in excess of 100,000 sq.ft. of manufacturing space, of which 75,000 is in the main building. The mill room has a capacity of approximately 10,000 ft. of finished stock per day. Power is furnished from the company's own plant, which supplies both steam and electric power.

Considerable foreign business is anticipated by the company due to its long experience in building and preparing bodies and buses for foreign shipment. This will, of course, be in addition to the domestic trade. Mr. Peters, the new sales manager, was for several years with the White Company before forming his present affiliations.

### Outside Exhibits Banned at Cleveland

Director of Exhibits Fred Dell, who is in charge of the big show to be staged by the American Electric Railway Association at Cleveland, Oct. 4-8, again wishes to call attention to the action of the executive committee in barring exhibits or demonstrations elsewhere than in the spaces provided for such

### Arrange Inspection Trips After Noon, Friday, Oct. 8

All manufacturers in the Cleveland territory who are planning inspection trips to their plants and other forms of entertainment for convention delegates are asked by the executive committee to abide by the plan of scheduling all such affairs following the close of the regular convention program. By noon on Friday, Oct. 8, all meetings will be over and the inspection of exhibits terminated so that inspection trips held after that time will receive the undivided attention of delegates. In return for co-operation in this program it is planned to give full information on all scheduled inspection trips in the official program of the convention.

purposes in the buildings and grounds of the convention. The text of the committee's resolution bearing on this matter was published on page 604 of the issue of ELECTRIC RAILWAY JOURNAL for April 3, 1926.

### Rail Cars May Now Operate on Distillate

Delivery is now being made of ten additional gas-electric cars for the Boston & Maine Railroad. They are being built by the Osgood-Bradley Car Company, Worcester, Mass. The electrical equipment is furnished by the General Electric Company and the gasoline and distillate burning engine by the Winton Engine Company of Cincinnati, Ohio. These are the first rail cars in the country to employ distillate as a fuel in the prime mover. The special carburetor which makes possible the change-over from gasoline to distillate when the engine is turning over at approximately 400 r.p.m. is installed on the cars by the Electro-Motive Car Company, although it is not manufactured by that concern.

Eight of the new rail cars are to be 61 ft. in over-all length, while the remaining two will be 73 ft. long. The generator and power plant on each car are the same, being capable of 275 hp. at 1,000 r.p.m. The engine burns gasoline at low speeds and distillate at the higher speeds, the point of change-over being governed by the position of a



One of the Two 73-Ft. Rail Cars Just Delivered to the Boston & Maine Railroad

damper in the carburetor. It is necessary only to carry 50 gal. of gasoline in a small auxiliary tank, while the main fuel tank of course contains distillate. The cars are designed to operate with an auxiliary trailer coach and will be placed in service for light traffic handling on various of the Boston & Maine lines. The railroad will have sixteen rail cars which embody the electric drive feature when all of the present order have been delivered. It is estimated that from 30 to 50 per cent saving in fuel costs will be effected with the new distillate-burning feature.

### Distribution to Be Discussed at Congress of American Industry

One of the major phases of economics to be considered at the Congress of American Industry being held at Philadelphia, Sept. 7 to 24, is the distributor as a factor in American life and business.

In this connection it has been announced that Albert L. Salt, president of the Graybar Electric Company, will address the congress and describe in detail the function and significance of twentieth century distribution methods in their relation to the producer and consumer.

### Chicago & Joliet Cars Built by Cummings

In a brief description of the ten new interurban cars which have been built for the Chicago & Joliet Electric Railway of Joliet, Ill., which was published on page 368 of the issue of ELECTRIC RAILWAY JOURNAL for Aug. 28, no mention was made of the fact that the cars were constructed by the Cummings Car & Coach Company. They were built in the works of that company at Paris, Ill., and embody the latest designs for interurban service. Four of the cars have a seating capacity of 48, while the remainder will accommodate 52 passengers.

### New Ohio Brass Catalog

Some changes in the order of presentation have been made in the trolley materials section of the new No. 20 O-B general catalog now being distributed by the Ohio Brass Company, Mansfield, Ohio. Electric railway operators will find such products presented in a very convenient manner. Included in this

### Metal, Coal and Material Prices

Metals—New York		Sept. 7, 1926
Copper, electrolytic, cents per lb.	.....	14.35
Copper wire, cents per lb.	.....	16.25
Lead, cents per lb.	.....	8.875
Zinc, cents per lb.	.....	7.77
Tin, Straits, cents per lb.	.....	67.25
<b>Bituminous Coal, f.o.b. Mines</b>		
Smokeless mine run, f.o.b. vessel, Hampton Roads, gross tons	.....	\$5.425
Somerset mine run, Boston, net tons	.....	1.975
Pittsburgh mine run, Pittsburgh, net tons	.....	2.00
Franklin, Ill., screenings, Chicago, net tons	.....	1.575
Central, Ill., screenings, Chicago, net tons	.....	1.50
Kansas screenings, Kansas City, net tons	.....	2.35
<b>Materials</b>		
Rubber-covered wire, N. Y., No. 14, per 1,000 ft.	.....	\$6.00
Weatherproof wire base, N. Y., cents per lb.	.....	18.00
Cement, Chicago net prices, without bags	.....	2.10
Linseed oil (5-bbl. lots), N. Y., cents per lb.	.....	11.8
White lead in oil (100-lb. keg), N. Y., cents per lb.	.....	15.25
Turpentine (bbl. lots), N. Y., per gal.	.....	\$0.96

grouping, as well as in the rail bond section, are a number of new products developed and offered to electric railways since the last edition of the catalog. The books are carefully indexed and cross-references are plentiful.

This book of 945 pages, exceeding the previous edition by 175 pages, includes complete listing of all O-B porcelain insulators, trolley and line materials, rail bonds, car equipment and mining materials. It is logically divided and thumb-indexed for the well-defined classes of products of this company. In addition to descriptive and listing information, there are many helpful suggestions for the man concerned with the installation work.

### Trim Should Have Been Haskelite

In publishing the list of principal specifications on the new street cars for the Gary Railway, Gary, Pa., which appeared in the issue of ELECTRIC RAILWAY JOURNAL for Aug. 7, an error was made in stating the specifications for interior trim. Haskelite was used for interior trim instead of the mahogany which was specified.

### Track and Line

United Electric Railways, Providence, R. I., will double track the highway over the entire length of the proposed improvements being made by the city. The single track on Smith Street between Elmhurst and Oakland Avenue is being removed.

Trenton & Mercer County Traction Corporation, Trenton, N. J., will install a loop at State and Olden Avenues and lay a single track in Wilmer Alley.

Portland Electric Power Company, Portland, Ore., has asked the City Council for a franchise to construct, maintain and operate railway tracks over the new Vista Avenue viaduct, now being built. The viaduct is about two-thirds completed.

### Power Houses, Shops and Buildings

Ontario Hydro-Electric Railway, Windsor, Ont., is building a converter station at McDougall Avenue and Erie Street, Windsor. The building, which will be of brick and concrete construction, will be equipped with three 1,000-kw. converters, receiving current at 13,000 volts, a.c., and converting it to 600 volts, d.c. It will be ready for operation about Oct. 1.

Boston Elevated Railway, Boston, Mass., has sold nearly all of the land with buildings comprising the Grove Hall carhouse site of more than four acres. About one-fifth of an acre with an emergency truck garage has been retained. The garage was constructed during 1920 and 1921. There have been and are several buildings on the property. Facing on Blue Hill Avenue was formerly a large frame and brick carhouse, the frame part of which was erected in 1890 by the West End Street Railway. The brick part was a stable belonging to the Highland Street Railway. In 1922 the front area of the car-

house was reduced by nearly an acre. The property also contains substantial buildings formerly used for carhouse purposes and shops.

### Trade Notes

Oakite Products, Inc., is the new name recently adopted by what was formerly the Oakley Chemical Company. The general offices are located at 22 Thames St., New York, while the factory continues as heretofore in Bush Terminal, Brooklyn, N. Y. Since 1909 the company has manufactured Oakite industrial cleaning materials. The personnel of the management and the field organization will remain the same under the new name.

American Brown Boveri Electric Corporation, New York, N. Y., announces the opening of a Boston office and the appointment of George M. Bates as district manager. The New England sales office is located at 842 Summer Street, Boston, Mass. Mr. Bates was with the New England sales force of the Westinghouse Electric & Manufacturing Company for 28 years, prior to accepting his latest appointment. He was a graduate of Tufts College in 1893, receiving the degree of B.E.E. After taking the student course with the Westinghouse company he was associated with the West End Street Railway and later the Boston Elevated in Boston, Mass. He joined the sales force of the Westinghouse Electric & Manufacturing Company in 1898.

### New Advertising Literature

Roller-Smith Company, New York, N. Y., has issued bulletins 110 and 150 describing respectively its new type HTD direct-current and HTA alternating-current portable ammeters, voltmeters, volt-ammeters and single-phase wattmeters. The instruments are stated to be small enough for the pocket, tool kit or traveling bag, sufficiently accurate for all ordinary tests and light in weight.

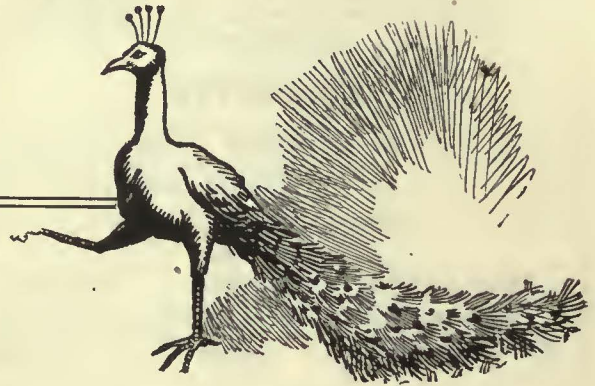
General Electric Company, Schenectady, N. Y., has issued bulletin GEA-394 containing information on induction motor-generator sets with capacities from 1 to 35 kw. and for use at 125 or 250 volts.

American Car & Foundry Company, New York, N. Y., has issued the first two of a series of folders disclosing the reasons which actuated the company in taking over the active production of motor bus equipment and in selecting the Hall-Scott engine and the Fageol Safety Coach to uphold its standards in this field.

Electric Service Supplies Company, Philadelphia, Pa., has issued a 200-page catalog covering a complete listing of bus equipment for the motor bus industry. The book, known as Catalog 9, contains a brief description of specialties adapted for use on buses of either the gasoline or trackless trolley type. Many diagrams and illustrations accompany the text and a list number index and material index are included to facilitate handy reference.



and now—



## Improved Training for Platform Men on Modern Railway System includes Peacock Staffless Brakes

In the intensive curriculum of the training school for platform-men of the Third Avenue Railway System, New York City, Peacock Staffless Brakes are included as an important part of the equipment. The men are trained in the proper use of both air and hand brakes by efficient instructors. And a rule of this system is that the hand brakes on each car must be applied at least once on every trip!

Peacock Staffless Brakes are modern in every particular;

low installation and maintenance costs; simplicity of operation; minimum platform space; develop three times the braking capacity of ordinary hand brakes; 144-in. chain winding capacity insuring adequate braking power even though brake shoes are worn and brake rigging is loose.

There are other factors that adapt Peacock Staffless Brakes to the most modern cars. Facts, figures and estimates upon request.



The  
Peacock  
Staffless

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

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

# 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

EXAMINATIONS REPORTS APPRAISALS  
ON  
INDUSTRIAL AND PUBLIC SERVICE PROPERTIES

New York

Boston

Chicago

## THE BEELER ORGANIZATION

ENGINEERS AND CONSULTANTS

Traction - Traffic - Equipment - Power Investigations

TRANSPORTATION, TRAFFIC, AND OPERATING SURVEYS

COORDINATING SERVICE—FINANCIAL REPORTS

APPRAISALS—MANAGEMENT

52 Vanderbilt Ave.

New York

## SANDERSON & PORTER ENGINEERS

PUBLIC UTILITIES & INDUSTRIALS

Design Examinations Construction Reports Valuations Management

CHICAGO

NEW YORK

SAN FRANCISCO

## ENGELHARDT W. HOLST

Consulting Engineer

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

## KELKER, DELEUW & CO.

CONSULTING ENGINEERS

REPORTS ON

Operating Problems

Rates

Traffic Surveys

111 W. Washington Street, Chicago, Ill.

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 1904 Citizens National Bank Bldg.  
Phone: Hanover: 2142  
NEW YORK 49 Wall Street

## DAY & ZIMMERMANN, INC. ENGINEERS

DESIGN - CONSTRUCTION - REPORTS  
VALUATIONS - MANAGEMENT

NEW YORK

PHILADELPHIA

CHICAGO

## HEMPHILL & WELLS

CONSULTING ENGINEERS

Gardner F. Wells

Albert W. Hemphill

APPRAISALS

INVESTIGATIONS COVERING

Reorganization Management Operation Construction

43 Cedar Street, New York City

## STEVENS & WOOD

INCORPORATED

ENGINEERS AND CONSTRUCTORS

120 BROADWAY, NEW YORK

ENGINEERING  
CONSTRUCTION

YOUNGSTOWN, O.

FINANCING  
MANAGEMENT

## WALTER JACKSON

Consultant on Fares and Motor Buses

The Weekly and Sunday Pass—Differential  
Fares—Ride Selling

143 Crary Ave., Mt. Vernon, N. Y.

## Transmission Line and Special Crossing Structures, Catenary Bridges

WRITE FOR OUR NEW DESCRIPTIVE CATALOG

## ARCHBOLD-BRADY CO.

Engineers and Contractors

SYRACUSE, N. Y.

## 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

## McCLELLAN & JUNKERSFELD

Incorporated

ENGINEERING AND CONSTRUCTION

Examinations—Reports—Valuations

Transportation Problems—Power Developments

68 Trinity Place, New York

CHICAGO

ST. LOUIS

# Railway & Industrial Bond Issues

WE are prepared to purchase entire bond issues of sizeable and sound American railroads and industrial companies.

Address our office  
at  
42 Broadway, New York City

## HORNBLOWER & WEEKS

ESTABLISHED 1888

BOSTON  
DETROIT

NEW YORK  
PROVIDENCE

CHICAGO  
PORTLAND, -ME.

CLEVELAND  
PITTSBURGH

### KELLY, COOKE & COMPANY ENGINEERS

Operation and Management  
Traffic and Transportation Surveys

PARKWAY at SIXTEENTH ST. PHILADELPHIA

### THE P. EDWARD WISH SERVICE

50 Church St. Street Railway Inspection 131 State St.  
NEW YORK DETECTIVES BOSTON

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

"Axle Specialist Since 1866"  
Address all Mail to Post Office Box 515, Richmond, Va.

### CAR AXLES J. R. JOHNSON AND CO., INC. FORGED STEEL AXLES

For Locomotives, Passenger, Freight and Electric Cars  
Smooth Forged or Rough Turned—Carbon or Alloy Steel—Plain or Heat Treated, Forged and Turned Piston Rods, Crank Pins, Large Shafts, Round Bars, etc.

### ACME Window Curtain Fixtures

Noiseless—direct acting—enlarged friction surface—less parts—stronger—more easily and finely adjusted.

MORTON MANUFACTURING COMPANY  
Chicago

### A Single Segment or a Complete Commutator

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

Cameron Electrical Mfg. Co., Ansonia, Connecticut

**BRAZED** **ERICO** **ARC WELD**  
Rail Bonds  
Portable Arc Welding Outfits  
The Electric Railway Improvement Co.  
Cleveland, Ohio

### INDUSTRIAL GASES

OXYGEN  
ACETYLENE



HYDROGEN  
NITROGEN

Quick shipment and low prices also on cylinders, valves, torches, regulators and supplies.

International Oxygen Co., Main Offices: Newark, N. J.  
Branches: New York Pittsburgh Toledo

ROEBLING

WELDING CABLE  
ELECTRICAL WIRES and CABLES

John A. Roebling's Sons Company, Trenton, N. J.

# TIMKEN



## In Atlanta—

Fifteen double-deck, gas-electric Fageols being operated by Atlanta Coach Company—subsidiary of Georgia Railway and Power Company—are averaging 45,000 miles a month.

The routes served by these vehicles encounter many steep grades, and the operating company reports "No axle trouble in this service, although the operating conditions are severe."

These vehicles are equipped with Timken Axles—front and rear.



[ You are cordially invited to visit our exhibit at  
the American Electric Railway Association's Con-  
vention, Cleveland, October 4th to 8th, 1926 ]

THE TIMKEN-DETROIT AXLE CO., DETROIT, MICH.

# AXLES



One of the 36 Studebakers operated by Brewster Transportation Co., Banff, Alberta, through the Canadian National Park. Studebaker units replaced equipment of another make that had failed to show a profit over the difficult mountain routes of the Canadian Rockies.

Part of a fleet of Studebaker Busses that are operating daily over a 112-mile route between Stathelle, Arendal and Kristiansand in Norway. More than 35 Studebaker Busses are bringing in steady profits to Norwegian bus companies.



(Left) The New South Wales Travel Agency of Sydney, Australia, operates a fleet of Studebakers between Sydney and Katoomba, a run of 62 miles over the Blue Mountains.

# The sun never sets on Studebaker Busses

In 37 foreign countries, as in every state in the Union, Studebaker busses are giving dependable service to operators.

The same stamina and low operating cost that have made Studebaker Busses the choice of more than 1200 American operators are today swinging foreign operators to Studebaker equipment.

It makes no difference whether costs are figured in dollars, shillings, lire or yen, the result is the same if the busses are Studebakers—More Profit per Passenger Mile.

*Mail the coupon for further information*

Eight of the thirteen 21-passenger street-car-type Studebakers operated by the Compania Transportadora Puertriquena at San Juan, Porto Rico.



Studebaker Busses operate daily over the grueling grades between Honolulu and Waimana, Hawaii. At one point the road rises more than 1500 feet in 2 1/2 miles. The Studebaker bus is admirably adapted to climbing tasks since it is the most powerful bus of its size in the world.

THE STUDEBAKER CORPORATION OF AMERICA,  
Dept. B, South Bend, Ind.

Send further particulars on Studebaker busses without obligation.

Name .....

Address .....

City..... State.....

How many busses have you at present?.....

Check below type Bus on which you wish information.

Type: Sedan.....Parlor Car.....Street-Car type.....

Capacity:.....Passengers.....

# Every one a winner—

Look over this list of Boyerized Parts—every one a prize winner in the endurance contest.

Their great stamina due to the special Boyerizing Process, enables them to last three to four times longer than ordinary steel parts.

Put on a dollar and cents basis this means a considerable saving in maintenance costs.

*Ask for quotations  
on the parts you need.*

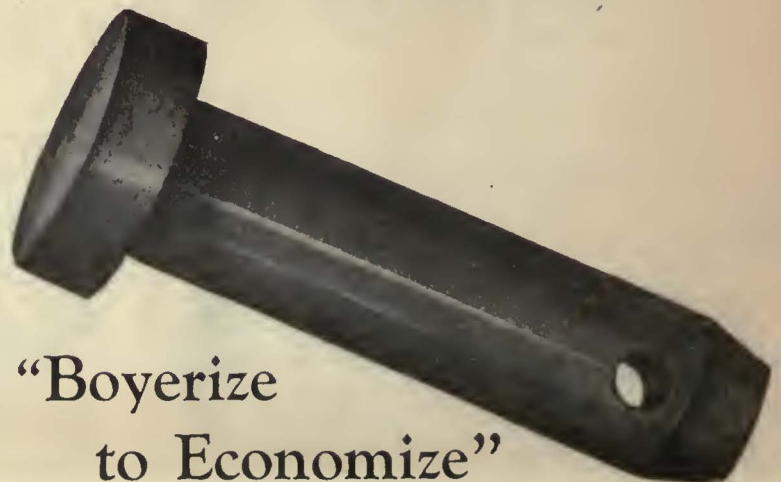
**Bemis Car Truck Company**

*Electric Railway Supplies  
Springfield, Mass.*

**Representatives:**

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

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



“Boyerize  
to Economize”



**Mack**

**Bus**

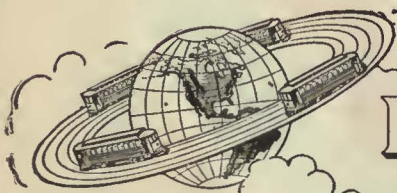
**6** Mack designed it **6**  
**6** Mack built it **6**  
**6** Mack stands behind it **6**  
**6** **Mack Trucks Inc.** **6**

International Motor Company  
25 Broadway New York City

53-8846

The advertisement features a red background with a repeating pattern of the number '6'. At the top, the word 'Mack' is written in a large, black, stylized script font. Below it, a large, black, stylized '6' is outlined in white. Inside this '6', the word 'Bus' is written in a bold, black, serif font. Below 'Bus', there are four lines of text, each starting with a large '6' and followed by a statement: 'Mack designed it', 'Mack built it', 'Mack stands behind it', and 'Mack Trucks Inc.'. Below this text is the contact information for International Motor Company. At the bottom, a black and white photograph shows the front view of a Mack bus with the license plate '53-8846'.

The creation and maintenance of car advertising space values requires the same degree of highly specialized knowledge as the construction and maintenance of railroads. Such tasks should be delegated only to those of widest experience and longest record of success.



**Barron G. Collier**

INCORPORATED  
CANDLER BLDG. NEW YORK



# Re-capturing Patronage

Street Railway companies can re-capture profitable patronage now absorbed by competitive forms of transportation.

Motor Coaches, co-ordinated with a street railway system and paralleling main lines, bring back lost passengers. Many are being installed for this express purpose, as in Detroit where 50 more Graham Brothers Motor

Coaches have recently been placed in operation.

Safe, speedy, comfortable, dependable service is necessary to invite patronage and hold it. Graham Brothers Motor Coaches meet these requirements. Moreover, their low

operating cost justifies the greater frequency so essential for satisfactory service.

21-Passenger  
Street Car Type  
Motor Coach  
Complete,

**\$3815**

f. o. b. Detroit

12-Passenger  
Parlor Coach  
Complete,

**\$3750**

f. o. b. Detroit

**GRAHAM BROTHERS**

Evansville - DETROIT - Stockton  
A DIVISION OF DODGE BROTHERS, INC.  
GRAHAM BROTHERS (CANADA) LIMITED - TORONTO, ONTARIO

# GRAHAM BROTHERS MOTOR COACHES

SOLD BY DODGE BROTHERS DEALERS EVERYWHERE

# Right on your desk —just the data you want

Electric railway executives, engineers and operating men have long respected Richey's **ELECTRIC RAILWAY HANDBOOK** as the one great pocketbook of practice data, formulas and tables in the electric railway field.

The second edition of Richey covers the latest developments—describes new methods—records changes in theory and practice. It covers every phase of electric railway work from Roadbed and Track to Signals and Communication.

*Saves  
time  
and  
trouble*



Try  
it for  
10 days  
FREE

Second Edition,  
798 pages,  
flexible, pocket  
size, fully illus-  
trated, \$4.00  
net, postpaid.

This widely-known handbook is virtually an encyclopedia on modern electric railway organization, administration and operation.

It presents

- (1) Data on subjects which come up in everyday electric railway practice for constant use by the operating, constructing and designing engineer.
- (2) Material of service to the non-technical manager or operator.
- (3) Reference material on electric railway practice for those who are specializing in other or allied fields.

Information every electric railway man needs—the latest and best methods—changes in practice and theory—that's the New Richey.

See your copy FREE  
Mail just this coupon

## McGraw-Hill FREE EXAMINATION COUPON

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

You may send me on 10 days' approval Richey's Electric Railway Handbook, \$4.00 net. I agree to pay for the book or return it postpaid within 10 days of receipt.

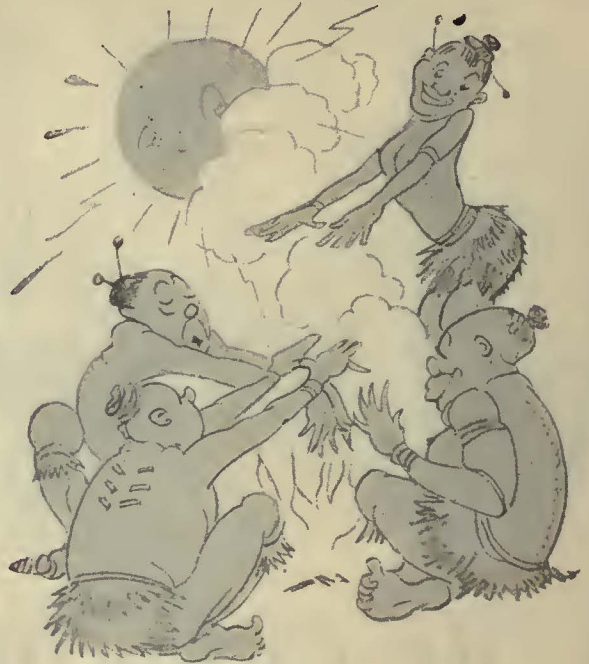
Signed .....

Address .....

Official Position .....

Name of Company .....

(Books sent on approval to retail purchasers in the U. S. and Canada only.) E9-11-26



## GHURUM

No matter how hot the day you will find the Kaffirs gathered around a fire absorbing the ghurum, or heat, some haunching down on their heels, others standing, all with hands outstretched toward the blaze.

There is something soothing in sparks and fire which attracts a great many people—and that includes operators of electric machines.

The latter may frequently be seen taking a seeming comfort from sparking, noisy rotaries, due to misapplication of misfit brushes.

Of course as culture spreads in this field (and the use of Morganite brushes spreads with culture) the fireworks lessen and in our best electrical families sparking is unknown—petting, perhaps, but no sparking.

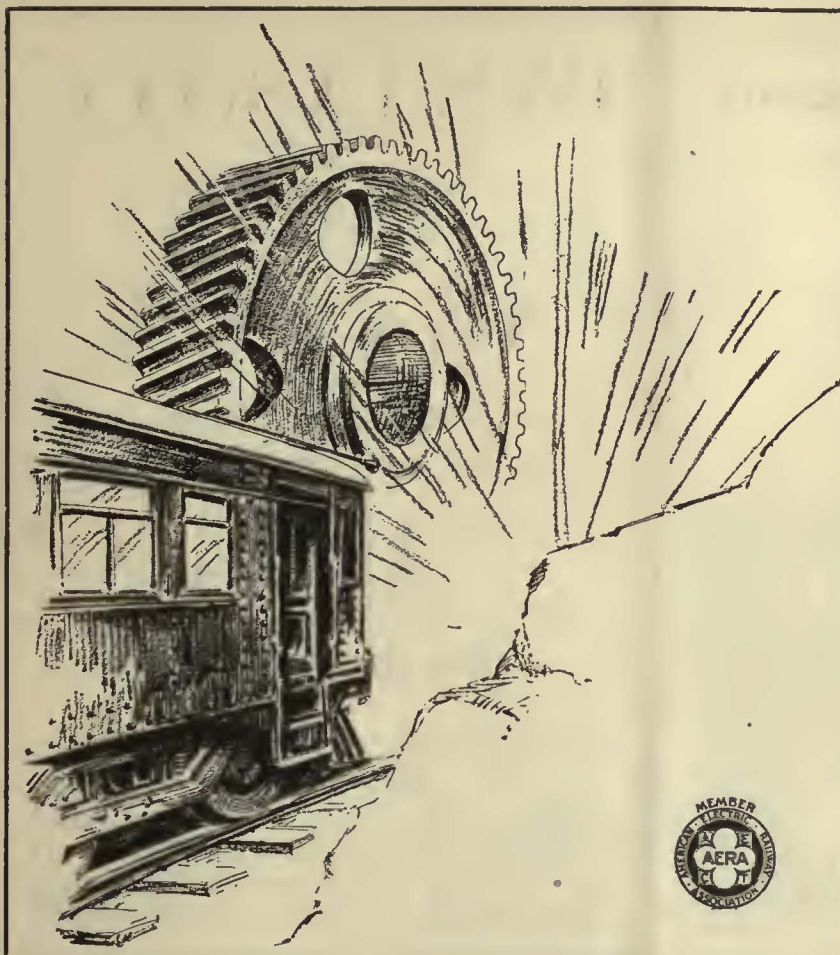


Main Office and Factory

519 West 39th St., New York

DISTRICT ENGINEERS AND AGENTS

- Pittsburgh, Electrical Engineering & Mfg. Co., 909 Penn Ave.
- Cincinnati, Electrical Engineering & Mfg. Co., 607 Mercantile Library Building.
- Cleveland, Electrical Engineering & Mfg. Co., 422 Union Building.
- Baltimore, O. T. Hall, Sales Engineer, 437-A Equitable Building.
- Revere, Mass., J. F. Drumme, 75 Pleasant Street.
- Los Angeles, Special Service Sales Co., 502 Delta Building.
- San Francisco, Special Service Sales Co., 222 Underwood Building, 545 Market Street.
- Toronto, Can., Railway & Power Engineering Corp., Ltd., 101 Eastern Ave.
- Montreal, Can., Railway & Power Engineering Corp., Ltd., 326 Craig St., West.
- Winnipeg, Can., Railway & Power Engineering Corp., Ltd., P. O. Box 325.



# Nearly $\frac{3}{4}$ of a Million Miles and apparently good for a million

ONE of the first Nuttall Heat Treated Helical Gears ever installed is still running, and is apparently good for an indefinite life.

DO YOU get that sort of service from the gears you buy?

Nuttall BP Helical Gears are saving most of their cost on many properties, just due to minimizing vibration.

Write for Bulletins giving full details

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



All Westinghouse Electric & Mfg. Co. District Offices are Sales Representatives in the United States for the Nuttall Electric Railway and Mine Haulage Products. In Canada: Lyman Tube & Supply Co., Ltd., Montreal and Toronto.

*You're having brush trouble*

CORRECT IT  
 USE LE CARBONE CARBON BRUSHES

*They talk for themselves*

COST MORE PER BRUSH  
 COST LESS PER CAR MILE

**W. J. Jeandron**  
 Hoboken Factory Terminal,  
 Building F, Fifteenth Street, Hoboken, N. J.  
 Pittsburgh Office: 634 Wabash Bldg.  
 Chicago Office: 1657 Monadnock Block  
 San Francisco Office: 525 Market Street  
 Canadian Distributors: Lyman Tube & Supply Co., Ltd.  
 Montreal and Toronto



**MORE-JONES  
 TROLLEY  
 WHEELS  
 AND  
 HARPS**

WE MANUFACTURE various types of trolley equipment. The quality of metal, conductivity, resistance to friction, effect on overhead, shape and size of wheel groove, have all been carefully worked out and perfected. In addition to the highly specialized V-K Oilless Trolley Wheels and Harps, More-Jones make the most complete line of lubricated trolley wheels and harps to meet all requirements. Let us quote you.

**More-Jones Brass & Metal Co.**  
 St. Louis, Mo.

**MORE-JONES  
 QUALITY PRODUCTS**

**Griffin Wheel Company**  
 410 North Michigan Ave.  
 Chicago, Ill.

**GRIFFIN  
 F. C. S.  
 WHEELS**

**For Street and Interurban  
 Railways**

**FOUNDRIES:**

Chicago  
 Detroit  
 Denver

Boston  
 Kansas City  
 Council Bluffs

St. Paul  
 Los Angeles  
 Tacoma

**PANTASOTE**

Trade Mark

Seat and Curtain Materials  
*There is no substitute for Pantasote*

**AGASOTE**

Trade Mark

Roofing—Headlining—Wainscoting  
*The only homogeneous panel board*

*standard  
 for electric railway cars  
 and motor buses*

**The PANTASOTE COMPANY Inc.**  
 At 46th, 250 Park Avenue Street  
 NEW YORK



*Time is the great test.  
 The most efficient and  
 permanent insulation  
 known is*

**KERITE**

**KERITE INSULATED WIRE & CABLE COMPANY**  
 NEW YORK CHICAGO



**Cold Dinners**

for your passengers?

Not if you use

**AJAX  
 BABBITT for ARMATURES**

*keeps the rolling stock rolling*



**The Ajax Metal Company**

Established 1880

**PHILADELPHIA**

NEW YORK

CHICAGO

BOSTON

CLEVELAND

# THE BABCOCK & WILCOX COMPANY

85 LIBERTY STREET, NEW YORK

Builders since 1868 of  
Water Tube Boilers  
of continuing reliability

BRANCH OFFICES

BOSTON, 49 Federal Street  
PHILADELPHIA, Packard Building  
PITTSBURGH, Farmers Deposit Bank Building  
CLEVELAND, Guardian Building  
CHICAGO, Marquette Building  
CINCINNATI, Traction Building  
ATLANTA, Candler Building  
PHOENIX, ARIZ., Heard Building  
DALLAS, TEX., 2001 Magnolia Building  
HONOLULU, H. T., Castle & Cooke Building  
PORTLAND, ORE., 305 Gasco Building



WORKS  
Bayonne, N. J.  
Barberton, Ohio

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

BRANCH OFFICES

DETROIT, Ford Building  
NEW ORLEANS, 344 Camp Street  
HOUSTON, TEXAS, 1011-13 Electric Building  
DENVER, 444 Seventeenth Street  
SALT LAKE CITY, 405-6 Kearns Building  
SAN FRANCISCO, Sheldon Building  
LOS ANGELES, 404-6 Central Building  
SEATTLE, L. C. Smith Building  
HAVANA, CUBA, Calle de Agular 104  
SAN JUAN, Porto Rico, Royal Bank Building

## 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.



CARNEGIE STEEL COMPANY  
PITTSBURGH - PENNA.



Special Track Work of every  
description

## THE BUDA COMPANY

Harvey (Suburb Chicago) Illinois

Tisco Manganese Steel in trackwork,  
introduced by Wharton in 1894, is  
still the superior metal for long life  
under severest railway service.

WILLIAM WHARTON JR. & CO., Inc.  
Easton, Penna.

B. A. HEGEMAN, Jr., President H. A. HEGEMAN, First Vice-Pres. and Treas.  
F. T. SAROENT, Secretary W. C. PETERS, Vice-Pres. Sales and Engineering

### National Railway Appliance Co.

Grand Central Terminal, 452 Lexington Ave., Cor. 45th St., 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	Ft. Pitt Spring & Mfg. Co., Springs
Anglo-American Varnish Co., Varnishes, Enamels, etc.	Flaxilnum Insulation
National Hand Holds	Anderson Slack Adjusters
Genesco Paint Oils	Economy Electric Devices Co., Power Saving and Inspection Meters
Dunham Hopper Door Device	Yellow Coach Mfg. Company— Single and Double-deck Buses
Garland Ventilators	
Walter Tractor Snow Plows	
Feasible Drop Brake Staffs	

### SPECIALISTS

in the

Design and Manufacture  
of

*Standard—Insulated—and  
Compromise Rail Joints*

The Rail Joint Company  
165 Broadway, New York City

**ELRECO TUBULAR POLES.**



**COMBINE**

**Lowest Cost  
Least Maintenance**

**Lightest Weight  
Greatest Adaptability**

Catalog complete with engineering data sent on request.

**ELECTRIC RAILWAY EQUIPMENT CO.**  
CINCINNATI, OHIO

New York City, 30 Church Street

**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 Bottom Dump Ballast Car  
Differential Car Wheel Truck and Tractor

**THE DIFFERENTIAL STEEL CAR CO., Findlay, O.**

**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.

**THE WORLD'S STANDARD**

**"IRVINGTON"**

Black and Yellow  
Varnished Silk, Varnished Cambric, Varnished Paper

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

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

*Sales Representatives in the Principal Cities*



**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**



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

We solicit a test of TULCO  
on your equipment

**The Universal Lubricating Co.**  
Cleveland, Ohio

Chicago Representatives: Jameson-Ross Company,  
Straus Bldg.



Type R-11  
Double Register

**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.

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

**Advertisements for the  
Searchlight Section**

Can be received at the New  
York Office of Electric  
Railway Journal  
until 10 a. m.



**Wednesday**

For issue out Saturday



# Mack

Bus  
**The result  
of 6 years  
development**

See it at the Cleveland Show.

**Mack Trucks Inc.**

International Motor Company  
25 Broadway New York City



"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.

Gen. Rep.: Engineering Materials Limited, Montreal.

Cuban Rep.: Victor G. Mendoza Co., Havana.

## Waterproofed Trolley Cord



Is the finest cord that science and skill can produce. Its wearing qualities are unsurpassed.

FOR POSITIVE SATISFACTION ORDER SILVER LAKE

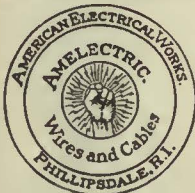
If you are not familiar with the quality you will be surprised at its ENDURANCE and ECONOMY.

Sold by Net Weights and Full Lengths

SILVER LAKE COMPANY

Manufacturers of bell, signal and other cords.

Newtonville, Massachusetts



## AMELECTRIC PRODUCTS

BARE COPPER WIRE AND CABLE

TROLLEY WIRE

WEATHERPROOF WIRE AND CABLE

PAPER INSULATED UNDERGROUND CABLE

MAGNET WIRE

Reg. U. S. Pat. Office

AMERICAN ELECTRICAL WORKS  
PHILLIPSDALE, R. I.

Boston, 176 Federal; Chicago, 20-32 West Randolph Street;  
Cincinnati, Traction Bldg.; New York, 100 E. 42nd St.

# Hubbard and COMPANY

PITTSBURGH • OAKLAND, CAL • CHICAGO



{ The Hardware makes the line }  
Hubbard makes the Hardware

# Arc Weld Rail Bonds

AND ALL OTHER TYPES

Descriptive Catalogue Furnished

American Steel & Wire Company

Chicago  
New York

Boston  
Cleveland

Pittsburgh  
Denver

San Francisco

U. S. Steel Products Co.

Los Angeles

Portland

Seattle

Northern CEDAR POLES Western

We guarantee

all grades of poles; also any butt-treating specifications

BELL LUMBER COMPANY

Minneapolis, Minn.

# ANACONDA TROLLEY WIRE

ANACONDA COPPER MINING COMPANY  
THE AMERICAN BRASS COMPANY

Rods, Wire Cable Products

NEW YORK

CHICAGO

Chapman  
Automatic Signals  
Charles N. Wood Co., Boston



NAUGLE POLES  
WESTERN & NORTHERN CEDAR  
NAUGLE POLE & TIE CO.  
59 E. MADISON ST. CHICAGO ILL.  
New York • Columbus • Kansas City • Spokane • Vancouver • Boston

## 25 CYCLE, 600 VOLT, G. E. ROTARIES FOR SALE

These Rotaries now being removed from service because of system change to 60 cycle operation. The machines are all in good operating condition, some of them still running. Available for inspection at any time.

Quantity	K.W.	R.P.M.	Winding
*2	300	500	Shunt
*1	300	500	Compound
2	500	500	Shunt
*2	1000	300	Shunt
1	1000	375	Shunt
2	1000	375	Compound
5	1000	250	Shunt
1	1500	300	Shunt

\*13,200 Volt transformers available on these items.

ADDRESS INQUIRIES TO  
**PUBLIC SERVICE ELECTRIC & GAS COMPANY**

80 PARK PLACE, NEWARK, N. J.

FOR ATTENTION OF:

**THOMAS SPROULE**, *General Superintendent of Distribution.*

### POSITIONS VACANT

EXPERIENCED track foreman: Energetic man wanted on city work. Give references and experience in detail. P-930, Electric Railway Journal, Tenth Ave. at 36th Street, New York.

### POSITIONS WANTED

ACTIVE young man, single, age 22, over three and one half years special training with large builder of street railway cars and trucks, desires change to mechanical department of operating company with opportunities for advancing. Can arrange for an interview with any interested party at Cleveland convention and solicit correspondence of others not attending. PW-927, Electric Railway Journal, 1600 Arch Street, Philadelphia, Pa.

OPERATING man: Capable of taking charge of transportation department of electric railway. Practical experience in each of its branches. Highest of references. PW-929, Electric Railway Journal, Star Building, St. Louis, Mo.

OPERATING executive, superintendent transportation, motive power and equipment. Broad experience and a successful record on city, one-man safety, interurban and bus properties. Labor, industrial, public relations, traffic problems. Co-ordination of railway and bus service. Desires to re-enter operating field. University graduate. All references. PW-921 Electric Railway Journal, 7 South Dearborn Street, Chicago, Ill.

SUPERINTENDENT with twenty years' experience in operation and maintenance of railway rolling stock and track; an outstanding success as a railway operator and as operator of co-ordinated railway and bus services desires for personal reason to make change. Fully capable of taking complete charge as manager or superintendent. PW-925, Electric Railway Journal, 7 South Dearborn St., Chicago, Ill.

### POSITIONS WANTED

SUPERINTENDENT of transportation: Qualified by a former successful record of twenty years on large city and interstate properties also co-ordination of rail and bus service recognized as an official of exceptional ability, successful in rehabilitation of properties, public relations, accident prevention, one man operation and handling of labor. Fully competent to take over any property and get results. High-grade references, correspondence invited. Will make appointments for interview at Cleveland convention or at convenience of interested parties. PW-926, Electric Railway Journal, Guardian Building, Cleveland, Ohio.

## WHITE 2½ TON LINE TRUCK

McCardell three section tower. Less than 3 years old and in excellent condition. Electric starter and lights.

*Prompt reply advisable as this equipment must be moved quickly.*

FS-931, Electric Railway Journal  
Tenth Ave. at 36th St., New York City

### FOR SALE

## 14 BIRNEY SAFETY CARS

Brill Built  
West, 508 or G.E. 264 Motors  
Cars Complete—Low Price—Fine Condition  
**ELECTRIC EQUIPMENT CO.**  
Commonwealth Bldg., Philadelphia, Pa.

## TO HELP YOU

LOCATE SELLING OPPORTUNITIES  
"Searchlight" Advertising

G-1

## ROTARY CONVERTERS

2—Converter and Transformer units new in 1924.  
Can be seen in operation at Warehouse Point, Conn.  
Synchronous Converters  
No. 4006698—4006699 G.E.  
Type H.C.C. 6—500—1200.  
Form P. Speed 1200 Direct Current.  
Amperes 834 Nominal Volts 600 3 Phase, 1250 Amp. 2 hrs. 55 degrees C Rise.

## TRANSFORMERS

Type H.J.T.H.  
Form D.D. Volts 13200 Y 445 Cycle 60  
Capacity 500 K.V.A. Nominal.  
750 K.V.A 2 hrs. 60 Degrees C Rise.  
Reactance 12% approx.  
G.E. Regular Coil H. Design.  
Immediate delivery can be made.

## THE PERRY BUXTON DOANE CO.

Boston, Mass.

Advertising, Street Car  
Collier, Inc., Barron G.

### Air Brakes

Westinghouse Air Brake Co.  
Air Receiver & Aftercoolers  
Ingersoll-Rand Co.

### Anchors, Guy

Elec. Service Supplies Co.  
Graybar Electric Co.  
Ohio Brass Co.  
Westinghouse E. & M. Co.

### Armature Shop Tools

Elec. Service Supplies Co.  
Automatic Return Switch  
Stands

### Automatic Safety Switch

Stands  
Ramapo Ajax Corp.

### Axles

Bemis Car Truck Co.  
Bethlehem Steel Co.  
Brill Co., The J. G.  
Cincinnati Car Co.  
Johnson & Co., J. R.  
National Ry. Appliance Co.  
Westinghouse E. & M. Co.

### Axles, Carbon Vanadium

Johnson & Co., J. R.

### Axles (Front & Rear) Motor

Truck & Passenger Car  
Timken-Detroit Axle Co.,  
The

### Axles, Steel

Carnegie Steel Co.  
Johnson & Co., J. R.

### Axles, Trailer & Motor Bns

Timken-Detroit Axle Co.,  
The

### Babbit Metal

Ajax Metal Co.  
Johnson & Co., J. R.  
More-Jones Brass and  
Metal Co.

### Badges and Buttons

Elec. Service Supplies Co.  
International Register Co.

### Bankers

### Hornblower & Weeks

Bearings and bearing Metals  
Ajax Metal Co.  
Bemis Car Truck Co.  
Brill Co., The J. G.  
General Electric Co.  
More-Jones Brases and  
Metal Co.  
Westinghouse E. & M. Co.

### Bearings, Center and Roller

Slide  
Stucki Co., A.

### Bells & Buzzers

Consolidated Car Heating Co.  
Ohio Brass Co.  
Brill Co., The J. G.  
Elec. Service Supplies Co.  
Graybar Electric Co.

### Benders, Rail

Railway Trackwork Co.

### Body Material, Haskellite and

Plymetl  
Haskellite Mfg. Corp.

### Boilers

Babecock & Wilcox Co.  
Bond Testers  
American Steel & Wire Co.  
Electric Service Supplies Co.

### Bonding Apparatus

American Steel & Wire Co.  
Electric Railway Improve-  
ment Co.  
Elec. Service Supplies Co.  
Graybar Electric Co.  
Ohio Brass Co.  
Railway Trackwork Co.  
Una Welding & Bonding Co.

### Bonds, Rail

Amer. Steel & Wire Co.  
Electric Railway Improve-  
ment Co.  
Elec. Service Supplies Co.  
General Electric Co.  
Graybar Electric Co.  
Ohio Brass Co.  
Railway Trackwork Co.  
Una Welding & Bonding Co.  
Westinghouse E. & M. Co.

### Book Publishers

McGraw-Hill Book Co.

### Brackets and Cross Arms

(See also Poles, Ties,  
Posts, Etc.)  
Elec. Ry. Equipment Co.  
Elec. Service Supplies Co.  
Graybar Electric Co.  
Hubbard & Co.  
Ohio Brass Co.

### Brake Adjusters

Brill Co., The J. G.  
National Ry. Appliance Co.  
Westinghouse Tr. Br. Co.

### Brake Shoes

American Brake Shoe &  
Foundry Co.  
Bemis Car Truck Co.  
Brill Co., The J. G.  
St. Louis Car Co.

### Brakes, Brake Systems and

Brake Parts  
Bemis Car Truck Co.  
Brill Co., The J. G.

# 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

General Electric Co.  
National Brake Co.  
Safety Car Devices Co.  
Westinghouse Tr. Br. Co.

Brushes, Carbon  
General Electric Co.  
Jeaodron, W. J.  
Le Carbone Co.  
Morganite Brush Co., Inc.  
Westinghouse E. & M. Co.

Brushes, Graphite  
Morganite Brush Co., Inc.

Brushes, Wire Pneumatic  
Ingersoll-Rand Co.

### Bulkheads

Haskellite Mfg. Corp.

### Bus Seats

Hale-Kilburn Co.  
Buses, Motor  
Brill Co., The J. G.  
Graham Bros.  
International Motor Co.  
Mack Trucks  
Studebaker Corp. of  
America

### Bushings, Case Hardened

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

Cables (See Wires and  
Cables)

Cambric Tapes, Yellow and  
Black Varnish  
Irvington Varnish & Ins.  
Co.

Carbon Brushes (See  
Brushes, Carbon)

Car Lighting Fixtures  
Elec. Service Supplies Co.

Car Panel Safety Switches  
Consolidated Car Heat. Co.  
Westinghouse E. & M. Co.

### Car Wheels, Rolled Steel

Bethlehem Steel Co.

### Cars, Dump

Brill Co., The J. G.  
Differential Steel Car Co.

### Cars, Oas, Rail

Brill Co., The J. G.  
Cars, Passenger, Freight,  
Express, etc.  
American Car Co.  
Brill Co., The J. G.  
Cincinnati Car Co.  
Kuhlman Car Co., G. C.  
National Ry. Appliance Co.  
Wason Mfg. Co.

### Cars, Second Hand

Electric Equipment Co.

### Cars, Self-Propelled

Brill Co., The J. G.  
General Electric Co.

Castings, Brass Composition  
of Copper  
Ajax Metal Co.  
More-Jones Brass & Metal  
Co.

Castings, Gray Iron and  
Steel  
American Steel Foundries  
Bemis Car Truck Co.

Castings, Malleable and Brass  
Bemis Car Truck Co.

Catchers and Retrievers,  
Trolley  
Elec. Service Supplies Co.  
Ohio Brass Co.  
Wood Co., Chas. N.

Catenary Construction  
Archbold-Brady Co.  
Graybar Electric Co.

Celling Car  
Haskellite Mfg. Corp.  
Pantasote Co., Inc.

Ceilings, Plywood, Panels  
Haskellite Mfg. Corp.

Change Carriers  
Cleveland Fare Box Co.  
Electric Service Supplies Co.

Circuit-Breakers  
General Electric Co.  
Westinghouse E. & M. Co.

Clamps and Connectors for  
Wires and Cables  
Elec. Ry. Equipment Co.  
Elec. Ry. Improvement Co.  
Elec. Service Supplies Co.  
General Electric Co.  
Hubbard & Co.  
Ohio Brass Co.  
Westinghouse E. & M. Co.

Cleaners and Scrapers Track  
(See also Snow-Plows,  
Sweepers and Brooms)

Brill Co., The J. G.  
Cincinnati Car Co.  
Ohio Brass Co.

Clusters and Sockets  
General Electric Co.

Coil Banding and Winding  
Machines  
Elec. Service Supplies Co.  
Westinghouse E. & M. Co.

Coils, Armature and Field  
General Electric Co.  
Westinghouse E. & M. Co.

Coils, Choke and Kicking  
Elec. Service Supplies Co.  
General Electric Co.  
Westinghouse E. & M. Co.

Coin Counting Machines  
Cleveland Fare Box Co.  
International Register Co.

Coin Sorting Machines  
Cleveland Fare Box Co.

Coin Wrappers  
Cleveland Fare Box Co.

Commutator Slotters  
Elec. Service Supplies Co.  
General Electric Co.  
Westinghouse E. & M. Co.

Wood Co., Chas. N.

Commutator Truing Devices  
General Electric Co.

Commutators or Parts  
Cameron Electrical Mfg. Co.  
General Electric Co.  
Westinghouse E. & M. Co.

Compressors, Air  
General Electric Co.  
Graybar Electric Co.  
Ingersoll-Rand Co.  
Westinghouse Tr. Br. Co.

Compressors, Air, Portable  
Ingersoll-Rand Co.

Condensers  
General Electric Co.  
Ingersoll-Rand Co.  
Westinghouse E. & M. Co.

Condenser Papers  
Irvington Varnish & Ins.  
Co.

Connectors, Solderless  
Westinghouse E. & M. Co.

Connectors, Trailer Car  
Consolidated Car Heat. Co.  
Elec. Service Supplies Co.  
Ohio Brass Co.

Controllers or Parts  
American Brown Boveri  
Elec. Corp.  
General Electric Co.  
Westinghouse E. & M. Co.

Controller Regulators  
Elec. Service Supplies Co.

Controlling Systems  
General Electric Co.  
Westinghouse E. & M. Co.

Converters, Rotary  
American Brown Boveri  
Elec. Corp.  
General Electric Co.  
Westinghouse E. & M. Co.

Copper Wire  
American Brass Co.  
Amer. Steel & Wire Co.  
Anaconda Copper Mining  
Co.

Copper Wire Instruments,  
Measuring, Testing and  
Recording  
American Brass Co.  
American Steel & Wire Co.  
Anaconda Copper Mining Co.

Cord, Bell, Trolley, Register  
Amer. Steel & Wire Co.  
Brill Co., The J. G.  
Elec. Service Supplies Co.  
International Register Co.  
Roebbing's Sons Co.,  
John A.  
Samson Cordage Works  
Silver Lake Co.

Cord Connectors and  
Couplers  
Elec. Service Supplies Co.  
Samson Cordage Works  
Wood Co., Chas. N.

Couplers, Car  
American Steel Foundries  
Brill Co., The J. G.  
Cincinnati Car Co.  
Ohio Brass Co.  
Westinghouse Tr. Br. Co.

Cranes, Hoists & Lifts  
Elec. Service Supplies Co.  
Cross Arms (See Brackets)

Crossing Foundations  
International Steel Tie Co.

Crossings  
Ramapo Ajax Corp.  
Wm. Wharton, Jr. & Co.

Crossings, Frogs & Switches  
Ramapo Ajax Corp.  
Wm. Wharton, Jr. & Co.

Crossings, Manganese  
Bethlehem Steel Co.  
Ramapo Ajax Corp.  
Wm. Wharton, Jr. & Co.

Crossings, Track (See Track  
Special Work)

Crossings, Trolley  
Ohio Brass Co.  
Westinghouse E. & M. Co.

Curtains & Curtain Fixtures  
Brill Co., The J. G.  
Morton Mfg. Co.  
Pantasote Co., Inc.

Dealer's Machinery & Second  
Hand Equipment  
Elec. Equipment Co.  
Perry Buxton Doane Co.  
Public Service Electric &  
Gas Co.  
Salzberg, Inc., H. E.

Dealer Second Hand Rails  
Electric Equipment Co.

### Derailing Devices (See also

Track Work)

Derailing Switches  
Ramapo Ajax Corp.

Destination Signs  
Elec. Service Supplies Co.

Detective Service  
Wish-Service, P. Edward

Door Operating Devices  
Brill Co., The J. G.  
Consolidated Car Heating Co.  
Nat'l Pneumatic Co., Inc.  
Safety Car Devices Co.

Doors & Door Fixtures  
Brill Co., The J. G.  
General Electric Co.  
Hale-Kilburn Co.  
Morton Mfg. Co.

Doors, Folding Vestibule  
Nat'l Pneumatic Co., Inc.  
Safety Car Devices Co.

Drills, Track  
Amer. Steel & Wire Co.  
Electric Service Supplies Co.  
Ingersoll-Rand Co.  
Ohio Brass Co.

Dryers, Sand  
Electric Service Supplies Co.  
Ohio Brass Co.  
Westinghouse E. & M. Co.

Ears  
Ohio Brass Co.  
Westinghouse E. & M. Co.

Electric Grinders  
Graybar Electric Co.  
Railway Trackwork Co.

Electrical Wires and Cables  
Amer. Electrical Works  
Amer. Steel & Wire Co.  
Graybar Electric Co.  
John A. Roebbing's Sons Co.

Electrodes, Carbon  
Railway Trackwork Co.  
Una Welding & Bonding Co.

Electrodes, Steel  
Railway Trackwork Co.  
Una Welding & Bonding Co.

Engineers, Consulting, Con-  
tracting and Operating  
Archbold-Brady Co.  
Beeler, John A.  
Bibbing, J. Rowland  
Buchanan & Layng Corp.  
Day & Zimmerman, Inc.  
Ford, Bacon & Davis  
Hemphill & Wells  
Hotel, Engelhardt W.  
Jackson, Walter  
Kelker & DeLew  
Kelly, Cooke & Co.  
McClellan & Junkersfeld  
Richey, Albert S.  
Sanderson & Porter  
Stevens & Wood  
Stone & Webster  
White & Webber Corp., The  
J. G.

Engines, Gas, Oil or Steam  
Ingersoll-Rand Co.  
Westinghouse E. & M. Co.

Exterior Side Panels  
Haskellite Mfg. Corp.

Fare Boxes  
Cleveland Fare Box Co.  
Nat'l Ry. Appliance Co.  
Perey Mfg. Co.

Fare Registers  
Elec. Service Supplies Co.

Fences, Woven Wire and  
Fence Posts  
Amer. Steel & Wire Co.

Fenders and Wheel Guards  
Brill Co., The J. G.  
Cincinnati Car Co.  
Consolidated Car Fender Co.  
Star Brass Works  
Wood Co., Chas. N.

Fibre and Fibre Tubing  
Westinghouse E. & M. Co.

Field Coils (See Coils)

Fluximum Insulators  
National Railway Appliance  
Co.

Floodlights  
Electric Service Supplies Co.

Floor, Sub  
Haskellite Mfg. Corp.

### Floors

Haakalite Mfg. Corp.

### Forgings

Brill Co., The J. G.  
Frogs & Crossings, Tee Rail  
Bethlehem Steel Co.  
Ramapo Ajax Corp.  
Wm. Wharton, Jr. & Co.

Frogs, Track (See Track  
Work)

Frogs, Trolley  
Elec. Service Supplies Co.  
Ohio Brass Co.  
Westinghouse E. & M. Co.

Furnaces, Electric, Steel  
Melting  
American Brown Boveri  
Elec. Corp.

Fuses and Fuse Boxes  
Consolidated Car Heating Co.  
General Electric Co.  
Graybar Electric Co.  
Westinghouse E. & M. Co.

Fuses, Refillable  
General Electric Co.

Gaskets  
Westinghouse Tr. Br. Co.

Gas-Electric Cars  
General Electric Co.  
Westinghouse E. & M. Co.

Gas Producers  
Westinghouse E. & M. Co.

Gates, Car  
Brill Co., The J. G.  
Cincinnati Car Co.

Gauges, Oil and Water  
Ohio Brass Co.

Grar Blinks  
Brill Co., The J. G.

Gear Cases  
Chillingworth Mfg. Co.  
Electric Service Supplies Co.  
Westinghouse E. & M. Co.

Gears and Pinions  
Bemis Car Truck Co.  
Electric Service Supplies Co.  
General Electric Co.  
Nat'l Ry. Appliance Co.  
Nuttall Co., R. D.

Generating Sets, Gas-Electric  
General Electric Co.

Generators  
American Brown Boveri  
Elec. Corp.  
General Electric Co.  
Westinghouse E. & M. Co.

Gilder Rails  
Bethlehem Steel Co.  
Lorain Steel Co.

Gongs (See Bells and Gongs)

Greases (See Lubricants)

Grinders & 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.

Guard Rail Clamps  
Ramapo Ajax Corp.

Guard Rails, Tee Rail &  
Manganese  
Ramapo Ajax Corp.  
Wm. Wharton, Jr. & Co.

Guards, Trolley  
Elec. Service Supplies Co.  
Ohio Brass Co.

Hammers, Pneumatic  
Ingersoll-Rand Co.

Harps, Trolley  
Elec. Service Supplies Co.  
More-Jones Brass & Metal  
Co.

Nuttall Co., R. D.  
Star Brass Works

Headlights  
Elec. Service Supplies Co.  
General Electric Co.  
Ohio Brass Co.

Headlining  
Haskellite Mfg. Corp.  
Pantasote Co., Inc.

Heaters, Car (Electric)  
Consolidated Car Heating Co.  
Gold Car Heat. & Ltg. Co.  
Nat'l Ry. Appliance 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.

### Holists, Portable

Ingersoll-Rand Co.

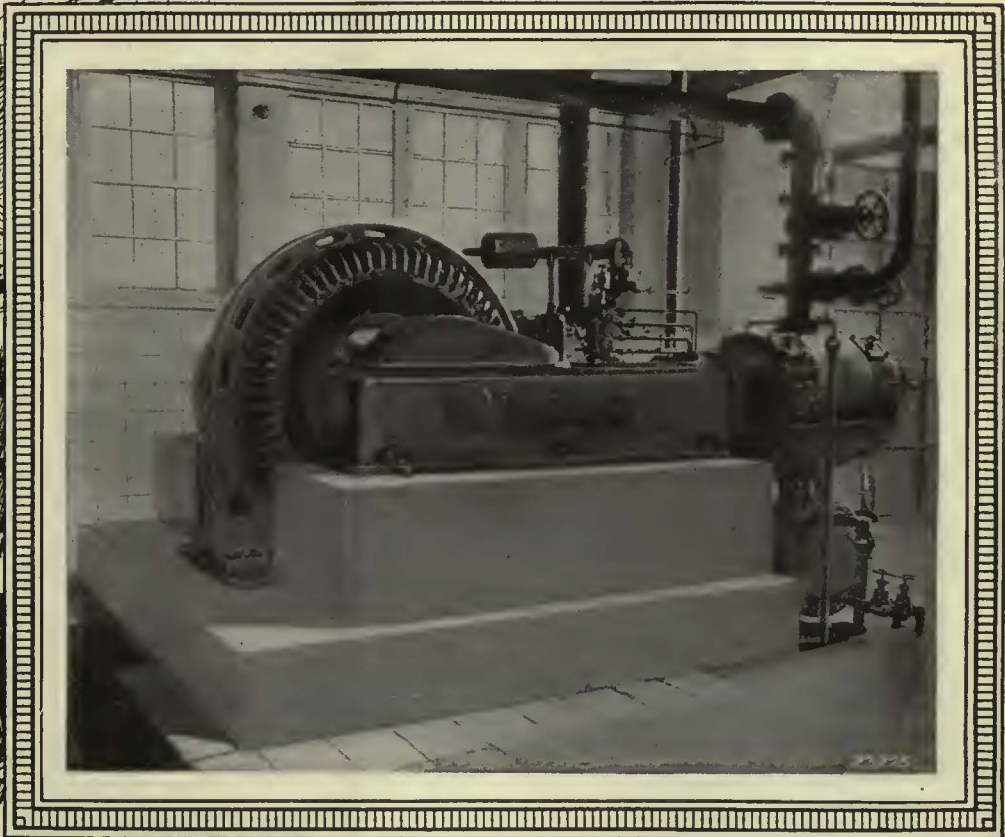
### Hose, Bridges

Ohio Brass Co.

### Hose, Pneumatic

Westinghouse Traction  
Brake Co.

(Continued on page 40)



An Ingersoll-Rand XRE-2 Air Compressor installed in a railway shop, Valladolid, Spain

## Service Extraordinary

**D**ON QUIXOTE'S bony old nag no longer wanders up and down the roads between Valencia and Madrid. Sancho Panza grows fat and "calls" the railroad trains that have taken the old horse's place.

Spanish railroads, like those in every other country, have installed

Ingersoll-Rand Air Compressors in their shops and terminals. That they have received the utmost satisfaction from I-R machines and I-R service is proved by the continued popularity of this equipment.

A world-wide organization gives constant attention to the Company's customers.

INGERSOLL-RAND COMPANY • 11 Broadway • New York City

*Offices in principal cities the world over*

For Canada Refer—Canadian Ingersoll-Rand Co., Ltd., 260 St. James St., Montreal, Quebec

# Ingersoll-Rand

845C

- Instruments, Measuring, Testing and Recording  
Amer. Steel & Wire Co.  
General Electric Co.  
Graybar Electric Co.  
Westinghouse E. & M. Co.
- Insulating Cloth, Paper and Tape  
General Electric Co.  
Irvington Varnish & Ins. Co.  
Okonite-Callender Cable Co.  
Westinghouse E. & M. Co.
- Insulating, Silk  
Irvington Varnish & Ins. Co.
- Insulating Varnishes  
Irvington Varnish and Insulator Co.
- Insulation (See also Paints)  
Electric Ry. Equipment Co.  
Elec. Service Supplies Co.  
General Electric Co.  
Irvington Varnish & Ins. Co.  
Okonite Co.  
Okonite-Callender Cable Co.  
Westinghouse E. & M. Co.
- Insulation Slots  
Irvington Varnish & Ins. Co.
- Insulator Pins  
Elec. Service Supplies Co.  
Hubbard & Co.
- Insulators (See also Line Materials)  
Elec. Ry. Equipment Co.  
Elec. Service Supplies Co.  
General Electric Co.  
Graybar Electric Co.  
Irvington Varnish & Ins. Co.  
Ohio Brass Co.  
Westinghouse E. & M. Co.
- Interior Side Linings  
Haskellite Mfg. Corp.
- Interurban Cars (See Cars)
- Jacks (See also Cranes, Hoists and Lifts)  
Buda Co.  
Elec. Service Supplies Co.  
National Ry. Appliance Co.
- Joints, Rail  
(See Rail Joints)
- Journal Boxes  
Bemis Car Truck Co.  
Brill Co., The J. G.
- Lamp Guards & Fixtures  
Electric Service Supplies Co.  
General Electric Co.  
Westinghouse E. & M. Co.
- Lamps, Arc & Incandescent (See also Headlights)  
General Electric Co.  
Westinghouse E. & M. Co.
- Lamps, Signal and Marker  
Electric Service Supplies Co.  
Ohio Brass Co.
- Letter Boards  
Haskellite Mfg. Corp.
- Lightning Protection  
Elec. Service Sup. Co.  
General Electric Co.  
Ohio Brass Co.  
Westinghouse E. & M. Co.
- Line Material (See also Brackets, Insulators, Wires, etc.)  
Archbold-Brady Co.  
Electric Ry. Equipment Co.  
Electric Service Supplies Co.  
General Electric Co.  
Graybar Electric Co.  
Hubbard & Co.  
More-Jones Brass & Metal Co.  
Ohio Brass Co.  
Westinghouse E. & M. Co.
- Locking Spring Boxes  
Wm. Wharton, Jr. & Co.
- Locomotives, Electric  
American Brown Boveri Elec. Corp.  
General Electric Co.  
Westinghouse E. & M. Co.
- Locomotives, Oil Engine  
Electric Driven  
Ingersoll-Rand Co.
- Lubricating Engineers  
Universal Lubricating Co.
- Lubricants, Oil and Grease  
Universal Lubricating Co.
- Manganese Parts  
Bemis Car Truck Co.
- Manganese Steel Guard Rails  
Ramapo Ajax Corp.  
Wm. Wharton, Jr. & Co.
- Manganese Steel, Special Track Work  
Bethlehem Steel Co.
- Manganese Steel Switches, Frogs & Crossings  
Bethlehem Steel Co.  
Ramapo Ajax Corp.  
Wm. Wharton, Jr. & Co.  
Meters (See Instruments)
- Motor and Generator Sets  
General Electric Co.
- Motor Buses (See Buses, Motor)
- Motor Generators  
American Brown Boveri Elec. Corp.
- Motors and Controls  
Graybar Electric Co.
- Motors, Electric  
American Brown Boveri Elec. Corp.  
General Electric Co.  
Westinghouse E. & M. Co.
- Motorman's Seats  
Brill Co., The J. G.  
Electric Service Supplies Co.  
Wood Co., Chas. N.
- Nuts and Bolts  
Bemis Car Truck Co.  
Hubbard & Co.
- Oils (See Lubricants)
- Omnibuses (See Buses, Motor)
- Oxy-Acetylene (See Cutting Apparatus, Oxy-Acetylene)
- Oxygen  
International Oxygen Co.
- Packing  
Westinghouse Traction Brake Co.
- Paints and Varnishes (Insulating)  
Electric Service Supplies Co.  
Irvington Varnish & Ins. Co.
- Paints and Varnishes for Woodwork  
National Ry. Appliance Co.
- Panels, Outside, Inside  
Haskellite Mfg. Corp.
- Pavement Breakers  
Ingersoll-Rand Co.
- Pickup, Trolley Wire  
Elec. Service Supplies Co.  
Ohio Brass Co.
- Pinion Pullers  
Elec. Service Supplies Co.  
General Electric Co.  
Wood Co., Chas. N.
- Pinions (See Gears)
- Pins, Case Hardened, Wood and Iron  
Bemis Car Truck Co.  
Ohio Brass Co.  
Westinghouse Tr. Brake Co.
- Pipe Fittings  
Westinghouse Tr. Brake Co.
- Planers (See Machine Tools)
- Plates for Tee Rail Switches  
Ramapo Ajax Corp.
- Pliers, Rubber Insulated  
Elec. Service Sup. Co.  
Nat'l Ry. Appliance Co.
- Plywood, Roofs, Headlinings, Floors, Interior Panels, Bulkheads, Truss Planks  
Haskellite Mfg. Corp.
- Pneumatic Tools  
Ingersoll-Rand Co.
- Pole Line Hardware  
Bethlehem Steel Co.  
Electric Service Supplies Co.  
Ohio Brass Co.
- Pole Reinforcing  
Hubbard & Co.
- Poles, Metal Street  
Elec. Ry. Equipment Co.  
Graybar Electric Co.  
Hubbard & Co.
- Poles and Ties Treated  
Bell Lumber Co.
- Poles, Ties, Posts, Piling & Lumber  
Bell Lumber Co.  
Naugle Pole & Tie Co.
- Poles, Trolley  
Bell Lumber Co.  
Electric Service Supplies Co.  
Nuttall Co., R. D.
- Poles, Tubular Steel  
Elec. Ry. Equipment Co.  
Electric Service Supplies Co.
- Portable Grinders  
Buda Co.
- Pathways  
Okonite Co.  
Okonite-Callender Cable Co., Inc.
- Power Saving Devices  
National Ry. Appliance Co.
- Pressure Regulators  
General Electric Co.  
Ohio Brass Co.  
Westinghouse E. & M. Co.
- Pressure Regulators  
General Electric Co.  
Westinghouse Traction Brake Co.
- Pumps  
A. S. Cameron Steam Pump Wks. (Ingersoll-Rand Co.)  
Ingersoll-Rand Co. (A. S. Cameron Steam Pump Wks.)
- Pumps, Vacuum  
A. S. Cameron Steam Pump Wks. (Ingersoll-Rand Co.)  
Ingersoll-Rand Co. (A. S. Cameron Steam Pump Wks.)
- Punches, Ticket  
International Register Co.  
Wood Co., Chas. N.
- Rail Braces & Fastenings  
Ramapo Ajax Corp.
- Rail Filler  
Philip Carey Co., The
- Rail Grinders (See Grinders)
- Rail Joints  
Carnegie Steel Co.  
Rail Joint Co., The
- Rail Joints—Welded  
Corain Steel Co.  
Metal & Thermit Corp.
- Rail Welding  
Metal & Thermit Corp.  
Railway Trackwork Co.  
Una Welding & Bonding Co.
- Rails, Steel  
Carnegie 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.  
Elec. Service Supplies Co.  
Hale-Kilburn Co.
- Rectifiers, Mercury  
American Brown Boveri Elec. Corp.
- Registers and Fittings  
Brill Co., The J. G.  
Cincinnati Car Co.  
Electric Service Supplies Co.  
International Register Co.
- Reinforcement, Concrete  
American Steel & Wire Co.  
Bethlehem Steel Co.  
Carnegie Steel Co.
- Repair Shop Appliances (See also Coll Banding and Winding Machines)  
Elec. Service Supplies Co.
- Repair Work (See also Colls)  
General Electric Co.  
Westinghouse E. & M. Co.
- Replacers, Car  
Electric Service Supplies Co.
- Resistances  
Consolidated Car Heating Co.
- Resistance, Wire and Tube  
American Steel & Wire Co.  
General Electric Co.  
Westinghouse E. & M. Co.
- Retrievers, Trolley (See Catchers and Retrievers, Trolley)
- Rheostats  
General Electric Co.  
Westinghouse E. & M. Co.
- Roofing, Car  
Haskellite Mfg. Corp.  
Pantastote Co., Inc.
- Roofs, Car and Bus  
Haskellite Mfg. Corp.
- Safety Control Devices  
Safety Car Devices Co.
- Sanders, Track  
Brill Co., The J. G.  
Electric Service Supplies Co.  
Ohio Brass Co.
- Sash Fixtures, Car  
Brill Co., The J. G.
- Sash Metal Car Window  
Hale-Kilburn Co.
- Scrapers, Track (See Cleaners and Scrapers, Track)
- Screw Drivers, Rubber Insulated  
Electric Service Supplies Co.
- Seating Materials  
Brill Co., The J. G.  
Haskellite Mfg. Corp.  
Pantastote Co., Inc.
- Seats, Bus  
Brill Co., The J. G.  
Hale-Kilburn Co.
- Seats, Car (See also Rattan)  
Brill Co., The J. G.  
Hale-Kilburn Co.
- Second Hand Equipment  
Electric Equipment Co.  
Perry, Buxton Doane Co.  
Public Service Electric & Gas Co.  
Salzberg, Inc., H. E.
- Shades, Vestibule  
Brill Co., The J. G.
- Shovels  
Brill Co., The J. G.  
Hubbard & Co.
- Shovels, Power  
Brill Co., The J. G.  
Slide bearings (See Bearings, Center and Side)
- Signals, Car Starting  
Consolidated Car Heating Co.  
Electric Service Supplies Co.  
Nat'l Pneumatic Co., Inc.
- Signal Systems, Block  
Electric Service Supplies Co.  
Nachod and United States Electric Signal Co.  
Wood Co., Chas. N.
- Signal Systems, Highway Crossing  
Nachod and United States Electric Signal Co.  
Wood Co., Chas. N.
- Slack Adjusters (See Brake Adjusters)
- Sleet Wheels and Cutters  
Elec. Ry. Equipment Co.  
Elec. Ry. Improvement Co.  
Elec. Service Supplies Co.  
More-Jones Brass & Metal Co.  
Nuttall Co., R. D.
- Snow-Plows, Sweepers and Bronns  
Brill Co., The J. G.  
Consolidated Car Fender Co.
- Soldering and Brazing Apparatus (See Welding Processes and Apparatus)
- Special Adhesive Papers  
Irvington Varnish & Ins. Co.
- Special Trackwork  
Bethlehem Steel Co.  
Loran Steel Co.  
Wm. Wharton, Jr. & Co.
- Spikes  
Amer. Steel & Wire Co.
- Splicing Compounds  
Westinghouse E. & M. Co.
- Splicing Sleeves (See Clamps and Connectors)
- Springs, Car and Truck  
American Steel Foundries  
American Steel & Wire Co.  
Bemis Car Truck Co.  
Brill Co., The J. G.
- Sprinklers, Track and Road  
Brill Co., The J. G.
- Steel and Steel Products  
Carnegie Steel Co.  
Hillola Steel Co.  
Morton Manufacturing Co.
- Steel Car Doors  
Morton Mfg. Co.
- Steel Flooring  
Morton Mfg. Co.
- Steps, Car  
Brill Co., The J. G.  
Morton Mfg. Co.
- Stokers, Mechanical  
Babcock & Wilcox Co.  
Westinghouse E. & M. Co.
- Storage Batteries (See Batteries, Storage)
- Strain Insulators  
Electric Service Supplies Co.  
Ohio Brass Co.  
Westinghouse E. & M. Co.
- Strand  
American Steel & Wire Co.  
Roebbling's Sons Co., J. A.
- Street Cars (See Cars, Passenger, Freight, Express)
- Superheaters  
Babcock & Wilcox Co.
- Sweepers, Snow (See Snow Plows, Sweepers and Bronns)
- Switch Stands and Fixtures  
Ramapo-Ajax Corp.
- Switches and Switchboards  
American Brown Boveri Elec. Corp.  
Consolidated Car Heating Co.  
Electric Service Supplies Co.  
General Electric Co.  
Westinghouse E. & M. Co.
- Switches, Tee Rail  
Ramapo Ajax Corp.
- Switches, Track (See Track Special Work)
- Tampers, Tie  
Ingersoll-Rand Co.  
Railway Trackwork Co.
- Tapes and Cloths (See Insulating Cloth, Paper and Tape)
- Tee Rail Special Track Work  
Ramapo Ajax Corp.
- Telephones and Parts  
Elec. Service Supplies Co.  
Graybar Electric Co.
- Testing Instruments (See Instruments, Electrical Measuring, Testing, etc.)
- Thermostats  
Consolidated Car Heating Co.  
Gold Car Heating & Lighting Co.  
Railway Utility Co.  
Smith Heater Co., Peter
- Ticket Choppers and Destroyers  
Electric Service Supplies Co.
- Ties and Tie Rods, Steel  
Carnegie Steel Co.  
International Steel Tie Co.
- Ties, Mechanical  
Dayton Mechanical Tie Co.
- Ties, Wood Cross (See Poles, Ties, Posts, etc.)
- Tongue Switches  
Wm. Wharton, Jr. & Co.
- Tools, Track & Miscellaneous  
American Steel & Wire Co.  
Electric Service Supplies Co.  
Hubbard & Co.  
Railway Trackwork Co.
- Torches, Acetylene (See Cutting Apparatus)
- Towers and Transmission Structures  
Archbold-Brady Co.  
Westinghouse E. & M. Co.
- Track Grinders  
Metal & Thermit Corp.  
Railway Trackwork Co.  
Ramapo Ajax Corp.
- Track, Special Work  
Buda Co.  
Ramapo Ajax Corp.
- Trackless Trolley Cars  
Brill Co., The J. G.
- Transformers  
American Brown Boveri Elec. Corp.  
General Electric Co.  
Graybar Electric Co.  
Westinghouse E. & M. Co.
- Treads, Safety, Stair, Car Step  
Morton Mfg. Co.
- Trolley Bases  
General Electric Co.  
More-Jones Brass & Metal Co.
- National Railway Appliance Co.  
Nuttall Co., R. D.  
Ohio Brass Co.
- Trolley Bases, Retrieving  
General Electric Co.  
National Railway Appliance Co.  
Nuttall Co., R. D.  
Ohio Brass Co.
- Trolley Buses  
Brill Co., The J. G.  
General Electric Co.  
Westinghouse E. & M. Co.
- Trolley Material, Overhead  
Electric Service Supplies Co.  
More-Jones Brass & Metal Co.  
Ohio Brass Co.  
Westinghouse E. & M. Co.
- Trolley Wheel Bushings  
More-Jones Brass & Metal Co.  
Star Brass Works
- Trolley Wheels and Harps  
Electric Service Supplies Co.  
More-Jones Brass & Metal Co.
- Star Brass Works
- Trolley Wheels (See Wheels, Trolley)
- Trolley Wire  
Amer. Electrical Works  
Amer. Steel & Wire Co.  
American Brass Co.  
Anaconda Copper Min. Co.  
Graybar Electric Co.  
Roebbling's Sons Co., J. A.
- Trucks, Car  
Brill Co., The J. G.  
Bemis Car Truck Co.  
Cincinnati Car Co.
- Trucks, Motor  
Graham Bros.  
International Motor Co.  
Mack Trucks, Inc.
- Truss Planks  
Haskellite Mfg. Corp.
- Trubing, Yellow & Black  
Flexible Varnish  
Irvington Varnish & Ins. Co.
- Turbines, Steam  
General Electric Co.  
Westinghouse E. & M. Co.
- Turnstiles  
Electric Service Supplies Co.  
Percy Mfg. Co., Inc.
- Turntables  
Electric Service Supplies Co.  
Ohio Brass Co.  
Westinghouse Tr. Br Co.
- Varnished Papers & Silks  
Irvington Varnish & Ins. Co.

Our advertisement in the issue of August 21 showed how **HASKELITE** and **PLYMETL** are being used in reconstructed cars.

*Another ad will appear next week.*

**HASKELITE MANUFACTURING CORPORATION**  
133 W. Washington St., Chicago, Ill.

# Hale and Kilburn SEATS

Better Quality Seats  
For Cars and Buses

**Hale-Kilburn Co.**  
1800 Lehigh Ave., Philadelphia, Pa.

## SAMSON SPOT WATERPROOFED TROLLEY CORD



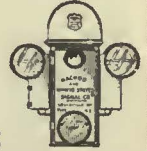
Trade Mark Reg. U. S. Pat. Off.

Made of extra quality stock firmly braided and smoothly finished. Carefully inspected and guaranteed free from flaws. Samples and information gladly sent.

**SAMSON CORDAGE WORKS, BOSTON, MASS.**

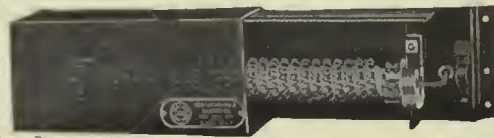
## NACHOD & UNITED STATES SIGNAL CO., INC.

LOUISVILLE, KY.  
BLOCK SIGNALS



FOR  
**ELECTRIC RAILWAYS**  
**HIGHWAY CROSSING SIGNALS**

## THE BEST TRUSS PLANK ELECTRIC HEATER EVER PRODUCED



No.  
**478E**

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



## Gets Every Fare PEREY TURNSTILES or PASSIMETERS

Use them in your Prepayment Areas and Street Cars

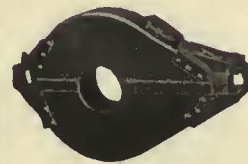
**Perey Manufacturing Co., Inc.**  
101 Park Avenue, New York City



## Car Heating and Ventilation

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

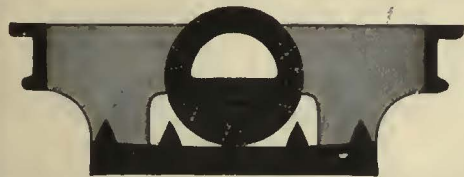
**The Peter Smith Heater Company**  
6209 Hamilton Ave., Detroit, Mich.



## CHILLINGWORTH One-Piece Gear Cases

Seamless—Rivetless—Light Weight  
Best for Service—Durability and Economy. Write Us.

**Chillingworth Mfg. Co.**  
Jersey City, N. J.



## STUCKI SIDE BEARINGS

**A. STUCKI CO.**  
Oliver Bldg.  
Pittsburgh, Pa.

# UNA

RAIL BONDS—RAIL JOINTS  
DYNAMOTORS  
WELDING ROD

UNA Welding & Bonding Co.  
Cleveland, Ohio.

## RAIL GRINDERS AND WELDERS

**Railway Track-work Co., Philadelphia**

682

## RAILWAY UTILITY COMPANY

CAR COMFORT WITH HEATERS  
**UTILITY** REGULATORS  
VENTILATORS

141-151 West 22d St.  
Chicago, Ill.

Write for  
Catalogue

1328 Broadway  
New York, N. Y.

ELECTRIC CAR HEATERS  
THERMOSTATS BUZZERS  
PNEUMATIC DOOR OPERATORS

**CONSOLIDATED CAR HEATING CO.**

NEW YORK ALBANY, N.Y. CHICAGO

Eliminate rail joints  
by  
**THERMIT-WELDING**

METAL & THERMIT CORPORATION  
120 Broadway, New York City, N. Y.

**SEVEN WORKS**  
RAMAPO-AJAX-ELIOT

**Ramapo Ajax Corporation**

RAMAPO AUTOMATIC  
RETURN SWITCH STANDS  
FOR PASSING SIDINGS  
TEE RAIL SPECIAL WORK  
MANGANESE CONSTRUCTION

SALES OFFICES AT ALL WORKS  
Main Office, HILLBURN, N. Y.

## H B LIFE GUARDS PROVIDENCE FENDERS

Manufactured by  
**CONSOLIDATED CAR FENDER CO., PROVIDENCE, R. I.**  
General Sales Agents  
**WENDELL & MacDUFFIE CO., 110 E. 42nd St., N. Y. C.**

# ALPHABETICAL INDEX TO ADVERTISEMENTS

	Page		Page
<b>A</b>		<b>K</b>	
Ajax Metal Co., The . . . . .	32	Kelker, DeLeuw & Co. . . . .	22
American Brass Co., The . . . . .	36	Kelly, Cooke & Co. . . . .	23
American Brown Boveri Electric Corp. . . . .	18-19	Kerite Ins. Wire & Cable Co. . . . .	32
American Car Co. . . . .	43	Kuhlman Car Co. . . . .	43
American Electrical Works. . . . .	36		
American Steel Foundries . . . . .	4	<b>F</b>	
American Steel & Wire Co. . . . .	36	Ford, Bacon & Davls. . . . .	22
Anaconda Copper Mining Co. . . . .	36	"For Sale" Ads. . . . .	37
Archbold-Brady Co. . . . .	22		
		<b>L</b>	
<b>B</b>		<b>M</b>	
Babcock & Wilcox Co. . . . .	33	LeCarbone Co. . . . .	31
Beeler Organization . . . . .	22	Lorain Steel Co. . . . .	33
Bell Lumber Co. . . . .	36		
Bemis Car Truck Co. . . . .	26	<b>N</b>	
Bethlehem Steel Co. . . . .	10	McClellan & Junkersfeld . . . . .	22
Bibbins, J. Rowland . . . . .	22	McGraw-Hill Book Co. . . . .	30
Brill Co., The J. G. . . . .	43	Mack Trucks, Inc. . . . .	17, 27, 35
Buchanan & Layng Corp. . . . .	23	Metal & Thermit Corp. . . . .	41
Buda Co., The. . . . .	33	More-Jones Brass & Metal Co. . . . .	31
		Morganite Brush Co., The. . . . .	30
		Morton Mfg. Co. . . . .	23
<b>C</b>		<b>O</b>	
Cameron Electrical Mfg. Co. . . . .	23	Ohio Brass Co. . . . .	5
Carcy Co., The Philip. Front Cover	33	Okonite-Callender Cable Company, Inc., The. . . . .	36
Carnegie Steel Co. . . . .	33	Okonite Co., The . . . . .	30
Chillingworth Mfg. Co. . . . .	41		
Cincinnati Car Co. . . . .	14-15	<b>P</b>	
Cleveland Fare Box Co. . . . .	34	Pantasote Co., Inc. . . . .	32
Collier, Inc., Barron G. . . . .	28	Percy Mfg. Co., Inc. . . . .	41
Consolidated Car Fender Co. . . . .	41	Perrey, Buxton Doane Co. . . . .	37
Consolidated Car Heating Co. . . . .	41		
		<b>R</b>	
<b>D</b>		<b>S</b>	
Day & Zimmermann, Inc. . . . .	22	Safety Car Devices Co. . . . .	8
Dayton Mechanical Tie Co. . . . .	Insert 11-12	Salzburg Inc., H. E. . . . .	37
Differential Steel Car Co., The. . . . .	34	Samson Cordage Works. . . . .	41
		Sanderson & Porter . . . . .	22
		Searchlight Section . . . . .	37
		Silver Lake Co. . . . .	36
		Smith Heater Co., Peter . . . . .	41
		Star Brass Works . . . . .	34
		Stevens & Wood, Inc. . . . .	22
		Stone & Webster . . . . .	22
		Stuckl Co., A. . . . .	41
		Studebaker Corp. of America, The . . . . .	25
		<b>T</b>	
		Timken-Detroit Axle Co., The. . . . .	24
		<b>U</b>	
		Una Welding & Bonding Co. . . . .	41
		Universal Lubricating Co. . . . .	34
		<b>W</b>	
		"Want" Ads . . . . .	37
		Wason Mfg. Co. . . . .	43
		Westinghouse Elec. & Mfg. Co. . . . .	2
		Westinghouse Traction Brake Co. . . . .	6
		Wharton, Jr. & Co., Inc., Wm. . . . .	33
		"What and Where to Buy" . . . . .	38, 40, 42
		White Eng. Corp., The J. G. . . . .	22
		Wish Service, The P. Edw. . . . .	23
		Wood Co., Chas. N. . . . .	36

## WHAT AND WHERE TO BUY

(Continued from page 40)

<p><b>Ventilators, Car</b> Brill Co., The J. G. Cincinnati Car Co. Consolidated Car Heating Co. Natl. Ry. Appliance Co. Railway Utility Co.</p> <p><b>Vestibule Linings</b> Haskelite Mfg. Corp.</p> <p><b>Weatherproofing</b> Morton Mfg. Co.</p> <p><b>Welded Rail Joints</b> Electric Railway Improvement Co. Metal &amp; Thermit Corp. Ohio Brass Co. Railway Trackwork Co. Una Welding &amp; Bonding Co.</p>	<p><b>Welders, Portable Electric</b> Electric Railway Improvement Co. Ohio Brass Co. Railway Trackwork Co. Una Welding &amp; Bonding Co. Westinghouse E. &amp; M. Co.</p> <p><b>Welders, Rail Jolot</b> Ohio Brass Co. Railway Trackwork Co.</p> <p><b>Welding Processes and Apparatus</b> Electric Railway Improvement Co. General Electric Co. Metal &amp; Thermit Corp. Natl. Ry. Appliance Co. Ohio Brass Co. Railway Trackwork Co. Una Welding &amp; Bonding Co. Westinghouse E. &amp; M. Co.</p>	<p><b>Welding and Cutting Tools</b> International Oxygen Co. Welding Steel Electric Railway Improvement Co. Railway Trackwork Co. Una Welding &amp; Bonding Co.</p> <p><b>Welding Wire</b> American Steel &amp; Wire Co. General Electric Co. Railway Trackwork Co. Roebling's Sons Co., J. A.</p> <p><b>Welding Wire and Rods</b> Railway Trackwork Co. Wheel Guards (See Fenders and Wheel Guards) Wheel Presses (See Machine Tools)</p> <p><b>Wheels, Car, Cast Iron</b> Bemis Car Truck Co. Griffin Wheel Co.</p>	<p><b>Wheels, Car, Steel &amp; Steel Tire</b> American Steel Foundries Carnegie Steel Co.</p> <p><b>Wheels, Trolley</b> Elec. Ry. Equipment Co. Elec. Service Supplies Co. General Electric Co. More-Jones Brass &amp; Metal Co. Nuttall Co., R. D. Star Brass Works</p> <p><b>Wheels, Wrought Steel</b> Carnegie Steel Co.</p> <p><b>Whistles, Air</b> General Electric Co. Ohio Brass Co. Westinghouse F &amp; M Co. Westinghouse Traction Brake Co.</p>	<p><b>Window Sash, Locks and Raeks</b> Morton Mfg. Co.</p> <p><b>Wire Rope</b> American Steel &amp; Wire Co. Roebling's Sons Co., J. A.</p> <p><b>Wires and Cables</b> American Brass Co. American Electrical Works American Steel &amp; Wire Co. Anaconda Copper Min. Co. General Electric Co. Graybar Electric Co. Kerite Insulated Wire &amp; Cable Co. Okonite Co. Okonite-Callender Cable Co., Inc. Roebling's Sons Co., J. A. Westinghouse E. &amp; M. Co.</p>
-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------





*Seating capacity of Asheville's safety cars increased to 40 with Brill "Admor" Seats*

## Brill "Admor" Seats

Increase Seating Capacity

**More Seated Passengers**  
**More Satisfied Riders**  
**More Revenue Passengers**

*A few railways which have  
 adopted Brill "Admor" Seats:*

Brooklyn City R.R. Co.  
 Miami Beach Railway Co.  
 Asheville Power & Light Co.  
 Washington Ry & Elec. Co.  
 Chilian Elec. Co., Santiago  
 Mobile Light & R.R. Co.  
 Edison-Potomac Co.  
 Dallas Railway Co.

On double-end cars having wide door openings at all four corners, the installation of Brill "Admor" Seats across all of them makes possible its use on the left-hand side at all times. Consequently, if the door openings are wide enough to accommodate a five-passenger seat, the seating capacity of a 48-passenger car may be increased to 58, or over twenty per cent. If arranged for one-man, two-man operation, in which case the seats on both sides of the rear platform may be used at times, the seating capacity of this car may be increased to 63 passengers.

When not in service the Brill "Admor" Seat functions as a substantial barrier, dividing the door openings between in and out-going passengers when, under one-man operation, both classes of passengers use the same platform. It also serves as a "grab" for these passengers.

**THE J. G. BRILL COMPANY**  
 PHILADELPHIA, PA.

AMERICAN CAR CO. — G.C. KUHLMAN CAR CO. — WASON MANFG CO.  
 ST. LOUIS, MO. — CLEVELAND, OHIO. — SPRINGFIELD, MASS.

# One motor or two

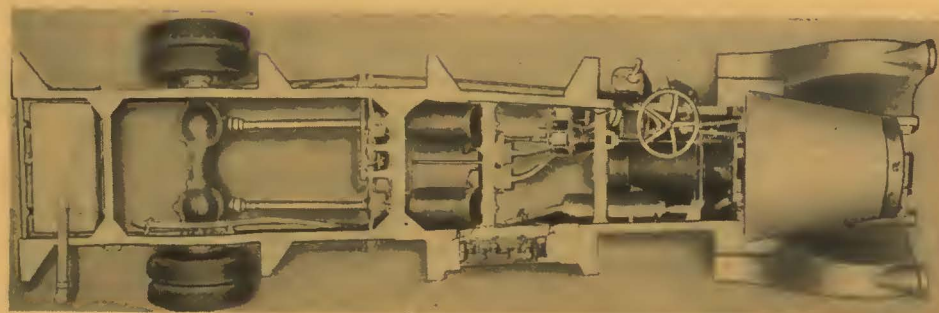
Some companies, contemplating the operation of gas-electric buses, wish to avail themselves of the obvious advantages offered by two-motor drive. Others prefer the greater simplicity and the lighter weight of a single-motor equipment and believe that the advantages of dual-drive are offset by the increased first cost.

General Electric builds electrical equipment for both types of drive, adaptable to any standard chassis. In cooperation with leading bus builders, it can furnish gas-electric drive to meet these alternative requirements, as may be determined by personal preference or operating conditions.

Just specify: *the electrical equipment shall be G-E.*

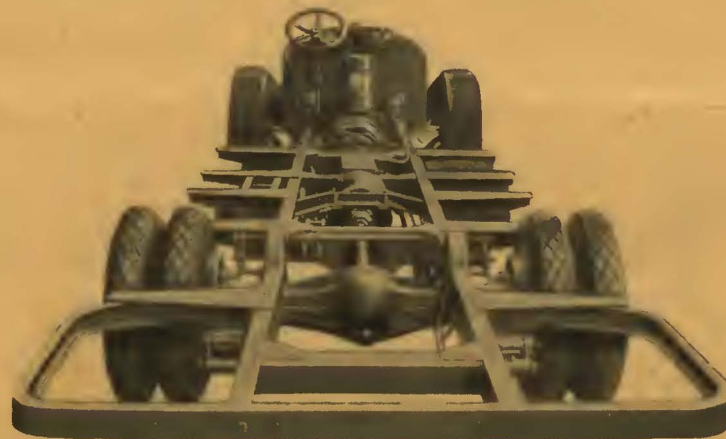


The trade mark of General Electric on bus equipment is a guarantee of successful service. It stands for a high degree of excellence in this electrical equipment such as has been recognized for years in G-E equipment for other phases of transportation.



## Dual Drive—its advantages:

- The differential is eliminated, which reduces the chance of wheel slippage and skidding—
- Better clearance is afforded below the motors for a given floor height—
- Operation with one motor is possible in emergencies.



## Single-Motor Drive—its advantages:

- This equipment is lighter in weight and has a lower first cost—
- It permits the use of standard rear axles—
- Any chassis can be more readily adapted to electric drive of this type.

**GENERAL ELECTRIC**  
GENERAL ELECTRIC COMPANY, SCHENECTADY, NEW YORK      SALES OFFICES IN ALL PRINCIPAL CITIES